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ENVIRONMENT PROTECTION

COMMODITY MARKETS AND STOCK EXCHANGES

INFORMATION TECHNOLOGIES IN NATURAL RESOURCES MANAGEMENT

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FOREWORD

Over the past two decades we have witnessed a growing interest in the problems of a permanent and efficient use of natural resources and preservation of the environment as a single, composite resource of a specific purpose. The tide of interest in the world has been accompanied by efforts in the field of economic theory and practice, with a desire to reconcile economic and environmental interests, and find more appropriate instruments and measures to promote sustainable social development. Unfortunately, these new breakthroughs in the field of economics and management have largely remained unknown to our public. For these reasons, Faculty of Management Zajecar is organising the Third International Symposium on Natural Resources Management this year.

The largest number of submitted papers has in their focus increasing efficiency of resource use (and hence reducing the intensity of use) and reducing the impact on the environment. In short, most of the researches have focused on finding practical policy options for separating the trend of economic development, and more generally, development in general, from the trend of resource use and environmental impact. There is a connection established between the use of resources and the negative impact of resource use on the environment and it is being determined where it is necessary to take certain actions in order to overcome the problem. The ability to accurately assess the capacity of an individual resource, the most effective method of its allocation and the willingness to adopt measures in the event of quality deterioration of the resource or its depletion are essential for management efficiency, and they should be accompanied (in the case of non-renewable sources) by an optimal level of exploitation, the allocation of the corresponding part of the yield from the natural resource exploitation in other forms of capital in order to prevent the overall reduction of capital, as well as appropriate measures to prevent or compensate the negative consequences, especially those concerning the negative impact on the environment. It is necessary to perform a detailed analysis of stakeholders in terms of their interest in the exploitation of certain natural resources, identifying winners and losers in the current policies of natural resources exploitation and with alternative policies, their ability to make decisions, use resources, seek alternatives. It is necessary to establish a coordinated, cross-sector management of natural resources, decentralized to the greatest extent possible and with the maximum involvement of the public in order to achieve the desired efficiency and distribution effects of the use of natural resources. The application of modern tools, such as the strategic assessment of the environmental impact is certainly one way to achieve this goal. Also, the empowerment of the poorer people and less developed regions to manage natural resources in an appropriate way, for example, through better access to information and participation in decision-making mechanisms by involving the public in the early stages of decision-making or in any other appropriate way, significantly contributes to maximum distribution effects as well as poverty reduction and balanced regional development.

The contributions to the international symposium have come from the professors and associates of Megatrend University as well as from authors from other universities in the

country and abroad. Professors and doctoral students from universities in Italy, Slovenia and Bosnia and Herzegovina have also made contributions to this conference.

The Proceedings are intended for the scientific and professional community as well as students of master and doctoral studies. The contents allow readers to learn about contemporary approaches, perspectives and challenges in the natural resources management of the new millennium.

Zaječar, May 2013

Editor in Chief
Bojan S. Đorđević, PhD

COPPER PRODUCTION TRENDS IN THE WORLD WITH TURNING ON SERBIAN POSITION

TRENDOVI PROIZVODNJE BAKRA U SVETU SA OSVRTOM NA POLOŽAJ SRBIJE

Branislav Mihajlovic, PhD, grad. min. eng.[1]

Abstract: *The past few decades the production of copper in the world characterized by increasing mass, productivity and profitability. Production growth is in line with the continual growth of demand in the market. In order to maintain such a long-term trend, the most powerful companies in the world in the production of copper made continuously adapt to rapidly changing conditions, both natural and market. Technological development of copper production worldwide has reached its fully developed highly sophisticated form, but the art technology is increasingly concentrated in the hands of a few powerful companies and countries. Other companies and countries are beginning to fall behind. Where the position of Serbia in that? This text is written primarily because it would be timely to point out the possibility that our country, which has a requirement to take a favorable position in the complex production and processing of copper, in the long-term development goal and achieve it.*

Apstrakt: *Unazad par desetina godina proizvodnju bakra u svetu karakteriše sve veća masovnost, produktivnost i profitabilnost. Rast proizvodnje je usklađen sa permanentnim rastom tražnje na tržištu. Da bi se dugoročno održao takav trend, najmoćnije svetske kompanije u proizvodnji bakra vrše stalno prilagođavanje brzim promenama uslova, kako prirodnih, tako i tržišnih. Tehnološki razvoj proizvodnje bakra u svetu je dostigao izuzetno razvijene visokosofisticirane forme, ali ta vrhunska tehnologija se sve više koncentriše u rukama nekoliko najmoćnijih kompanija i država. Ostale kompanije i države počinju da zaostaju. Gde je položaj Srbije u tome? Ovaj tekst je napisan prvenstveno zbog toga da bi se pravovremeno ukazalo na mogućnost da naša zemlja, koja ima uslova da zauzme povoljnu poziciju u kompleksu proizvodnje i prerade bakra, u dugoročnom razvoju taj cilj i postigne.*

1. INTRODUCTION

At the beginning of the twentieth century, consumption of copper in the world was at about half a million tons of metal per year, and the end of 2012. has exceeded 20 million tons, which is the country's per capita average of 3 kg / year. Average growth of copper consumption in that period is 3%. Forecasts of experts that this trend will continue in the future. At first it will affect growth of the world population and rapid industrialization in developing countries.

Copper production in the world are characterized by permanent decrease of copper content in the ore dug up with the constant increase in the depth of excavation and the amount of waste. These two factors - the decline in metal content, and increasing the amount of waste can be summarized in a single indicator: an increase in the amount of excavated materials per ton of copper produced. In the last period this parameter in the world reached 566 t and in Serbia 1548 t of excavated material per ton of copper produced. Of these quantities only 1 t is useful product – copper.

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2. MASS CHARACTER OF PRODUCTION OF COPPER

Over the past decade strongly established the need for sustainable development and reducing the overall pollution of the environment, which has been in the production and processing of copper imperative imposed by the need to reduce the amount of excavation material per ton of copper produced. Surface mining because its essence is not able to give a favorable response to this request, and has in recent decades developed large-scale underground mining of copper through the use of highly sophisticated mining methods. They have slashed the cost of excavation to a level that can successfully compete with surface mining costs, and most importantly, the amount of excavation per ton of copper decreased by several times.

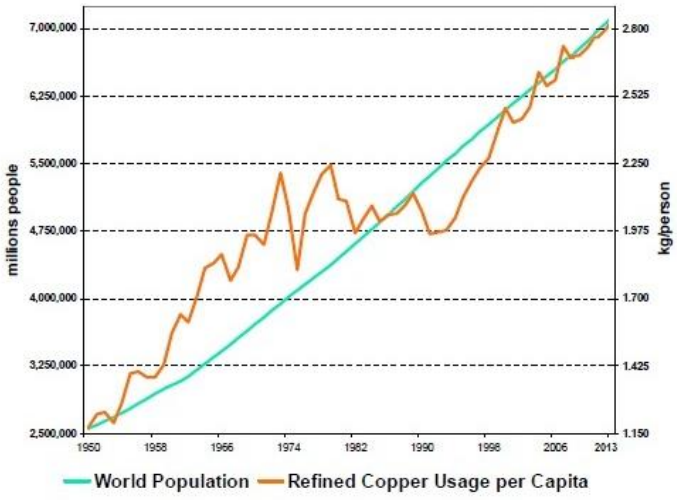

Figure 1. World refined usage per capita, 1950-2012 [2]

Mass production of the copper should not be unrestrainedand uncontrolledperform, but in terms of sustainability copper complex in Serbia must meet the following elements:

- The sustainability of the technological part
- The sustainability of economical part and
- Environmental sustainability part.

For themselves each of these units must have arguments for their sustainability, all three parts must fit into a strategy of sustainable development.

3. PROFITABILITY OF COPPER PRODUCTION

All major copper producing companies in the world have observed a substantial difference between revenues and costs, respectively selling prices of copper and its cost. Although both of the prices of essential importance for the survival of mining companies in the market, the main difference between them is that the mining companies can not affect the selling price of copper on the market, but it certainly can affect its cost price. Continuous and persistent cost control and constant struggle to reduce it, the world's leading companies in the production of copper developed high advantaged technologies of its production, thereby enabling acquisition itself enormously high profits. With the by-products of copper production (mainly

gold and silver) the amount of annual profits from the sale of the copper market is over $ 100 billion. The profit is increasingly concentrated in the hands of a small number of leading companies in the production of copper. Forecasts are that this trend will in the future continue even stronger.

Table 1. Top 20 copper mines by capacity [2]

Rank	Mine	Country	Owner(s)	Source	Capacity
1	Escondida	Chile	BHP Billiton (57.5%), Rio Tinto Corp. (30%), Japan Escondida (12.5%)	Concs & SX-EW	1,250
2	Codelco Norte (includes Chuquicamata, Radomiro Tomic, Mina Ministro Hales project)	Chile	Codelco	Concs & SX-EW	920
3	Grasberg	Indonesia	P.T. Freeport Indonesia Co. (PT-FI), Rio Tinto	Concentrates	750
4	Collahuasi	Chile	Anglo American (44%), Xstrata plc (44%), Mitsui + Nippon (12%)	Concs & SX-EW	520
5	Los Pelambres	Chile	Antofagasta Plc (60%), Nippon Mining (25%), Mitsubishi Materials (15%)	Concentrates	470
6	El Teniente	Chile	Codelco	Concs & SX-EW	434
7	Taimyr Peninsula (Norilsk/ Talnakh Mills)	Russia	Norilsk Nickel	Concentrates	430
8	Morenci	United States	Freeport-McMoRan Inc 85%, 15% affiliates of Sumitomo Corporation	Concs & SX-EW	420
9	Antamina	Peru	BHP Billiton (33.75%), Teck (22.5%), Xstrata plc (33.75%), Mitsubishi Corp. (10%)	Concentrates	370
10	Andina	Chile	Codelco	Concentrates	300
11	Bingham Canyon	United States	Kennecott	Concentrates	280
12	Batu Hijau	Indonesia	PT Pukuafu 20%, Newmont 41.5%, Sumitomo Corp., Sumitomo Metal Mining & Mitsubishi Materials 31.5%, PT Multi Daerah Bersaing 7%	Concentrates	250
12	Kansanshi	Zambia	First Quantum Minerals Ltd (80%), ZCCM (20%)	Concs & SX-EW	250
14	Los Bronces	Chile	Anglo Amercian 75.5%, Mitsubishi Corp. 24.5%	Concs & SX-EW	246
15	Zhezkazgan Complex	Kazakhstan	Kazakhmys (Samsung)	Concentrates	230
16	Olympic Dam	Australia	BHP Billiton	Concs & SX-EW	225
17	Rudna	Poland	KGHM Polska Miedz S.A.	Concentrates	215
18	Sarcheshmeh	Iran	National Iranian Copper Industry Co.	Concs & SX-EW	204
19	Spence	Chile	BHP Billiton	SX-EW	200
20	La Caridad	Mexico	Mexicana de Cobre S. A. (Grupo Mexico)	Concs & SX-EW	195

4. COMPATIBILITY OF GROWTH PRODUCTION AND DEMAND OF COPPER

The main enigma that is placed in front of the mining profession and sciencetoagree onlong-termgrowth trendsin demand andproduction . Demand is growing exponentially, and the production term cannot follow this trend. How to solve this enigma? World for now is the answer:

a. mass surface mining,
b. use SE -/ EW technology,
c. mass underground mining (block, panel and super caving excavation) and
d. the increasing share of copper recycling.

Our participation in these trends, except in the mass surface exploitation, is very limited.

Surface mining of copper in the world, the last few decades, closer to maximum productivity and minimum allowed costs. To the limit was enhanced development of equipment for mass excavation, using the modern achievements of science and technology, as well as the increasing computerization of the entire technological process.

Mining companies that surface mined copper ore the average direct cost of producing from mining to the cathode were strengthened at the $ 5 / t excavated material very difficult to make progress and improve this parameter. Productivity has also reached a very high level of 40 to nearly 400 tons of copper / employee / year (average about 235 tons of copper /

employee / year). In this way, surface mining reached its peak in achieving optimal technological parameters.

However, each open pit mining characterized by increase the total amount per ton of copper produced over time caused by the deterioration of environmental conditions during the excavation, which is reflected in the decrease of copper content and increase the amount of overburden due to increased depth of excavation. Next it was stated that surface mining technology has already reached the limits of productivity and costs, under which it is very difficult to get off. In the world,when reach the limit of 700 to 800 t excavated material per ton of copper, mine out of the zone of optimal operation. Therefore, surface mining can not provide a reliable and stable longterm prospects of copper in the world, but increasingly it has supplemented from underground mines.

Start of application of technology **SX-EW** sixties and seventies of the last century made it possible to exploit low content oxide ores which were previously unusable. This technology has enabled much cheaper to extract copper from the classical pyrometallurgical processing, and thus much lower content of copper in the ore from the mines to the content standard technology. Mean copper content in the ore from the mine to conventional excavation 2012th amounted to 1,08% Cu, and if we add the average content of the SX-EW mine (0,35% Cu), then that content drops to 0,92% Cu.

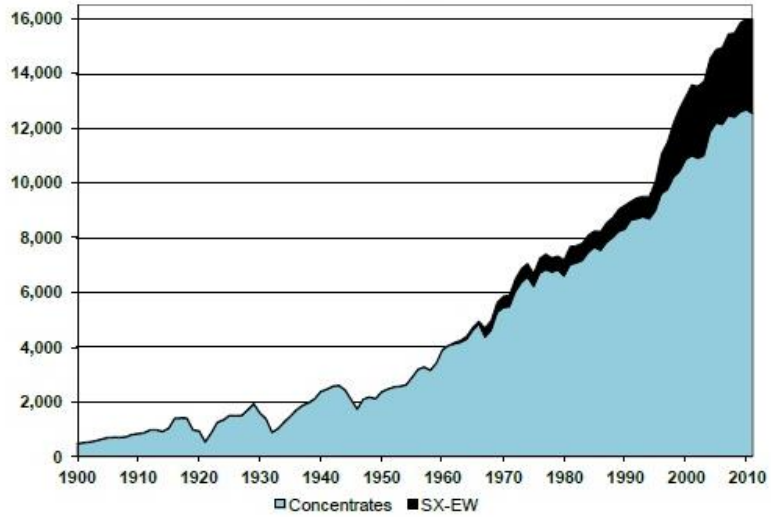

Figure 2. World copper mine production [2]

However, this low-cost copper production technology has brought many environmental disadvantages: excessive water consumption and the risk of pollution of watercourses and the enormously large amounts of excavation (waste) per ton of copper produced, much more than in conventional technologies. Rehabilitation of existing denying the new environmental damage resulting from the application of this technology is often caused by excessive costs and difficulties that many mining companies are not able to handle it. Therefore, in the developed world, the application of this technology avoiding in urban areas, but in the deserted and uninhabited areas.

Underground mining of copper in the world in recent years are in expansion. A quarter of the total mine production of copper, about four million tons, is produced annually in this way. Trends and forecasts predict a rapid increase of participation in the structure of underground mining of copper, so that by the end of this decade, it is expected to be 50%, with further growth.

The main reasons for this trend is the development of underground mining of copper lies in two facts:

1. Environmental factor
2. The development of highly sophisticated mining methods based on the development of geomechanics and computer software.

Environmental factor in decades is gaining increasing importance in a mine production. Sustainable development of the mining industry is built into the new legal form and becomes a rule that must be followed.

As mentioned above, the surface mining and SX-EW burdened with enormous amounts excavated material per ton of copper produced and that they can not provide a long-term positive response to tougher environmental requirements for their reduction. Underground mining is the only one able to give a positive response to such claims, for the simple reason that in her gangue – no waste. Quantity ofexcavated material per ton of copper produced, on average, three to five times lower than the amount of excavation in surface mining. However, underground mining of copper versus the undoubted advantages, and has a major drawback - the high cost of production, as it has for decades suppress the background.

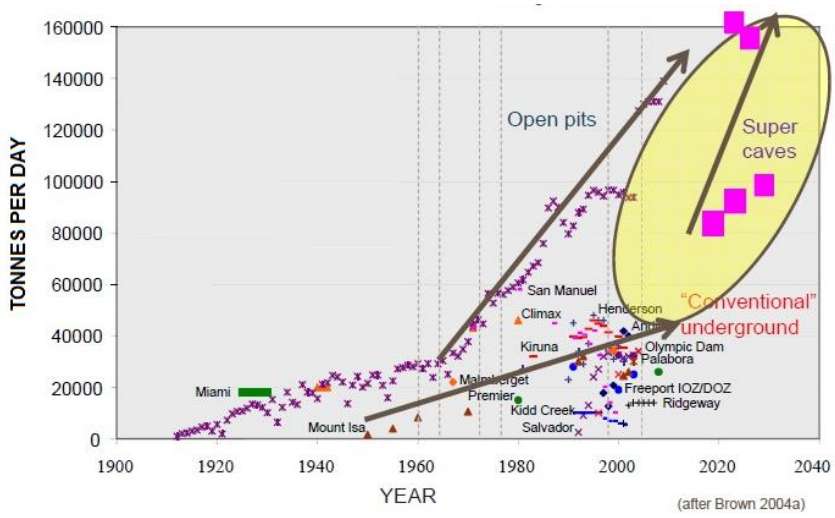

Fig . 3. Evolution of underground copper mines [7]

The development of highly sophisticated methods of underground mining of copper-based accomplishments in the application of geomechanics and computer software in the production of copper has introduced a revolution. In this regard, the most progress has been made in the development of large-scale underground block and panel caving methods. This method has been applied over a hundred years and holds primacy in productivity and low production

costs, but it is only in recent decades undergone a full expansion, so currently ¾ of copper from the underground mining (about three million tons per year) produced in this way.

Geomechanics and software packages development have made it possible to be done with detailed knowledge of all the features of the rock mass and to establish full control over its management. Thus makes it possible to develop a variant of giant size and capacity method of mining (panel caving) that literally "swallow all mountains". Mining of copper ore in this way with its basic characteristics - mass production, productivity and unit costs to successful approached to surface mining, while meeting environmental constraints.

The largest world producers of copper in a timely manner understood the significance of these trends. The above described technology is increasingly concentrated intheir hands allowing them primacy in the production of copper, and on its market.

Constant hunger for profit is mentioned company took one step further - to the early implementation of the so-called "super caving" mining. Their characteristic is a huge production (100-180 thousand tons / day), with the enormous production costs low, making the most developed beyond surface mining.

The world momentary working to develop more such projects:

– Bingham Canyon, USA
– La Escondida, Chile
– Grasberg, Indonesia
– Oyu Tolgoi, Mongolia
– Resolution, USA and
– Pebble, USA.

Each of these projects includes mineable reserves over of a billion tonnes of ore, with total volumes of development drifts from 200,000 to 300,000 meters, with an annual production volume of development from 20.00 to 50.000 m and daily production of 100 to 180 thousand tons of copper ore. Only these six mines in a few years to give more copper than it provides complete underground mine today. Such parameters have been unthinkable until recently.

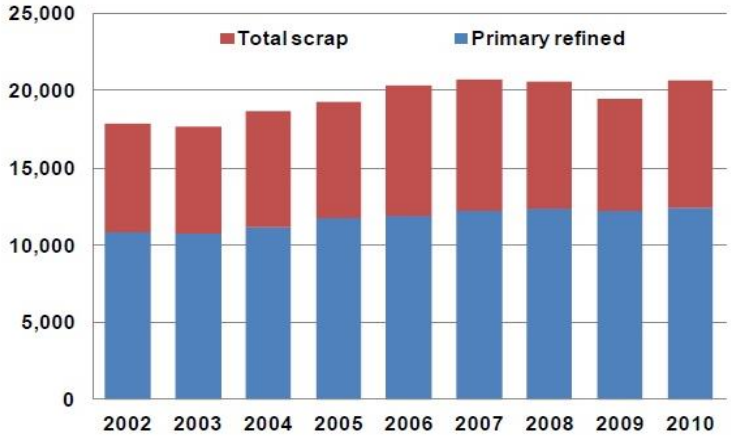

Figure 4. Total copper usage, including copper scrap [2]

In recent years the production of copper from **recycling** are increasingly gaining in importance in the total production of copper it accounts for 39%. This is the aspect of sustainability and environmentally friendly way and form of copper. Therefore, to propagate a greater volume of this type of copper production, although this is fraught with limited resources.

5. OPPORTUNITIES IN THE APPLICATION OF NEW FORMS OF TECHNOLOGICAL DEVELOPMENT IN SERBIA

The above-mentioned developments have led to a concentration of the most modern technology in the development of copper mining in the hands of a small number of the most advanced companies in the world. These companies are winning a growing monopoly on the world copper market and earn huge profits. Other companies do not follow this trend and are increasingly falling behind technologically, environmentally and economically.

For us, the important question: where is the place in Serbia this? Can copper production in Serbia to "join the train" with technologically advanced producers of copper?

Of the 46 countries in the world that are engaged in industrial production of copper, Serbia is last year ranked 24th place, with a production of 32000 tons of copper. The realization in 1548 t excavated material per ton of copper produced, mainly from surface mining and collection costs of 6,5 USD / t excavated material Serbian complex production and processing of copper is far behind the world.

Surface mining of copper with these parameters has no chance to compete with the world because of too much excavated materials per ton of copper produced, the devastating effect on the ecology. In Serbia, per ton of copper produced three times more waste than the world, and the cost of copper production is so almost three times more expensive than in the world.
Technology SX-EW in Serbia has no future due to lack of proper raw materials. Also contributes to the geographic and demographic factors - the long and harsh winter with lots of rain, and a relatively high population density.

Processing of scrap has very limited options because of the small Serbian market - is limited to an annual rate of several thousand tonnes, although this amount is not insignificant.

The best chance to "climb on the train" of modern technology of copper production in Serbia is underground mining. For more than twenty years, Serbia has systematized database of mineral deposit "Borska reka" that is ideal for the application of the above described highly sophisticated technology. The problem is that Serbia is not present such technology, no experience and no staff that is trained to carry out its implementation. On the other hand, Serbia is on the scene working out long-term development program of copper, which is based on the dominant surface mining and which, as described above, leads to technological, economic and especially ecological impasse.

6. CONCLUSION

The most important thing for the optimum development of mining copper production - appropriate resources on which it can be successfully implemented, Serbia has. Herself do not have the technology, the appropriate kind of knowledge and personnel capable to implement it. Aggravating circumstance was that the development is directed in the wrong direction - a massive surface mining that achieves an awkward technological, economic and especially environmental parameters. In such circumstances, there is little chance that Serbia "climb on the train" of modern trends in the production of copper. It certainly should not discourage, but on the contrary to be the pulse of mining professionals and related professions in Serbia to make the maximum effort into learning and mastering advanced technologies underground copper production. Only in this way complex production and processing of copper in Serbia can successfully to take an appropriate position in the world's copper production.

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PELLETIZED FLY ASH AS AGGREGATE FOR BUILDING MATERIALS

PELETIZIRANI LETEĆI PEPEO KAO AGREGAT ZA GRAĐEVINSKE MATERIJALE

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Abstract: *Although secondary waste material pelletization process is a world wide known technique in the production of artificial aggregates, it has not been widely used in construction sector. The cold-bonded fly ash aggregate was produced in semi-industrial pelletizing device. The fly ash particles were bonded with water-glass (Sodium silicate - Na_2SiO_3) and used as aggregate substitution in Portland cement based concrete. The performance characteristics of lightweight concretes and normal-weight concrete were investigated through compressive strength, modulus of elasticity and tensile strength representing the mechanical behavior.Utilizing fly ash to produce quality aggregates should yield significant environmental benefits.*
Key words: *pelletization, fly ash, aggregate, concrete.*

Apstrakt: *Iako je peletizacija sekundarnih siriovina postupak koji je već dugo poznat i primenjivan za dobijanje veštačkih agregata, on se i dalje dovoljno ne primenjuje u oblasti konstrukcionih materijala. Hladno vezani agregat na bazi letećeg pepela je dobijen uz pomoć polu-industrijskog peletizatora. Zrna letećeg pepela su međusobno povezana pomoću vodenog staklas (natrijum silkata - Na_2SiO_3), a potom upotrebljena kao zamena za agregat u standardnom Portland cementnom betonu. Ispitivana su finalna svojstva lako-agregatnih betona i standardnih betona (normalne zapreminske mase) tako što je određena pritisna čvrstoća, modul elstičnosti i čvrstoća na istezanje kao glavi reprezenti ponašanja građevinskog materijala. Očekuje se da primena letećeg pepela za proizvodnju kvalitetnog agregata ostvari značajan benefit po životnu sredinu.*
Ključne reči: *peletizacija, leteći pepeo, agregat, beton.*

1. INTRODUCTION

The "reuse" strategy in construction materials industry and environmental protection is becoming necessary. This principle refers to waste minimization through planning and design and it refers to the waste material recovery and transferring into secondary raw materials [1, 2]. Ash as by-product of the coal combustion is one of the most imminent environmental polluters. The annual global fly ash production is over 600 million tons which makes this by-product a serious problem with severe implications for the environment [3-5].

The construction industry is the biggest consumer of recycled raw materials with reapplication rate of approximately 21 million tons of fly ash per year, which is about 3 to 4 % of total ash production [5]. The relatively high recycling rate is obtained mainly due to the fly ash pozzolanic behavior. Possibilities for fly ash reapplications are numerous: as bonding agent or aggregate in concrete/mortar [7-10], filler in road base [11], raw material in cement clinker production [12, 13], component in bricks and tiles [14, 15], as injection material, as geopolymers [16, 17]. One possible fly ash reuse, which has not been, to this day, seriously investigated, is fly ash reapplication as a raw material for high-temperature and refractory materials. Therefore, the fly ash has to adequately answer the thermal stability criteria, in

terms that it should not affect the behavior of final product under exposure to elevated temperatures.

This paper presents the results of one part of an investigation with a much larger scope. The main objective of this investigation was to make a comparison between the mechanical properties and durability of lightweight concretes produced with lightweightfly ash aggregates and those of normal-weight concrete.

2. MATERIALS AND METHODS

Investigated fly ash originated from the filter system of coal-fired power plant "Kolubara", Lazarevac, Serbia. The fly ash was collected directly from the filter of the power plant and transported to a special closed silo; a sample of 500 kg of each fly ash was randomly taken from the silo and re-sampled by the quarter method (obtaining 50 kg samples); the samples were preserved in hermetically sealed boxes until further analyses. The chemical analysis of the investigated fly ash is given in Table 1, as well as content of oxides present in Portland cement used for preparation of experimental concretes. Analysis of chemical constituents was performed by means of X-ray fluorescence technique - XRF spectrophotometer ED 2000 – Oxford.

Table 1. Chemical composition of the fly ash (FA) and Portland cement (PC).

Oxide, %	SiO_2	Al_2O_3	Fe_2O_3	TiO_2	CaO	MgO	P_2O_5	SO_3	Na_2O	K_2O	MnO	CO_2	LoI
FA	53.31	20.19	6.78	0.67	7.72	3.29	0.02	1.25	0.5	1.21	0.03	0.11	3.82
PC	19.35	8.69	4.93	0.1	59.6	2.56	-	3.2	0.1	0.3	-	-	0.6

Grain size of the original fly ash varied from several μm up to 2 mm. Fly ash particles fraction content was analyzed by means of cyclo-sizer diffraction particle size analysis (Cyclo-sizer - Warman International LTD, Australia). Particle size distribution of the fly ash after mechanical activation is shown in Figure 1.

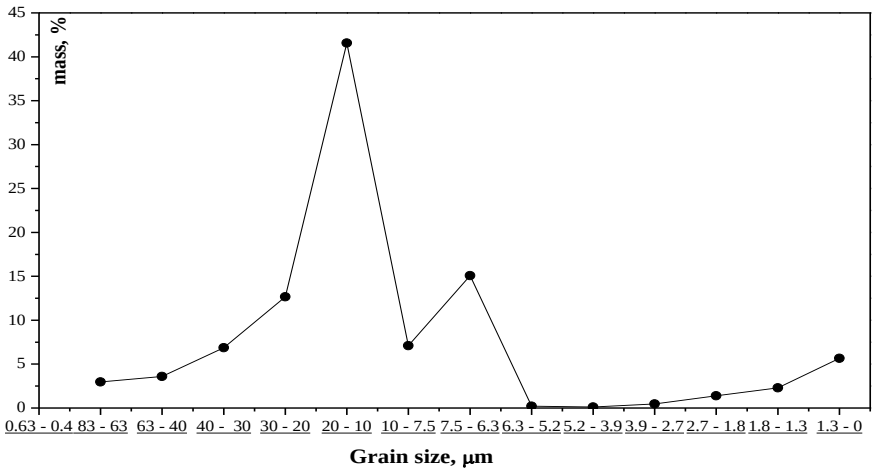

Figure 1. Distribution of fly ash particle fractions given in percentage of total mass

Preparation of fly ash pelletized aggregate

A pelletizer plate of 50 cm diameter and 15 cm depth was used for manufacturing of the lightweight fly ash pellets. The disc was operated at an angle of 45 ° and a rate of 50 rpm. The amount of 10 % by weight of fly ash of water-glass (Sodium silicate - Na_2SiO_3) was mixed with fly ash in order to produce lightweight aggregate (Figure 2). The pelletizer plate was rotating until the firm sphericalpellets have been formed (approximately 30 minutes). The pellets were afterwards placed in a furnace to be dried at 110°C to prevent its cracking.

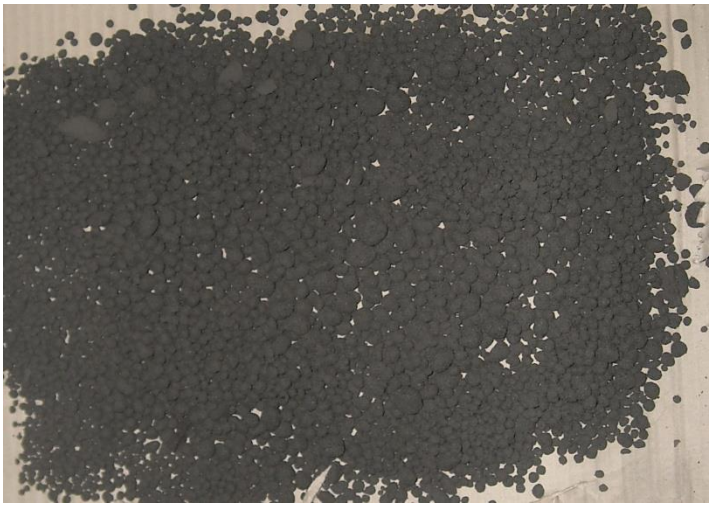

Figure 2. Obtained fly ash pellets (before drying)

Preparation of concrete samples

Concrete components were mixed for 8 minutes in laboratory RILEM-cem mixer and, afterwards, poured in 200 x 200 mm cubic steel moulds and thus shaped. After 7 days of

curing in a climate chamber at 20 ºC and humidity 60 %, the samples were demoulded and stored for another 21 days under the same conditions as in the climate chamber. The preparation of the samples was conducted in accordance with standards SRPS EN 12390-1:2012 and SRPS EN 12390-2:2010. Concrete mixtures were designed as it is given in Tab. 2.

Table 2. Mix-design of the experimental concretes.

Component:	Cement content	Fly ash content	Sand content	Water content
Control specimen (NC)	450 g	-	1350 g	225 g
Fly ash concrete (LC)	450 g	350 g	1000 g	225 g

Testing of the concrete samples

The mechanical strength (compressive and tensile) of the concrete samples were tested using a conventional laboratory hydraulic pressure device. Samples were tested at ambient temperature in accordance with standard procedure SRPS EN 12390-2:2010.Modulus of elasticity of concrete specimens was calculated using Eq. (1).

$$E_c = 9.25 \cdot \sqrt[3]{f_c + 10} \qquad (1)$$

Where: E_c - modulus of elasticity, (GPa); f_c - compressive strength of the cubic sample (200 x 200 mmm), (MPa).

3. RESULTS AND DISCUSSION

The uniformity of fly ash pellets was proved by visual inspection - the color and the size of newly formed aggregates should be relatively uniform. The uniformity in aggregate appearance furthermore resulted in the homogeneity of aggregate properties and also provided consistence in concrete properties, thus it is of utmost importance that the produced aggregate is of high quality and consistent characteristics. After visual examination it was concluded that pellets are of uniform size and color. The color, which was gray after pelletization, changed into yellow after drying procedure.

Approximate strength of individual fly ash pellets was determined by measuring load necessary for crushing a pellet when placed between two parallel plates of hydraulic pressure device. The crushing strength of a “green” pellet was approximately 4 MPa, while the crushing strength of dried pellet was 6 MPa. Values of approximate pellets crushing strength makes them as appropriate substitution for normal stone aggregate used in production of concrete.

The values of compressive strength of normal-weight concrete (NC) and light-weight concrete (LC) are shown in Figure 3. The 28-day compressive strength of light-weight concrete varied from 7 to 43 MPa through period of 56 days. As it was expected, the

light-weight aggregate concrete showed lower compressive strength than the normal-weight concrete due to the higher porosity and lower strength of the lightweight aggregates applied.

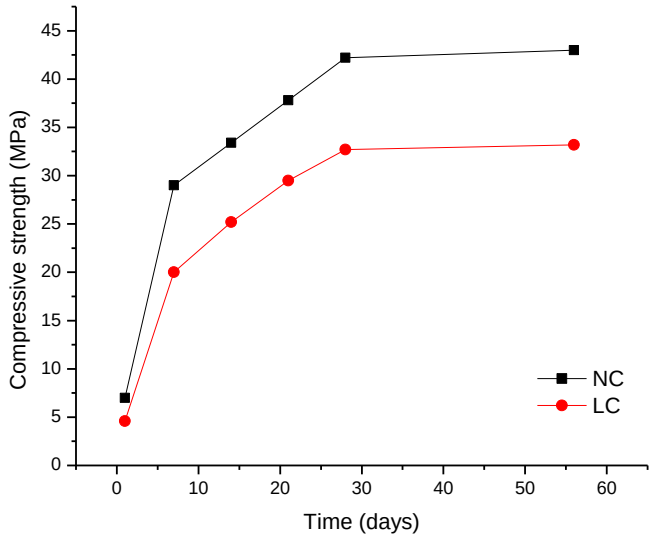

Figure3. Normal and light-weight concrete compressive strength change

The Figure 4. presents the tensile strength of light-weight andnormal-weight concretes investigated. LC concrete exhibited the lower 28 and 56-day tensile strength–2.92 and 2.95 MPa, respectively, than NC concrete whose tensile strength was 3.38 MPa and 3.42 MPa,respectively.Increase rates in tensile strength were smaller than those shown in case of the compressive strength.

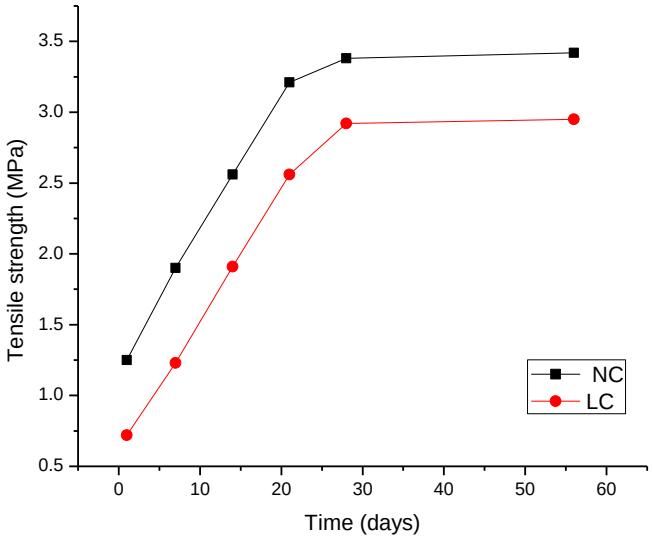

Figure 4. Normal and light-weight concrete tensile strength change

In the Fig 5., the change of modulus of elasticity for NC and LC concrete samples through time is shown. Same as in the case of compressive and tensile strength light-weight aggregate concrete had lower values of modulus of elasticity than the normal-weight concrete.

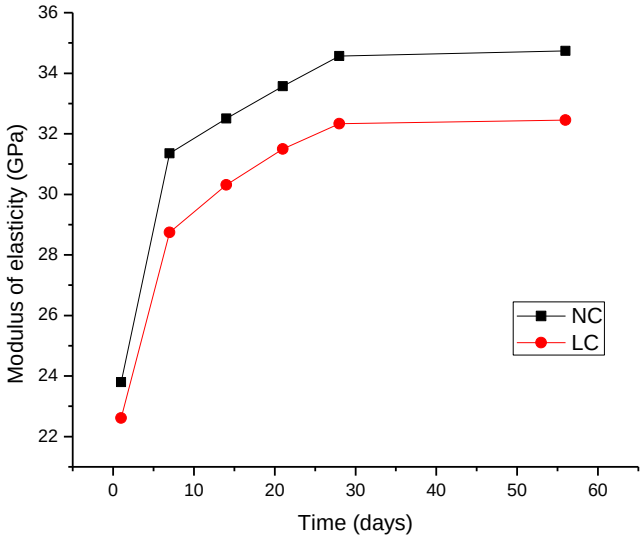

Figure 5. Normal and light-weight concrete modulus of elasticity change

The replacement of the normal aggregate in the concrete with the lightweight aggregate resulted in a 30 % reduction in the 28-day compressive strength. Reduction ratio decreased in 56-day strengths to 21 %.

Modulus of elasticity for LC ranged from 22.6 to 32.4 GPa, and for NC from 23.8 to 34.8 GPa through period of 56 days.The modulus of elasticity of depends on the density, but also on the pore structure and the surface texture of the light-weight aggregate. Therefore, an aggregate with a dense structure and evenly distributed pores gives higher modulus of elasticity and more concrete stiffness than a more porous aggregate.

4. CONCLUSION

The concreteprepared withpelletized fly ash aggregate seems to be a promising constructi-onand insulation material. The general conclusions made after results of the performed preliminary investigations are:

- The fly ash from "Kolubara" thermal plant in Serbia is applicable as secondary raw material in light-aggregate production. The uniformity of fly ash pellets was proved by visual inspection: the color and the size of newly formed aggregates were uniform.
- Workability of fresh lightweight concrete was positivelyaffected by the spherical shaped lightweight fly ash aggregateswhich may also result in a decrease of water demand for constantslump.
- Lightweight concretes with dried fly ash aggregate had lower compressive strength, tensile strenth andmodulus of elasticity compared to the normal-weight concretes. Lower density and crushingstrength of the fly ash aggregate were most probablyresponsible for this.
- Further investigations will concentrate on varying the fly ash aggregate content in concrete mixes to understand their dependence on mechanical characteristics and final performece.

ACKNOWLEGEMENTS

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USING TOPSIS METHOD FOR ORE DEPOSIT SELECTION

PRIMENA TOPSIS METODE ZA IZBOR RUDNOG LEŽIŠTA

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Abstract: *This paper develops an evaluation model based on TOPSIS method (Technique for Order Preference by Similarity to Ideal Solution), to help the decision makers in selection of the optimal ore deposit for exploitation. The weights of criteria are determined by using Entropy method. A real case study is used to illustrate the utilization of the model for ore deposit selection problem. Shown example demonstrates the effectiveness and feasibility of the proposed model.*
Key words: *Ore deposit selection, TOPSIS, entropy method, real case study.*

Apstrakt: *U radu je razvijen evaluacioni model baziran na TOPSIS metodi (Technique for Order Preference by Similarity to Ideal Solution), u cilju pružanja pomoći donosiocima odluka u izboru optimalnog rudnog ležišta za eksploataciju. Entropi metoda je upotrebljena za određivanje težine kriterijuma. Realna studija slučaja je upotrebljena radi ukazivanja na primenljivost modela kod problema izbora rudnog ležišta za eksploataciju. Prikazan primer demonstrira efikasnost i opravdanost predloženog modela.*
Ključne reči: *Izbor rudnog ležišta, TOPSIS, Entropi metod, realna studija slučaja*.

1. INTRODUCTION

Country progress is measured by degree of using minerals. It is impossible to list all the uses of minerals in an advanced economy, but very interesting is the fact that, on a tonnage basis, oldest materials have the greatest use. Minerals are very important input for nearly every sector in the industrialized economy and abundant and varied supply provide the abundant productivity of the diversified industry.

In minerals exploitation very important thing is selection of the appropriate ore deposit among several alternatives. The problem of ore deposit selection represents the multi-criteria decision making (MCDM) problem because of the set of alternatives and set of often conflicting criteria which complicated decision making. The MCDM methods enables better management decisions because they take into account variations in stake-holders preferences for criteria, and conflicting interests and values. In present conditions it is very difficult for decision maker (DM) to identify suitable alternative which maximizes all decision criteria.

Many authors have discussed the advantages, disadvantages and possibilities of using MCDM methods in the area of renewable energy resources, and examples are reviews include:[1-7]. In the field of non-renewable resources these methods are mainly used for mining method selection and for assessment of sustainable mining and minerals sector development [8-14]. Goal of this paper is to evaluate ore deposit in order to select the most suitable for exploitation from technical point of view and according to production costs by using combined TOPSIS

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and Entropy method. The paper is organized as follows: the used methods are explained in section 2; section 3 contains numerical example; and in section 4 conclusions are discussed.

2. METHODS

2.1. The Entropy method

Entropy method was developed by Shannon 1948 [15, 16], and it is widely used in many different fields because of its simplicity and reliability. This method is very useful for determination of the criteria weights and this is performed by following formula:

$$w_j = \frac{1 - e_j}{\sum_{j=1}^{n} \left(1 - e_j\right)}, \tag{1}$$

where $j =,..., n.$

The output entropy e_j of the $j-$th factor is calculated as:

$$e_j = -\frac{1}{\ln(m)} \sum_{j=1}^{n} r_{ij} \ln\left(r_{ij}\right), \tag{2}$$

where $j =,..., n..$

Determined criteria weights should satisfy the term: $\sum_{j=1}^{n} w_j = 1.$

2.2. The TOPSIS method

The TOPSIS was first introduced by Hwang and Yoon 1981 [17]. According to this method the most suitable alternative would have the shortest distance from the ideal solution and largest distance from the anti-ideal solution [18]. The positive-ideal solutions includes all best values attainable from the criteria, whereas the negative-ideal solution is vice versa. There have been many papers using TOPSIS for the solution of MCDM problems [19-21].

The TOPSIS method consists of following steps:

Step 1. ***Establish decision matrix.*** The matrix structure can be as in Table 1 [22]:

Table 1.The information table of TOPSIS

Alternatives	***Criteria***			
	C_1	C_2	...	C_j
A_1	x_{11}	x_{12}	...	x_{1j}
A_2	x_{21}	x_{22}	...	x_{2j}
.	.	.	.	.
A_i	x_{n1}	x_{n2}	...	x_{ij}
W	w_1	w_2	...	w_j

where $A_1, A_2, ..., A_i$ represent possible alternatives among which decision maker have to choose, $C_1, C_2, ..., C_j$ are criteria with which alternative performance are measured, x_{ij} is the rating of alternative A_i with respect to the criteria C_j, w_j is the weight of the criteria C_j, $i = 1, ..., m$, m is number of alternatives, and $j = 1, ..., n$, $n$is number of criteria [23].

Step 2. ***Calculate the normalized decision matrix***. The normalized value r_{ij} is calculated as:

$$r_{ij} = x_{ij} / \sqrt{\sum_{i=1}^{m} x_{ij}^2} \,. \tag{3}$$

Step 3. ***Create the weighted normalizeddecision matrix.*** The weighted normalized value v_{ij} is calculated as:

$$v_{ij} = w_j r_{ij} \,. \tag{4}$$

Step 4.***Determine ideal solution*** A^+ ***and anti-ideal solution*** A^-**.** The ideal solution A^+ and anti-ideal solution A^- are calculated by using following formulae:

$$A^+ = \{v_1^+, ..., v_n^+\} = \{(\max_i v_{ij} \mid i \in I'), (\min_i v_{ij} \mid i \in I'')\}, \tag{5}$$

$$A^- = \{v_1^-, ..., v_n^-\} = \{(\min_i v_{ij} \mid i \in I'), (\max_i v_{ij} \mid i \in I'')\}, \tag{6}$$

where I' is associated with set of benefit criteria, and I'' is associated with set of cost criteria.

Step 5.***Calculate the separation of each alternative from ideal solution*** D_i^+**, and anti-ideal solution** D_i^- ***using the n-dimensional Euclidean distance.*** The ideal solution D_i^+ and anti-ideal solution D_i^- are calculated as:

$$D_i^+ = \sqrt{\sum_{j=1}^{n} (v_{ij} - v_j^+)}, \tag{7}$$

$$D_i^- = \sqrt{\sum_{j=1}^{n} (v_{ij} - v_j^-)}. \tag{8}$$

Step 6.***Calculate the relative closeness to the ideal solution and rank the alternatives.*** The relative closeness to the ideal solution can be expressed as:

$$C_i^+ = D_i^- / (D_i^+ + D_i^-), \tag{9}$$

where $0 \le C^+ \le 1$.

3. A NUMERIC APPLICATION OF PROPOSED MODEL

Proposed model is applied to a real problem in mining industry. The aim of paper is to asses possible ore deposits and to help the DM accordingly to their requirements. Compared ore deposits are:

- A_1 **- Brezanik**
- A_2 **- Tilva roš**
- A_3 **- P_2A**

In this case only three alternative ore deposits are evaluated, but proposed model could be applied to any number of alternatives.

Assessment is based on the following criteria:

- C_1 **- mass of copper (t).**The ore deposit which contains the highest amount of copper has the advantage.
- C_2 **- mass of gold (kg).** The ore deposit which contains the highest amount of gold has the advantage.
- C_3 **- mass of silver (kg).** The ore deposit which contains the highest amount of gold has the advantage.
- C_4 **– variation coefficient of the copper content (%).** This coefficient represents the variability of useful components distribution, and mineralization in the ore deposit. Mineralization is considered as uniform when is variation coefficient of the useful components content ($V_{\%}$) up to 40%, and non-uniform when it is 40 to 100%.
- C_5 **- mineralization coefficient.** Calculation of this coefficient is based on the quantification of mullock share in the reserve contur. Ore deposit which mineralization coefficient is higher has the advantage.
- C_6**– production costs (US$/t).** Ore deposit exploitation which produces lower costs has the advantage.

In following example TOPSIS method is used for evaluation and selection of the most appropriate alternative ore deposit for exploitation. Raw data, which are retrieved from paper entitled *Geologicaly – economic estimate factor's of current push-back – „Jama Bor"*, are presented in Table 2 [24].

Table 2. Raw data

	Mass of copper (t)	Mass of gold	Mass of silver (kg)	Variation coefficient (%)	Mineralization coefficient	Production costs (US$ / t)
	max	max	max	min	max	min
Brezanik	12340.00	261.50	1773.00	135.00	0.94	20.60
Tilva roš	8071.00	169.00	986.00	46.60	0.89	14.10
P_2A	14729.00	809.00	3061.00	54.60	0.86	15.10

Normalized decision matrix (Table 3) is calculated by using formula (3).

Table 3. Normalized decision matrix

Alternatives	***Criteria***					
	C_1	C_2	C_3	C_4	C_5	C_6
	max	max	max	min	max	min
A_1	0.5921	0.3017	0.4828	0.8829	0.6047	0.7061
A_2	0.3873	0.1950	0.2685	0.3048	0.5744	0.4833
A_3	0.7067	0.9333	0.8335	0.3571	0.5518	0.5176

In order to determine the weights of shown criteria the entropy method is used. The results are gained by using formulae (1) and (2) and they are follows:

Table 4. The criteria weights

Criteria	w_j
C_1	0.0535
C_2	0.4090
C_3	0.1816
C_4	0.2231
C_5	0.0013
C_6	0.1315

Based on data from Tables 3 and 4, using formula (4) the weighted normalized decision matrix is calculated and presented in Table 5.

Table 5. Weighted normalized decision matrix

	Criteria					
	C_1	C_2	C_3	C_4	C_5	C_6
Weights	0.192	0.025	0.118	0.198	0.080	0.386
Alterantives	max	max	max	max	min	max
A_1	0.0317	0.1234	0.0877	0.1970	0.0008	0.0929
A_2	0.0207	0.0797	0.0488	0.0680	0.0008	0.0636
A_3	0.0378	0.3817	0.1514	0.0797	0.0007	0.0681

The ideal A^+ and anti-ideal solutions A^- are determined by formulae (5) and (6), and they are as in Table 5.

Table 6. The ideal A^+ and anti-ideal A^- solutions

A^+	0.0378	0.3817	0.1514	0.0680	0.0008	0.0636
A^-	0.0207	0.0797	0.0488	0.1970	0.0007	0.0929

The separation measures D_i^+ and D_i^- are determined by using the formulae (7) and (8). The results are shown in Table 7, columns I and II.Relative closeness of a particular solution to the ideal solution C_i is calculated by using formula (9), and it is given in column III.

Table 7. The separation measures and relative closeness to the ideal solution

Alternative	D_i^+	D_i^-	C_i
	I	**II**	**III**
A_1	0.2972	0.0595	0.1668
A_2	0.3194	0.1323	0.2929
A_3	0.0125	0.0125	0.9646

According to the results, the ranking is followed (Table 7):

Table 8. Ranking results

Alternative	C_i	***Rank***
A_1	0.1668	3
A_2	0.2929	2
A_3	0.9646	1

4. CONCLUSION

A decision model presented in this paper is provided for ore deposit selection problem. TOPSIS decision-making method has been used in the proposed model as a tool that can help in making the right decision. Entropy method is used to assign weights to the criteria. These weights are included in TOPSIS computations and the alternative priorities are determined based on them. Proper determination of criteria weights is very important because they could change the ranking.

Efficiency of the decision making process is significantly increased by using the proposed model. It can consider any number of different criteria and offers a more objective, simple and reliable ore deposit selection approach. Any decision-making problem that includes a set of different alternatives and conflicting criteria could be solved by proposed model. Proposed model can be combined with different mathematical models that will improve its accuracy and reliability.

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PROCEDURES FOR PREPARATION AND METALLURGICAL PROCESSING OF IRON AND STEEL CHIPS

POSTUPCI PRIPREME I METALURŠKE PRERADE STRUGOTINE GVOŽĐA I ČELIKA

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Abstract: *Importance of use of ferrous and steel secondary raw materials is reflected in the economic effects, through the preservation of primary resources, energy saving and prevention of environmental pollution. During the mechanical processing of semi-final or final products of iron and steel, besides high-quality pieces of scrap, a large amount of chips with various qualities are generating. Remelting of these chips in metallurgical aggregate without previous preparation is highly undesirable. Commonly applied operations of preparation are crushing, washing, spinning, drying, magnetic separation and briquetting. Obtained briquettes are representing a high quality batch and raw material in foundries and steelworks. Metallurgical processes of prepared chips are usually performed in the cupola furnace, induction and electric arc furnaces.*
Keywords:*iron and steel chips, recycling, preparation, melting*

Apstrakt: *Značaj korišćenja sekundarnih sirovina gvožđa i čelika ogleda se u ekonomskim efektima kroz očuvanje primarnih resursa, uštedi energije i sprečavanju zagađenja životne sredine. Pri mehaničkoj obradi poluproizvoda ili gotovih proiyvoda gvožđa i čelika, pored visokokvalitetnog komadastog otpatka, nastaje velika količina strugotine različitog kvaliteta i nepoželjno je njeno pretapanje u metalurškim agregatima bez prethodne pripreme. Od operacija pripreme najčešće se primenjuju drobljenje, ispiranje, centrifugiranje, sušenje, magnetna separacija i briketiranje. Dobijeni briketi predstavljaju kvalitetan uložak i sirovinu u livnicama i čeličanama. Metalurška prerada pripremljene strugotine najčešće se vrši u kupolnim, indukcionim i elektrolučnim pećima.*
Ključne reči: *strugotina gvožđa i čelika, reciklaža, priprema, topljenje*

1. INTRODUCTION

The importance of using of iron and steel secondary raw materials is reflected in the economic effects, first of all troughs preservation of primary resources, saving of energy and environmental pollution prevention.

The main ferrous metallurgy products, iron and steel, are still an irreplaceable in many industries. Besides iron ore, the main raw materials for the production of steel is steel scrap (or scrap iron) which is an integral part of the charge in all modern procedures for steel production. The share of steel scrap in the charge is different for different procedures and its ranges from 20-100% of all charge. Thus, it is needful to provide 20% of scrap iron in the charge for the production of crude steel in converters, 50% for the production in SM-furnaces, 90% for the production in electrical furnaces, and finally, 100% for the production of steel castings. Average consumption of steel scrap is around 400-500 kg per ton of crude steel and is not the same in all parts of the world. Out of that 84% is used to produce steel and castings, and 16% for iron production.

From an economic point of view, the reasons for processing of steel scrap are lying in the fact that the costs of production of steel from scrap are up to 4 times lower in comparison with the costs of production of steel from iron ore [1].

In addition, the quantity and quality of iron ore deposits in nature are reduced and the amounts of steel scrap generated from year to year are increasing. Iron ore reserves are estimated at about 95 billion tonnes, which is sufficient for the next 190 years of exploitation without recycling. This becomes quite logical if we take into account the fact that the production of steel was about 30 million tons at the beginning of the twentieth century and it is increased to 1200 million tonnes in year 2009 [2].

Depending on the source of derivation, iron and steel secondary raw material are classified into two major groups. The first group includes the waste generated in the production and processing of iron and steel as rejection, and is called process scrap [3-5]. Another large group of secondary raw iron and steel scrap is the amortization waste (or collecting scrap) [6], which occurs by elimination of products, that contain iron and steel, from consuming stage due to physical deterioration and technological obsolescence.

Process scrap generated in the steel mills during the production of iron in blast furnaces, steel production in steel plant, making semi-finished or final steel products in foundries and rolling mills, is immediately returned in the process of making steel as raw material and is called own or circulating steel scrap. Waste generated in mechanical treatment is called a machining scrap. One part of the machining scrap can be immediately used in the metalworking industry, eg remains of sheets, profiles and the like, to produce smaller parts or in other related plant. The second part of the machining scrap is used as a batch in the iron and steel foundries at metal-working complex plant. This part can be significant and it is mainly refers to the category of high quality scrap. Besides of high-quality pieces of scrap, at metalworking of iron and steel (mainly mechanical industry), a large amount of chips of various qualities occur. Remelting of these chips in metallurgical aggregate without previous preparation is highly undesirable. During the formation of chips, a presence of non-ferrous metals is often due to inappropriate rearrangement of chips. The presence of non-ferrous metals is undesirable, as it impairs the quality of the iron and steel obtained from the recycling process of chips.

Chips also contain large amounts of oil, grease and water, whose generate a large amount of gases at melting stage [7]. Fluid content ranges from 200 litres on 1 ton. Spiral chip has a low volumetric weight which makes it unfavourable for the transport. Laxness in the remelting process causes losses due to intensive oxidation. Combustion of the scattered chips ranges from 8-15%, and also consumption of coke and electrical power is increased. Scattered chips significantly slow down the speed of charging and melting process and tends to be bonded to the slag, or to cleave to the revetment of the furnaces.

2. PREPARATION OF STEEL AND IRON CHIPS

Due to the presence of undesirable impurities and low volumetric weight of chips, it is advisable to prepare it for efficient processing in metallurgical aggregates. The most important preparing operations are: crushing, washing, drying, magnetic separation and briquetting.
Preparing operations of chips are engaged in technological lines, as it is shown in Figure 1 [4]. The system of special transporters, feeders and dosers are linking the following operations: crushing, centrifugation, electromagnetic separation to the final briquetting operations and further transport to the transport vehicle. This provides an automated production line for the preparation of steel chips, which is formed depending on specifics and needs.

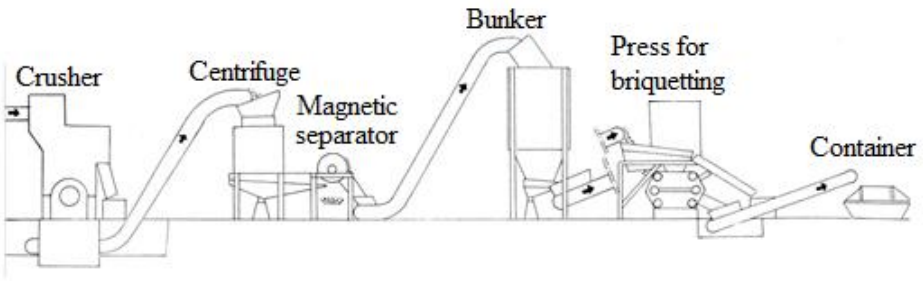

Figure 1. Technological line for the preparation of iron and steel chips [4]

2.1. Crushing

Chips of grey iron are in such a form that can be subjected to the briquetting presses, without crushing. Chips of steel occur in the form of helix and previously must be minced. Tangle steel chips have volumetric weight from 100 kg up to several hundred kilograms per cubic meter. Therefore its transportation from the place of formation to the place of processing without previous preparation is uneconomical due to the voluminosity and presence of impurities such as water, oil, non-ferrous metals, paper, plastics, etc.

For crushing of steel chips robust mills with hammers are employed, which are produced from special wear and impact-resistant steels. Their construction enables efficient and cost-effective size reduction of brass, bronze, carbon and alloy steel chips, to the grain size required for briquetting. Certain disadvantages are reflected in the producing of high noise, which must be reduced to some extent.

2.2. Precipitation, drying, centrifugation

Since the briquetting is the final prepare operation of chips, it is necessary to reduce the fluid content in the chips at minimum in order to obtain good quality briquettes. Also, it certainly makes the melting process more efficient.

For the separation of oils and fluids from chips, different types of precipitators, centrifuges, hydro cyclones etc. are employed. Precipitators remove the liquid phase on the principle of gravity and the main disadvantages are low efficiency and burliness. Unlike them, centrifuges occupy less space and are more efficient. There is a large range of centrifuges, such as the

hand running to fully automate. By centrifugation contents of liquids in the chips can be reduced to only 1.5%. To completely eliminate moisture and oil from the briquettes, drying in driers before briquetting or hot briquetting process can be applied. Hydro cyclones operate on the same principle as centrifuges, but without any moving parts.

One way of removing liquids and oil from metal chips is the application of heat processing. By combustion of non-metallic components, combustion products such as carbon dioxide, oxygen, nitrogen and water vapour occurs, which are completely harmless to the environment. Temperature of these gases is high (T = 1200 ^{O}C), so they can be used for other purposes. The separation of non-metallic components (oil and water) is improved by using the heat processing.

2.3. Electromagnetic separation

Extraction of magnetic components from non-ferrous metals, non-metals and other impurities is done by electromagnetic separation within the separator. This method has recently being increasingly used in the business of preparing and processing of waste materials. Electromagnetic drum, by means of the strip that runs passing through a zone of magnetic field transfers chips for further processing, and all nonmagnetic parts fall down into the container out from the strip.

2.4. Briquetting

With complete and efficient implementation of prepare operations including filings and agglomeration, we get a new, higher quality which opening the possibility of its multiple applications in contrast to the many problems that occur in processing of chips without previous preparation. The advantages of using briquettes compared to scattered chips are reflected in:

- lower losses at melting,
- reduction of combustion in furnaces with about 15% to about 2%,
- saving storage space,
- pollution reduction,
- batch materials are better and easier to handle,
- more economical for transportation etc.

Standards do not provide norms for determining the quality of briquetted chips, although the quality is determined on the basis of oil and moisture content, density, strength and other properties.

Practice has proved that the briquettes can be successfully recast as in the electric-arc furnaces as well as in other foundry aggregates (converters, cupola furnaces and induction furnaces). There is no influence on the increasing of the porosity in castings and increasing of refractory materials consumption for lining furnaces by using of the briquettes as row materials. Additional batching with wet briquettes on the surface of molten metal does not applicable, because it results in "jumping" of the briquettes on the liquid metal and can cause damage to the refractories. The best arrangement of charging is: briquettes, return iron, steel scrap.

Briquettes are also used to fill gaps in the furnace, making the batch heavier and providing greater production.

The briquetting of chips can be done with or without of binding medium.

2.4.1. Briquetting of steel and iron chips with binding medium

For briquetting of chips in order to achieve sturdy solid briquettes: cement, water glass, lime, clay, chalk, charcoal and water, etc. can be employed as binding medium.
Melting the batch of briquettes made with cement binder will result in combustion of Si and Mn and increased absorption of S, while briquettes made with clay, chalk, charcoal and water as binders will have the worst performance.

Briquettes made with a water glass or lime as binders have very good performance.
Briquetting of chips with the binding medium has many weaknesses, and the main ones are: uses the large amounts of binders (11-18%), technical and economic unjustifiable, the complexity of the process for obtaining of the briquettes, increases in labour, taking lots of space and so on.

2.4.2. Mechanical briquetting of steel and iron chips

The main advantage of this procedure over the previous is simplicity of making briquettes without addition of any binding medium, which make it more acceptable from both technological and economic point of view. If chips are more squashed (compact) in the briquette, its combustion in the cupola furnace is lower. For obtaining a compact briquette, strong mechanical or hydraulic press is required. However, the device with powerful presses is expensive and available only to large companies, which limit the application of this method of briquetting.

Briquettes are made in the form of low-cylinder or rectangular. Volume weight of briquettes ranges from 5-6 kg/dm^3. It is best to melt the briquettes made from chips of cast iron, and they can be regarded, to some extent, as a substitute of cast iron fractures in melting process. Briquettes as supplement in cupola furnaces are batching in range from 15% and up to 40% for castings with thicker walls.

2.4.3. Electrical briquetting of steel and iron chips

In this procedure chips are subjected to the electric heating with electricity of low voltage and high strength, and then pressing at low pressures. Electro-briquettes are close to the metal pieces and breaks according to their physical properties. High power consumption affects that this method can be applied only in production of expensive metals. During briquetting of iron and steel chips, this method is not economically justified.

3. METALLURGICAL PROCESSING OF STEEL AND IRON CHIPS

3.1. Melting of steel and iron chips in the cupola furnace

Issues that occur with melting of unprepared steel and iron chips in cupola furnace are [4]:

- chips are loose,thusthe large surface area is exposed to oxidation, which cause saturation of metals with sulphur from the sulphur dioxide gases in the cupola,
- tiny chips impede the passage of gases in the furnace, which causes an irregular supply of air and the deterioration of the melting process.

To prevent the oxidation of loose chips in the cupola, it is desirable to implement the method of protection from oxidation in the process of melting.

3.1.1. Melting of steel and iron chips in reducing atmosphere of cupola furnaces

To prevent chips oxidation, melting can be performed in a reducing atmosphere. Reducing atmosphere can be achieved in the following way:

- by reducing the amount of air insufflated into the cupola furnace, the reaction of reduction of CO_2 in the upper part of the furnace is favoured and the ratio of CO/CO_2 grows up to 2,
- the use of high-reactive fuels cause that the cupola gases passing through the batch is enriched with CO, wherein the ratio of CO/CO_2 increases to 5-5.5,so reducing atmosphere is established,
- at each fill of coke a certain percentage of high-reactive fuels is addedso the cupola gases passing through these layers are reducing, and the ratio of CO/CO_2 is from 4-6,
- by inserting of powdered or gaseous fuels,reduction atmosphere is created, where the ratio of $CO/CO_2$is approximately 4.7,
- by increasing the consumption of coke to 25% against to the metal batch, CO/CO_2 ratio is changed to 5. Reducing atmosphere is established because the gases containing $CO_2$by passing through a layer of incandescent coke is reduced to CO. This reaction does not occur with the normal consumption of coke.

3.1.2. Melting of steel and iron chips in oxidizing atmosphere of cupola furnaces

Increased consumption of fuel and reducing capacity of furnace at melting process of loose chips in the reducing atmosphere had caused that other conditions and ways have been found for melting the chips. Simplest solution was melting of chips in oxidizing atmosphere, but this attempt had failed, because the chips were compact and prevented the passage of gases through the batch. Therefore, the gas was passed along the walls of furnace and warmed them, so the chips are melted and "hung" on the walls of the furnace. All of this led to deadlock in the work.

For melting of cast iron chips it should not inject more than 2-3 batches of chips into the furnace, in order to avoid delays in melting process due to gas passing resistance through the furnace. For melting of steel chips, 3-5 batches of chips can be injected, because steel chips are very loose and the passage of gasesthrough them is much easier, allowingevenly heating and rapidly melting of chips.

During the melting of the loose grey iron chips in the cupola there was a large burning of basic chemical elements and the average composition is approaching to the steel composition. Therefore, the grey iron chips may be used as replacement of steel scraps in the cupola furnace melting process. The entered cast iron chips along with the batch in the cupola require no preparation. Chips are batching directly to backfill of the fuel closer to the middle of the furnace. In the calculation of batches with the grey iron chips, it should be consider the combustion of the elements from the grey iron. The resulting cast in terms of temperature and castability has similar characteristics.

3.2. Melting of steel and iron chips in induction furnaces

Large steel and grey iron scraps are used for melting in order to obtain castings of grey iron and steel, while small scraps and chips are used partially. However in foundries, recently, chips are used increasingly for melting and obtaining the materials of grey, malleable, ductile cast iron and steel casts [8].

In the production of grey iron and steel in the foundries trend of reduced consumption of primary raw materials (pig iron) has been observed, along with increase of the consumption of secondary raw materials. Foundries today tend to set the proportion of scraps in batches in such a way to not reduce the quality of castings. From the economic viewpoint,chips as least expensive raw materials have an important role in the steel and iron industry. Due to limitations on the amount of chips that can be melted in cupola furnaces, it is now more performed in the induction furnaces. The induction furnaces have no requirements about amount of chips in batches and consequentlythe contents of chips can be up to 100%. Nowadays, induction furnaces are widely used for obtaining of grey iron, ductile iron and malleable iron.

Low-frequency and medium frequency induction furnaces with no channels are most common in Europe and are simpler for working from canal type induction furnaces used in the U.S.Medium frequency furnaces operate at medium intensity of metal mixing and take less damage to the lining of furnace. Also, at any time, ladle of furnace may be discharged and recharged, unlike in the low-frequency induction furnace. Gas content in the castings obtained in an induction furnace is lower in comparison with the castings obtained in the cupola or electric furnace.

In the induction furnace, cast iron of desired composition can be gained with low or high carbon content. Chips must be clean and dry to prevent the higher concentration of hydrogen in grey iron. These furnaces are good for maintaining the temperature of metals, since the composition of the cast does not change for a long time. However, there is a problem concerning the batching device of induction furnace when it comes to batching with screwed steel chips. Melting of grey iron in induction furnaces has a number of advantages compared to the melting in cupola furnaces, the most important are:

- better use of heat (60-70% for induction, 30-40% in cupola furnaces),
- better quality castings (less hydrogen due to intense mixing),
- no increase in the sulphur content,

- less combustion,thereby the higher metals extraction,
- metal temperature is higher, which is important for casting of thin-wall casts,
- casts porosity is reduced to a minimum,
- it is possible to produce all types of cast iron,
- there is a possibility ofgrey ironcarburizing to the required composition, due to intense mixing of metals, graphite addition, ground coal, etc...

The main disadvantage of induction furnaces in comparison to the cupola is that the costs of installation are six times higher and the electrical energy is more expensive.

3.3. Melting of steel and iron chips by using of electric arc furnaces

In the steel production industry electric arc furnace are quite represented. They can be used for obtaining grey and malleable cast iron, although from an economic point of view these processes are not profitable. In the production of steel in electric arc furnace loose steel chips can be addedand mostly the floor and walls of furnace should be protected from the impact of larger pieces. Electric arc furnace can be with the indirect(no electrodes on the bottom of the furnace)and with the direct heating (with electrode at the bottom of the furnace).

In the most foundries are using electric arc furnaces with the indirect heating, and often they have three electrodes which work on the principle of establishing an electric arc between them and the metal batch.

Advantages of electric arc furnaces are:
- easily melting of metals and alloys with high melting temperatures,
- rapid melting,
- short time required for the commencement of furnace processing,
- refractory linings of the furnace and the dome can be quickly re-build or repair,
- high temperatures in the furnace can provide performance of various metallurgical processes,
- metal saturation with gases is insignificant (eg hydrogen),

The main disadvantage of electric arc furnace is a high cost of electric power. For melting in electric arc furnaces, chips are crushed and then briquetted in the press. The briquettes are then fed into the furnace. In the batches for electric arc furnace, except for briquettes of steel chips, there are ferro-alloys, iron ore, breaks of steel and own returns from steel.

4. CONCLUSION

Steel and iron chips belong to the lower quality secondary raw materials, consequentlythey have been in the background for a long timeand not used enough. Also, the reasons for such a trend were in their low filling weight, immixture with non-ferrous metals, non-metals, coolants and lubricants and the high costs of manipulation and transport. However, bypreparing the chips they quality is significantly improved and high quality briquettes are obtained which represent significant secondary row material in foundries and steel-works. Commonly applied operations of preparation are crushing, washing, spinning, drying, magnetic separation and briquetting.

Metallurgical processing of prepared steel and iron chips are performing in the cupola, induction and electric arc furnaces without any significant complications. In cupola melting process of unprepared chips, losses due to oxidation should be kept to a minimum. This is accomplished by melting in a reducing atmosphere. In induction furnace melting process of briquette chips there is a higher utilization of the metals due to the lower combustion, the content of chips in the batch may reach 100%, better usage of heat, better quality of casts etc… In electric arc furnaces, melting process of steel chips is rapidly and easy to accomplish but the main disadvantageis a high cost of electric power.

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RECYCLING OF GLASS COMPONENTS FROM ELECTRIC AND ELECTRONIC WASTE

RECIKLAŽA STAKLENIH KOMPONENTI IZ ELEKTRIČNOG I ELEKTRONSKOG OTPADA

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***Abstract**: In this paper a review of possible technological solutions for recycling of glass component from WEEE (Waste Electrical and Electronic Equipment) including the closed-loop and open-loop routes were presented. The perspective of glass recycling from CRTs (Cathode Ray Tubes) of TV and PC devices and the florescent lamp was analyzed. Despite the possible reuse of waste glass for fabrication of the new CRTs, the ceramics industry as well as the construction sector were marked as most perspective areas for their application. The recycling of WEEE glass should minimize all potential environmental hazards and negative impacts on human health..*

***Key words:** Recycling, glass, electric and electronic waste*

***Apstrakt:** U radu je prikazan pregled mogućih tehnoloških rešenja za reciklažu staklenih komponenti iz elektičnog i elektronskog otpada uključujući zatvoreni i otvoreni ciklus reciklaže. Analizirana je perspektiva reciklaže TV i PC otpadnih monitora (CRTs) i fluorescentnih sijalica. Pored moguće upotrebe otpadnog stakla za proizvodnu novih monitora kao najperspektivnije oblastii primene označene su keramička i građevinska industrija. Reciklaža električnog i eletronskog otpada treba da umanji sve potencijalne rizike za životnu sredinu i negativne uticaje na ljudsko zdravlje.*

***Ključne reči:** Reciklaža, staklo, električni i elektronski otpad*

1. INTRODUCTION

Fast industrial development in the word generates a huge ecological problems due to appearance of large amounts of toxic and hazardous waste. To solve these problems the dumping of waste material as a common disposal technique was frequently employed. In many cases such solution is not acceptable from ecological point of view. The modern waste management is based on the recycling technologies that can enable a sustainable development of every country. According to the waste hierarchy defined by EC directive 2008/98, the 'recycling' means any recovery operation by which the waste materials are reprocessed into products, materials or substances whether for the original or other purposes [1].

The growing consumption of electric and electronic equipment (EEE) causes also an increase of waste (WEEE) because of their short lifetime. Such waste has been identified as one of the fastest growing waste streams in the European Union. In The Directive of European Communities, the WEEE (Waste Electrical and Electronic Equipment) is classified and amount of materials and substances which should be reused and recycled were determined [2]. Therefore, because of complex composition (plastic, glass, metal, oxide coatings, etc) of these waste materials the selection of appropriate recycling solution becomes a challenging task for technologist. Regarding the WEEE glass components it is important to note that they are very

different in chemical composition and cannot be recycled together in a form of cullet for glass industry. WEEE glasses must be separated and properly cleaned previously.
In this paper a review of possible technological solutions for recycling of glass component from WEEE including the close-loop and open-loop routes were presented.

2.WEEE GLASSES RECYCLING METHODS

Two different routes can be employed for recycling of WEEE glasses: closed-loop and open-loop recycling. Closed-loop method is common in practice and it is referred to utilization of waste glass for the production of new parent glass (glass to glass recycling). In contrast, in open-loop recycling the waste glass is used for other application (new material fabrication) [3].

The greatest amount of WEEE glasses generates from CRTs (Cathode Ray Tubes) of TV and PC devices. CRTs contain 85% of glass and one of two main methods can employed in recycling : shredding or dismantling. The first method refers to shredding the entire device and further separation of metal, plastics and glass parts. By shredding the mixture of panel and funnel glasses which are different in chemical composition was separated. In such condition this waste glass is not appropriate for fabrication of new CRTs regarding to strict demands especially in panel glass production. The glass from the shredder is often sent to smelters for use as a flux. Only well separated and cleaned panel and funnel glasses can be directed in the production of new CTRs [4] As a first stage of the dismantling method the CRT is removed from the devices and then the panel is separated from funnel. The glasses are then crushed, cleaned, and sorted in an automated process that produces separate streams of glass that can be used in new CRTs. In Figure1, the main phases in CRTs recycling (dismantling method) are shown.

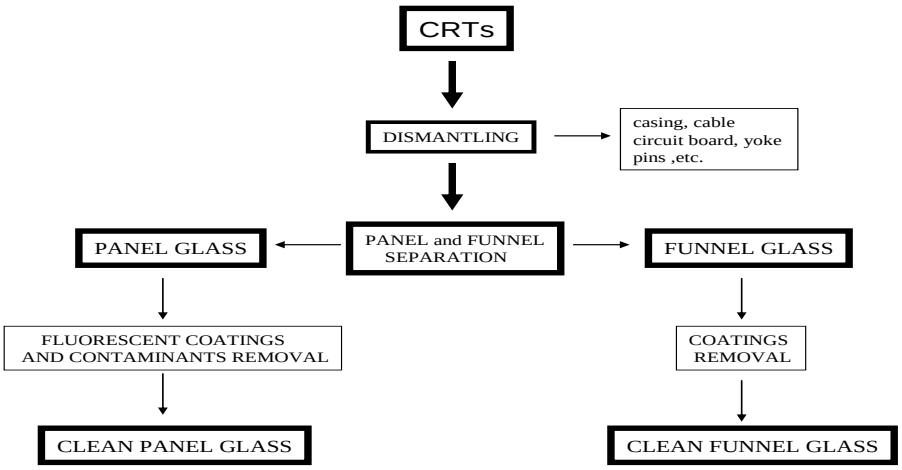

Figure1. CRTs recycling flow chart (dismantling method) [5]

In the case of florescent lamp recycling the same operations including separation of non-glassy components and further coating removal is employed. In such recycling a special attention must be paid on mercury removal. All modern lamp recycling plants contain one dust filter for collection of phosphor powder and fine glass particles. By second carbon

activated filter the mercury vapor was eliminated from the air. In Figure 4 , BALCAN M 6000-U.K recycling plant operated in BIS RecyclingCenter, Omoljica, Serbia is shown.

Figure2 BALCAN M 6000-U.K recycling plant operated in BIS RecyclingCenter, Omoljica, Serbia (Q = 5 mil. Lamps / year)

Two different glasses are present in a typical florescent lamp: soft sodium-calcium silicate glass and lead content hard glass. CRTs are composed of the barium strontium silicate glass (panel), lead silicate glass (funnel), solder low melting lead glass and high lead content glass (neck). The weight contribution of the panel glass is about 65% and for funnel is 30 % Regarding to CRTs manufacturers, the chemical composition of these glasses differs. In Table I, the typical range of panel and funnel glass composition is shown.

Table 1. Panel and funnel glass composition range [6]

Oxides (wt%)	Panel	Funnel
SiO_2	58.9–65.4	51.2–63.5
Al_2O_3	1.2–3.7	5.0–3.9
Na_2O	6.2–9.8	5.3–8.1
K_2O	6.0–9.0	7.2–10.3
Li_2O	0.0–0.5	-
F	0.0–0.8	-
BaO	1.9–14.2	0.0–3.0
SrO	0.0–11.6	0.2–0.7
CaO	0.0–4.6	1.6–4.5
MgO	0.0–2.0	0.9–3.0
As_2O_3	0.0–0.3	0.0–0.2

Sb_2O_3	0.2–0.7	0.0–0.4
TiO_2	0.0–0.6	-
CeO_2	0.0–0.6	-
PbO	0.0–3.3	11.6–24.6
ZrO_2	0.0–3.5	0.2–0.2
ZnO	0.0–0.7	-
Fe_2O_3	0.0–0.1	-

Considering possible application of WEEE glasses (mainly CRTs) , five industrial areas with potential to use significant quantities of these secondary raw materials were marked [3,6]: (1) new CRTs fabrication (2) bricks and tiles(3) flux in brick and/or ceramic ware manufacture, (4) foam glass for insulation(5) fluxing material in metal smelting.

Unfortunately, only small content of WEEE glasses is being recycled. Based on EU reports, quantity of WEEE increased rapidly (8-9 mil.tonnes annually) and the development of appropriate recycling technologies in this area is necessary.

3. OPEN-LOOP WEEE GLASSES RECYCLING PERSPECTIVE

In open-loop recycling the glasses from WEEE are utilized as a secondary raw material in fabrication of different industrial products. Numerous results of investigations revealed that the ceramics industry as well as the construction sector are one of most perspective areas for these glasses. Applicability evaluation of waste CRTs panel in a cement blocks and clay bricks showed that the properties of glass waste added samples are in accordance to the industrial tolerance values for such materials [7,8]. Also, the laboratory-scale test confirmed a possible application of CRTs for production of insulating foam glass and sintered glass-ceramics in combination with other industrial waste materials (fly ashes, metallurgical slag, etc) [9,10]. Based on the laboratory test results of ceramic engobes containing a waste fluorescent lamp glass a new innovative technology named Relux was developed for fabrication of the glazed porcelainized stoneware tile. It was revealed also that waste CTR glasses can potentially be used as a fluxing material in metal smelting (lead and cooper) [11]. The funnel glass and frit can be used as a source for lead obtaining. To extract lead efficiently a fully automated recycling process of CRTs was designed by Nulife Glass Processing Ltd – U.K. The lead extracted is typically 99% pure and is suitable for battery and other lead products fabrication [12].

It is important to note that the application of waste glass as secondary raw material requires an adjustment of its grain size in accordance to the selected technologies. Therefore, the equipment for additional crushing, separation, milling and storage is used. In such a way the total cost of recycling and obtaining of appropriate glass materials can be increased significantly. All this limits additionally the utilization of recycled glasses in a large quantity. Also, despite the potential wide application the survey of results in this area showed that a minor of new products based on these secondary glass raw materials were commercialized. Mainly, the studies performed are on laboratory level without ,,scale-up" of the process parameters defined for obtaining the new materials containing recycled glasses. Therefore, to increase the quantity of recycled glasses from WEEE a more intensive and comprehensive studies of their possible application in the existing industries are necessary.

4. CONCLUSIONS

As one of the fastest growing waste streams in the world WEEE deserves a special attention due to negative impact on environment and human health. As one of possible waste management practices the recycling of glass components from WEEE is a challenging task because of its complex composition. To obtain valuable waste glasses from WEEE the closed-loop or open-loop recycling methods can be employed. Unfortunately only small quantity of was glasses was recycled despite their possible application in different industries. To increase the applicability as well as environmental and economical benefits of recycled WEEE glasses a more intensive and comprehensive investigations are necessary.

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METHODS FOR VALUATING THE EFFECTS OF AIRBORNE POLLUTION IN COPPER PRODUCTION

METODE VREDNOVANJA EFEKATA ZAGAĐENJA VAZDUHA U PROIZVODNJI BAKRA

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***Abstract**: In copper production external costs arise as a result of degradation and damage to the environment. Ecological external effects influence environmental media which have the characteristics of public goods. It is indisputable that the degraded and polluted environment adversely affects human health, but that effect is difficult to quantify. External costs can be viewed as a cash equivalent to the damage to the environment and human health caused by copper production. This paper presents methods for evaluating the adverse effects of airborne pollution on human health and life of an individual. The above methods can also be used when it comes to other forms of pollution, such as the pollution of water and soil.*
***Keywords**: External costs, copper production, air pollution, human health and life, evaluation methods.*

***Apstrakt:**U proizvodnji bakra nastaju eksterni troškovi koji su rezultat degradacije i oštećenja životne sredine. Ekološko eksterni efekti utiču na medije životne sredine koji imaju karakteristike javnih dobara. Neosporno je da degradirana i zagađenja životna sredina negativno utiče na ljudsko zdravlje, ali je taj uticaj teško kvantifikovati. Eksterni troškovi se mogu posmatrati kao novčani ekvivalent oštećenja životne sredinei zdravlja ljudi uzrokovanih proizvodnjom bakra.U radu su prikazane metode za vrednovanje negativnih efekata zagađenja vazduha na ljudsko zdravlje i životni vek pojedinca. Navedene metode se mogu koristiti i kada su u pitanju drugi vidovi zagađenja, kao što je zagađenje vode i zemljišta.*
***Ključne reči**: Eksterni troškovi, proizvodnja bakra, zagađenje vazduha, ljudski život i zdravlje, metode vrednovanja.*

1. INTRODUCTION

On a global scale, mining and metallurgy are the biggest polluters of the environment, having cumulative and far-reaching consequences on the environment and climate change. The most obvious and most direct consequences of pollution are manifested through harmful gases causing air pollution (sulfur, carbon and nitrogen), mineral dust and heavy metals particles (lead, arsenic, manganese, cadmium, mercury), whose harmful effectson the health of population are alarming [1]. Given the above, it is easy now to prove a positive correlation between pollution and disease. The growing negative impacts on the environment and human health require their inclusion in the economic analysis. The main task of the economic analysis of the environment and of the adverse impactsis to determine an efficient way to prevent and control pollution. One way to monitor and control these influences is the internalization of externalities, i.e.including environmental costs in the operating costs of the emitter.

The internalization of externalities has become very interesting to many authors. On one hand, the "environmental" economists advocate the introduction of higher taxes in order to achieve

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more effective environmental protection. However, the "traditional" economists hold the position that taxes which are set too high can hurt not only the producers but the economic picture of one country as well. Eugster –Stäheli has,in his master thesis, showed external costs characteristic in the production of copper [2].

Given the importance of environmental preservation, the most important studies on the effects of pollution on health were conducted by U.S. researchers Schwartz, Dockery and Pope in the first half of the 1990s [3-5]. They found that there is a statistically significant link between the increased concentration of airborne particles and mortality and health of the population. The thresholdof activity was not set up, which means that even the slightest increase in their concentration in the air can cause some, even negligible effects on health. Based on these findings the functions of exposure-effect were created which determine the relative increase in the mortality cases, hospitalizations and days of reduced activity for a unit increase in the particle concentration.

Many authors have proposed a cost valuation of air pollution effects on human health and life. Remoundou et al. consider the effects of environmental changes on health in developed countries individually and globally [6]. Mortalityand subsequent diseasescaused by air pollution have been extensively studied through potential value inChina as well [7-9]. The issue of extended life expectancy and reduced risk of mortality from air pollution in Europe have been studied by Desaigues et al., Chilton et al., Krupnick et al. and many others [10-12]. Similar examples can be found in many publications, such as [13-17].

2. THE SOURCES OF AIR POLLUTION IN COPPER PRODUCTION

From an environmental point of view, the main sources of air pollution in copper production are harmful gases and dust. Stock piles from opencast mines and flotation tailings are the most important sources of mineral dust, especially during dry seasons. Blastingis also one of the sources of emissions and dust from mining. The volume of the dust cloud generated by blasts in opencast mines can reach several millions of cubic meters, their range tens of kilometers, which can be a regional problem. The emissions in copper production are the following:

- particulate emissions from mining operations and mobile equipment;
- particle emissions from crushing and grinding of ore;
- wind-blown particles from stockpiles and landfills [18].

Air quality monitoring includes systematicmeasurement ofair pollutants: gases (sulfur dioxide, nitrogen oxides, and carbon oxides), vapor or particles. Pollutantconcentrations are continuously monitored in relation to the permitted emission limit values, the influence of natural factors and changes in the condition and characteristics of the environment, as well as the assessment of the effect of pollutants on the environment and humans. The objectives of the airqualitymonitoring are:

- identification of the pollution sources;
- analysis of the exposure and implementation of the impact assessment on health;
- national and international standardscompliancecontrol;

- informing the public about air quality;
- obtaining objective data needed for air quality management [19].

As an illustration, the value of the presence of sulfur dioxide in the air in Bor in 2010, measured at two measuring points, was above the permissible annual limit of 50 μg/m^3(Table 1).

Table 1. Average annual concentrations of SO2 (μg/m^3), the number of days with exceeded daily LV, and categories of air quality in 2010. determined based on the average annual values.

AMSKV, Measuring Point	Average Value	Number of Days > GV	Max Daily value	Source	Measurement Method	Availability (%)
Bor – City Park	171	111	1558	1	A	83
Bor – Institute RIM	76	65	1009	1	A	93

Legend: *Data source*: 1 - Agency for Environment Protection;*Measurement method*: A - automatically
Source: [20]

As Table 1 shows, exceeding the maximum permissible daily limit of 125 μg/m^{3}in Bor was very common. At the measuring point AMSKV Bor - Park City,the limit was exceededfor 111 days, and at the measuring point AMSKV Bor– Institute of Mining and Metallurgy for the total of 65 days. The available data indicate that in 2010 the air in Bor was of the third category, that is excessively polluted.

Analogous to air pollution, the concentration of the priority and hazardous priority substances in the Borska river nearby the village of Rgotina is really worrying because cadmium concentration is 20 times higher than the maximum permissible amount. Table 2 shows the concentrations of nitrogen, phosphorus and heavy metals in municipal wastewater in Bor in 2010 according to the data from the Report on the Environmental Situation in the Republic of Serbia in 2010.

Table 2. Amounts of nitrogen, phosphorus and heavy metals in municipal wastewater in Bor

Communal Company	Total nitrogen (t/year)	Total phosphorus (t/year)	Total heavy metals (kg/year)
JKP Vodovod Bor	85,0	12,2	1,2

Source: [20]

3. SOCIAL AND PRIVATE COSTS OF POLLUTION

In theory, if we start from the assumption that there is a perfect competition on the market for the products made by firms-polluters and the absence of any government intervention, the market demand reflects the marginal social utility [21]. However, the market offer without state regulation reflects only marginal private costs. By ignoring external costs, the supply and demand will be in balance on the level of production Q_1 with the balanced cost per unit C_1, as shown in Figure 1.

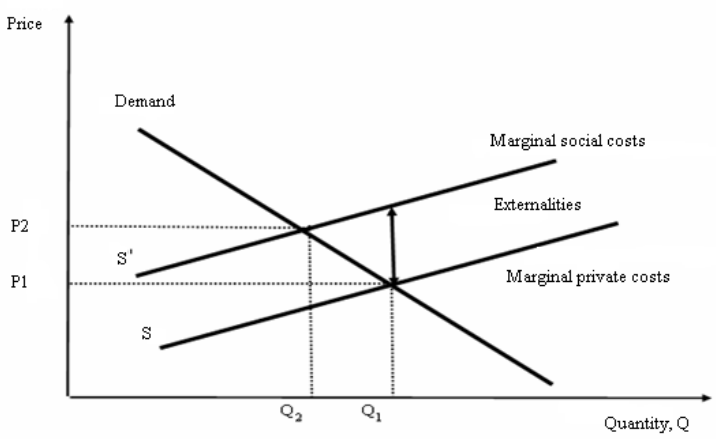

Figure1.Gap between private and social costs
Source: [21]

Since the polluter company through its production process creates costs for which it bearsno responsibility, the C_1 market price does not reflect the total cost of the production mentioned. The private cost of production increases the total cost for the amount that is presented in Figure 1 with the movement of the supply curve P to P'. Taking into account these costs, which correspond to internalization of externalities, requires the determination of the new higher price C2 and lower production level Q2. By applying the facts on a concrete example, in Figure 1 can be seen that if copper production causes harm to others, and gives no possibility of market compensation, the marginal social costs of production are higher than the private marginal costs of production.

It is clear that in copper production the ecological component plays an increasingly important role in the total costs (which in turn affect the profit), because the copper price must be competitive. If the costs of addressing environmental issues are equal to or greater than the selling price of copper, the survival of the company is at stake. That is why the environmental problems in copper production should not be resolved spontaneously, but they must be dealt with a systemic approach. What is needed for a systematic solution of environmental problems are investments (scientific research) in order to set and adjust the ecological system to the conditions that exist in the social and business system.

4. EXTERNAL EFFECTS EVALUATION METHODS

The priority negative impact on the environment and human health in the production of copper is attributed to air pollution. Harmful emissions of sulfur, carbon and nitrogen are the biggest air polluters. On the basis of atmospheric models it can be concluded that even at distances of several hundred kilometers from the source there is some, although very small, increase in the concentration of pollutants. Exposure to pollutants is defined as the contact of a person with a specific pollutant concentration in a given period, either through inhalation, food intake, or skin penetration. The negative impact on health represents a disorder of physiological functionsor the appearance of pathological changes that affect normal functioning of the body, or that may contribute to the reduced ability of the body to protect itself from additionalstrain [22]. In his thesis, Eugster - STÄHELI pointed to some basic

methods of evaluating harmful emissions into the air. In this case external costs are determinedfor the following categories: health, buildings and crops.

Evaluation of adverse health effects is based on determining the cost of mortality or premature death, as well as on defining the costof a diseases or health impacts which include three main categories: the cost of health care (medical expenses), opportunity costs (lost productivity and sick leave) and costs for incurred pain and suffering (reduced satisfaction, withdrawal, etc.)..

The cost of mortality is usually determined by the value of statistical life (VSL) or the value of prevented fatality (VPF). Thereare two basic approachesfor valuating a statistical life. The first approach measures the economic productivity and uses an individual's lifetime earning as its measure of value. Another approach measures the willingness to pay (WTP) to reduce the risk of premature death. Thefollowing methods are most often used for valuating a statistical life:

- **The compensating wage method.** In this method labour market data on wage are analysed for different jobs on their corresponding health risks. The essence of the method is to compare the wages in the so called risky and non-risky jobs. The wage that workers receive when they take over a risky position reflects their risk choice or WTP. There are many critics of this method since it assumes that workers are fully aware of job risks and the labour market is strictly competitive. According to the studies applying this method, the mean value of a statistical life is estimated to be € 6.5 million [23].
- **The avertive behaviour method.** Determines the money individuals spend on safety equipment for reducing the risk of death (e.g. air bags, smoke detectors, etc.). According to the case studies applying this method, the average value of a statistical life is €1-1.5 million.
- **The contingent valuation method (CVM).** This direct method is based on the use of questionnaires, which aim to determine how much an individual is willing to pay to reduce the risk of a negative impact, for example, the risk of death (WTP) or how much compensation he is willing to accept for additional risk (WTA) [24]. The above method is widely used, because it provides focus on the commodity to be valued.

Long-term presence of elevated concentrations of pollutants in the air can lead to chronic diseases and shortening of life for a number of years. Thus, air pollution can cause premature death, but it cannot be the sole cause of death. Therefore, for the evaluation of deaths due to air pollution is not recommended to use the value of a statistical life (VSL), but the value of life years VOLY. Using this method allows to valuatethe change of life expectancy in the context of air pollution. The results of the survey that ExternE team has conducted in nine European countries shows that VOLY is 40,000 € in air pollution [23].

Monetary value for an illness is based on the fact that the total costs of an illness are the amount that an individual is willing to pay (WTP) to reduce the negative consequences of the illness. This amount includes direct medical costs, lost income due to absence from work, the cost of leisure time lost, the cost of mental and physical pain of the ill person and of the psychological stress of their loved ones, as well as the expenditures for mitigating the possible consequences of the disease (drugs, therapy, etc.., if it is not possible to recover completely).

The first three components can be calculated with relative certainty: the direct medical cost of treatment is known for every illness, reduced income due to sick leave is calculated on the basis of the value of a working hour and the cost of leisure time lost is considered, based on CVM estimate, to be worth 30-50% the value of a working hour. All three of these components together represent COI – thecost of illness [22].

Pollution can also cause damage to buildings due to the degradation of the construction materials. When evaluating buildings, it is not enough to calculate only the cost of repairs and maintenance, but also to take into account their aesthetic appearance and value of existence. One of the most harmful pollutants is sulfur dioxide, which can also have a detrimental effect on agricultural production. For determining the adverse impact on agricultural production most often is used the method of exceeding critical strain, which assumes that ecosystem has a threshold below which the damage is negligible, or that natural mechanisms of self-regulation are in operation. Exceeding this threshold, ie. critical strain, even in very small amounts, may in the future have serious impacts on arrable land.

The methods presented in the above paper have primarily been used for the evaluation of air pollution. However, they may prove equally useful in the contamination evaluation of other environmental mediasuch as water and land.

5. CONCLUSION

Copper production causes, among other things, pollution of air as one of the environmental media, and thus damages the health of the population in the area where the production takes place. Evaluation of the environmental damage caused by air pollution in the copper production is based on the estimation of the people's preferences regarding the change of state of the environment in which they live. In order to introduce the economic valuation of the environment, one must start from the same principles as in the valuation of the product of human labor, and these are "the principle of the willingness to pay" (WTP) in order to avoid environmentalpollution and "the principle of the willingness to accept payment"(WTA)as compensation for environmental pollution and degradation. When these parameters are measured, then the economic valuation allows to show the environmental costs and benefitsin financial terms, as is seen in determining the value of the damages caused by pollution in various scenarios of pollution control. In this case, there is a possibility to validate the net environmental benefits and costs to the society as a whole.

The lack of markets and prices for environmental products and services is a double challenge for economists. The first challenge is to identify in which ways environmental damages affect the well-being and the second one is to calculate the cash value of these changes by the use of a number of direct and indirect techniques. This paper presents the valuation methods that were presented in the above mentioned master thesis, concerning the evaluation of emissions into the air with the external costs identified in the following categories: health, buildings and crops. These methods, which include methods for the estimation of a human life and the evaluation of illness, have their own advantages and disadvantages which suggests that there is room for further research in this area.

The most complex and controversial part of the evaluation of the adverse impacts on human health and life is seen in determining the monetary values of the damages. The methods presented in this paper are based on an estimation of the value of one's own life and health, the willingness to pay to prevent the risk of endangering life and health, and of the total social costs caused by deteriorating health due to air pollution. However, determining the number of the diseased and dead due to pollution is quite a complex issue which indicates the lack of reliability of the methods and the need for their improvements.

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DEFECTS IN CASTINGS CAUSED BY HUMAN ERROR

DEFEKTI NA ODLIVCIMA UZROKOVANI LJUDSKOM GREŠKOM

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Abstract: *This paper analysed the influence of various factors on moulding discontinuities and moulding quality. The research established that most causes were rooted in a casting process itself, such as: the method of alloy preparation, mold fabrication, moulding design and alike. Further, human fault is often referred to as a cause of moulding discontinuities. This paper showed that business entities do not pay much attention to human errors made in decision-making. Based on the research conducted, a series of measures have been proposed to prevent moulding dicontinuities.*
Key words*: human fault, control measures, quality system.*

Izvod*:U radu je analiziran uticaj različitih faktora na pojavu grešaka na odlivcima i njihov uticaj na kvalitet odlivaka. Sprovedenim istraživanjem utvrđeno je da najčešći uzroci potiču iz samog procesa livenja: način pripreme legure, izrade kalupa, konstrukcija odlivaka, a često se kao uzrok diskontinuiteta navodi i ljudska greška. Pokazano je da radne organizacije ne poklanjaju potrebnu pažnju ljudskim greškama koje nastaju u poslovnom odlučivanju. Na osnovu sprovedenih istraživanja predložen je niz mera za sperečavanje pojava diskontimualnosti na odlivcima.*
Ključne reči*: ljudska greška, mere kontrole, sistem kvaliteta.*

1. INTRODUCTION

Moulding discontinuities refer to variations from the requirements as specified in a moulding technical documentation with regard to: shape, size, composition, weight, mechanical properties, structure. Discountinuities may be classified according to type, size, position or orientation. From the operators' point of view, the types of discontinuities may be divided into: large (when a moulding cannot be used anymore), medium (when it should estimate whether to repair or re-melt a moulding) and small (when there is an opportunity to repair a moulding in a cost-efficient manner). An estimate referring to accuracy and quality represents the level accomplished in reference to the planned moulding properties, in particular to accuracy of measures and shape, surface quality, structure and properties. [1-3]

Discontinuities should be revealed first; then, their prospective influence on the object functionality should be estimated. In terms of further casting practices, it is of particular imporance to define systematic measures for human fault prevention. Control measures should also be introduced in order to prevent these from happening at any of the work stages, especially on critical positions, such as preparation of batch melting components, mold fabrication, positioning of cores etc, obeying the prescribed technology. In fact, staff practices should be strictly controlled and the fault causes should be thoroughly examined and eliminated.[4-7]

2. HUMAN FAULT CLASSIFICATION

Human error should be referred to as a cause of certain notions, outcomes and activities leading to failure to accomplish the result axpected. According to the level of awareness, faults may be divided into the following categories: faults and violations, Figure 1.

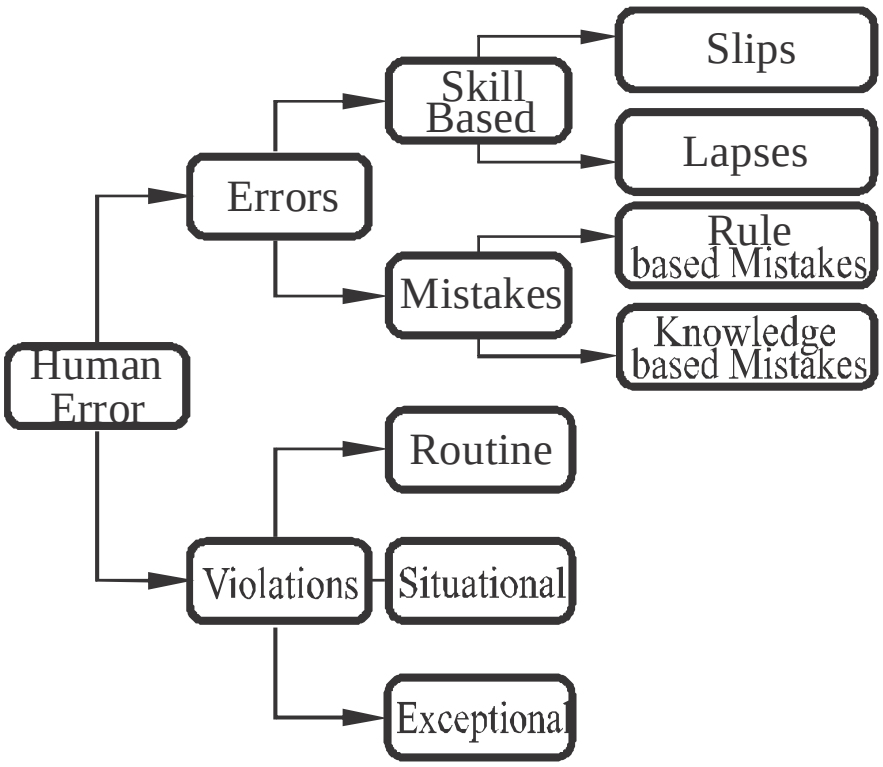

Figure 1. Human fault classification

Errors are due to the lack of knowledge or experience, and violations are due to negligence. Most often, faults are slips - accidental failures in carrying out certain activities or tasks, that is, violations of the planned or established activities. Most often, a short working operation with no long-term consequences is concerned, not leading, though, to the objective foreseen, thus implying a repeated performance.It happens when certain activity is carried out either too early or too late or when it is missing. Slips are also due to the actions being carried out in a wrong direction, with inappropriate forces or objects, insufficient knowledge, insufficient or wrong information, the lack of experience to do the job etc. Omissions are the faults due to the lack of comprehending either planned or assigned activities, i.e. omissions of a part of the activities to be carried out. Slips and omissions are classified into the same fault category based on skills, i.e. due to a clumsy way of performing operations. These faults are assumed to be caused by the lack of routine and skills to carry out a task. Intentional failures to obey the rules cause faults classified as violations.

In a moulding production planning and organization system, a manager should carry out a series of functions , such as: objective planning and setting; human and material resources

organization and co-ordination; human resources policy management; human resources selection, training and stimulation; influencing employees and motivating associates; assignment performance control and monitoring.

3. EXPERIMENT

The subject of research referred to causes, frequency and consequences of human faults in business decision – making during moulding production process.

Production engineer should observe a person performing certain stage of operation as either an operational or false system component, in just the same context as if equipment is concerned. It implies the need to deeply and thoroughly analyse the ways individuals perform the tasks assigned within a concrete technology. Basic features of task executants are knowledge and motivation. Apart from knowledge, a manager must have a seriers of skills such as calmness, punctuality, ability to recognize opportunities to incite and motivate task executants, since the more a person is motivated, the less number of faults is made. Short-tempered, hasty, impatient managers make more mistakes. Their faults are partially due to certain features of their personalities but also to stressful working conditions. Research and analyses may be made in reference to whether and to which extent human personalities are biologically pre-determined and to which extent they are the result of a wrongly adopted desired behaviour.

A research method was a conventional methodological approach referring to collecting, analysing and interpreting the data obtained. A special questionnaire with specific questions was used; features of the questioned (cast house operators) were determined, as well as their stand points concerning the subject. Since human fault management is a complex process, research was carried out in a series of steps as follows: to identify weak system points; to notice and report the events not causing likely adverse consequences; to notice the faults and encourage fault reporting; to seek root causes; to notice and detect hidden faults. In order to easily notice and analyse faults, three factor groups were noted as follows: occupational factors, individual factors and organizational factors. Based on monitoring and research results, a concept of human fault observation with regard to working situation has been suggested, as well as a series of measures to eliminate the same.

4. RESULTS AND DISCUSSION

The research concerning moulding discontinuities and human faults as a prospective cause showed that an attention should be paid to the three factor groups in order to minimize fault as follows:

a) Work factors:
- Ilogical equipment or instrument design,
- Constant working process interruptions and disturbances,
- Vague instructions,
- Being overloaded with work,
- Noisy and inconvenient working conditions.

b) Individual factors:
- Lack of knowledge and skill,
- Exhausted workers,
- Indifferent and unmotivated workers and
- Health issues.

c) Organizational factors:
- Poor job planning leading to an increased pressure,
- Lack of security system and defensive mechanisms,
- Inadequate reaction to previous accidents,
- Management based on one-way communication,
- Lack of responsibility and co-operation,
- Poor security management,
- Poor safety behaviour.

Results of research referring to the ratio between the level of skill of executants and their job showed that it is: fully matched - 48,8% ; mostly matched- 34,39% , not matched - 17,01%,most frequently being the cause of human error.

Having been asked whether they noticed, analysed and learnt out of own mistakes, the questioned replied positive - 63,3% sometimes - 29,89% , while 6,8% replied that they did not pay attention to either own or others' faults.

The question referred to executants wanting to either increase their own knowledge or to change the current job. 12,27% replied they intended to find another job, 56,62% would change a job if there was a better job opportunity, while 31,11% was satisfied with the current job and wanted to increase the knowledge.

Having been asked if the organization paid enough attention to human fault issues and whether these were reported, 51,52% replied negative, 48,48% replied positive.

4. CONCLUSION

Having analysed the measures to be taken in order to form “a faultless organization”, it was suggested to arrange for courses required to increase knowledge of executants dedicated to the jobs they do. Further, fault prevention courses, increased and additional trainings, general security policy, simulation model trainings etc should also be arranged, as well as each activity motivating employees. Research results show that human fault issues are highly tolerated in working organizations. Organizations do not pay enough attention to human faults emerging from business decision-making. It may be concluded that the entire human fault concept in a working situation is relatively vague; it is influenced by a number of factors therefore future research should be carried out in order both to have it more precisely defined and to propose concrete measures to eliminate human faults in business decision-making.

ACKNOWLEDGEMENTS

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EFFECTS OF APPLICATION ON NEW CASTING METHODS ON QUALITY OF CASTING AND PRODUCTIVITY OF COPPER ALLOY CASTINGS

EFEKTI PRIMENE NOVIH METODA LIVENJA NA KVALITET I PROIZVODNOST ODLIVAKA LEGURA BAKRA

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Abstract: *In this paper, results of investigation of new methods of casting of copper alloys with accent on the Lost foam process are presented. Phases of casting procedure were investigated, along with important process parameters and their influence on structure and properties of obtained castings. This technology enabled obtaining of the castings with complex construction and thin walls, and significant savings in casting procedure: expensive operations such are cleaning and machine processing of castings are minimized, while exploitation of metal is increased. Critical parameters of the process were investigated: casting temperature, types of refractory coatings, types of polymer models and their influence on formation of the structure. Results showed that new technology can be applied for obtaining of quality copper alloy castings which can be widely used in mechanical industry. It was shown that application of this method of casting attributes to the increasing of the cost-effectiveness of the manufacturing and improvement of the quality of copper alloy castings.*
Key words*: copper castings; Lost foam process; quality of castings; cost-effectiveness.*

Izvod: *U radu su prikazani rezltati istraživanja novih metoda livenja odlivaka legura bakra sa akcentom na Lost foam procesa livenja. Istražene su faze procesa livenja, relevantni parametri procesa i njihov uticaj na strukturu i svojstva dobijenih odlivaka. Ova tehnologija omogućila je dobijanje odlivaka složene konstrukcije, tankih zidova uz ostarivanje velikih ušteda u procesu: smanjene su skupe livačke operacije čišćenja i mašinske obrade odlivaka, povećano je iskorišćenje metala. Istraženi su kritični parametri procesa: temeratura livenja, vrste vatrostalnih premaza, vrste polimernih modela i njihov uticaj na formiranje strukture u uslovima livenja u pun kalup. Rezultati su pokazali da se nova tehnologija može primeniti za dobijanje kvalitetnih odlivaka legura bakra koji se široko koriste u mašinskoj industriji. Pokazano je da nova tehnologija livenja doprinosi povećanju proizvodnosti, smanjenju cene koštanja odlivaka i postizanju visokog kvaliteta odlivaka.*
Ključne reči*: odlivci bakra; Lost foam proces; kvalitet odlivaka; uštede.*

1. INTRODUCTION

Evaporative patterns casting (Lost foam casting process) is patentedby H.F. Shroyer in 1958. Since then, up to today, developmentand practical application goes on with changeablesuccess. Mainly, the problems of the development of thisprocess are lack of appropriate materials for making evaporativepatterns and refractory pattern coatings.Unlike casting in the sand moulds, the process usespatterns and pouring systems, which remain in the mouldafter its making until pouring of metal. This justifies the title "full mould casting", Figure 1. In the contact with liquid metal, thepattern is split in a relatively short time. At the same time,the castings crystallization takes place. As the consequenceof the pattern splitting, a great quantity of gaseous andliquid products is produced. If the conditions of theirelimination from the mould are not fulfilled, many defectswill appear on the castings, which are considered characteristicfor this process. [1-5]

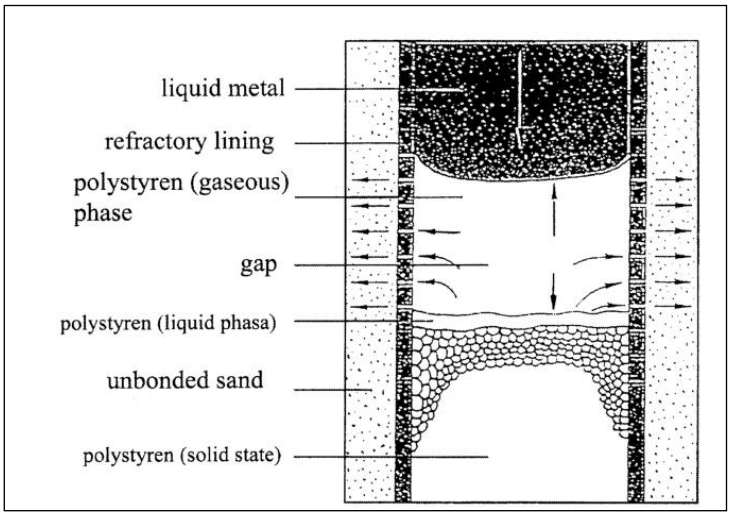


Figure 1. System balance: liquid metal-refractory lining-pattern-sand

Important factors on pattern's decomposition and evaporation process, besides temperature and pattern's density, are also the type and refractory coat layer's thickness which the evaporable pattern is been coveredwith, type and size of sand grain for modeling, respectively permeability of sand for modeling, castings and gating of moulds' construction. The pattern's density and permeability of refractory coat and sandy cast determine polymers evaporation velocity. The velocity of liquid metal coming into the cast and its contact with the pattern is regulated by proper defining the gating of moulds. [6-9]

In order to obtain castings of a priori desired quality, critical process parameters should be determined for each particular polymer pattern, as well as the type of alloy for casting. That requires long-lasting researches with a goal to achieve optimization of Lost foam casting process and obtain the castings of a priori specified properties. In order to understand correctly the Lost foam process optimization it is necessary to know that various types of castings' structure determine their different properties. Besides this dependency for obtaining the castings of a priori specified properties there also should be determined the fundamental structure dependency on technology, which implies critical process parameters' control and control of useful castings' properties, and a special consideration in this paper was given to that matter. [10,11]

2. EXPERIMENT

A two series of experiments were done with the goal of analyzing the possibilities for appliance of refractory coats based on talc (series mark: T) andcordierite (series mark: C) in Lost foam casting process. The coats' compositions were defined (table 1) and the coats components' preparation methods were determined. Grinding and fine grinding of refractory loaders of talc andcordierite was done in mill with balls of Cr-Ni steel, capacity 20 kg/h, with mill load of 70% and grinding time 45-60 minutes.

Table 1. Compositions of used refractory coats on talc, (T), and cordierite (C) base

Composition of refractory coat type T: -refractory filler: talc with grain size of 40μm, 93 -95 % -binding agent: bentonite 1.5-2.5%; bindal H, 0.5-1%, -suspension maintanance agent: $Na_3P_3O_3$ 1-3%, carboxymethylcellulose (CMC), 0.5-1% -solvent: water
Composition of refractory coat type C: -refractory filler: cordierite with grain size of 40μm, 92 -94 % -binding agent: bentonite 1.5-2.5%; bindal H, 0.5-1%, -suspension maintanance agent: $Na_3P_3O_3$ 1-3%, carboxymethylcellulose (CMC), 0.5-1% -solvent: water

At applying refractory coat on polymer pattern by techniques of immersion into the tank with coat, overflowing and coating with brush, a special attention was given to coat's quality control, Figure 2. The basic criteria for quality evaluation of this type of refractory products were-pertinence for applying, drying behavior, resistance to attrition, sedimentation and penetration.

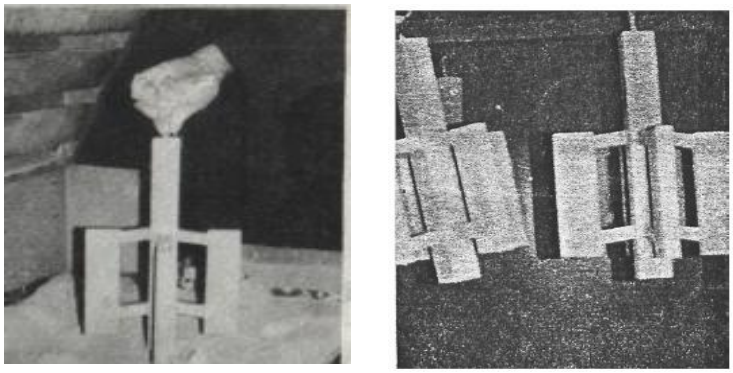


Figure 2. Coatings and drying

The process parameters for production of refractory coats series T and C, methods of coat applying on patterns and drying, when optimal results of testing the structure and properties of obtained aluminum alloy castingswere:

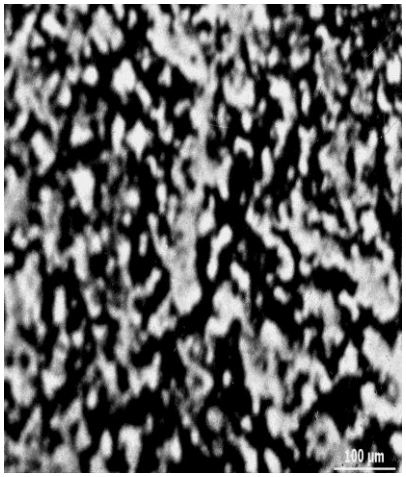
- Coat densities: 2g/cm^3
- Coat temperature: 25°C
- The way of coat's excess remove from the pattern after pulling out from the tank for lining: patterns are been seeped, in vertical position, 5-10 s, and then set 5 s under 45° angle in order to coat layers on pattern's surface get equally even
- Slowly coat mixing in tank during the coat applying on pattern: velocity 1 revolutions/min
- Methods of coat applying on pattern: "cluster" immersion into tank with coat; overflowing; coating with brush
- Drying: first layer 2 hours; final layer 24 hours
- Coat layer's thickness on the pattern after drying: 0,5-1,5 mm.

The experimental parameters of Lost foam casting process regarding which were done the selection of composition and preparation of refractory coats series: T and Cwere:

- Tested alloy: copper alloy (chem. composition (%): Cu 86,0; Sn 13,9; P 0,1)
- Preparation methods of liquid die: refinement by Cu_3P
- Casting temperature:1150 °C
- Evaporable polystyrene pattern: density 20-25 kg/m^3; pattern construction: plate (200x50x20)mm; polystyrene grain size 1-1,5 mm
- Mounting pattern for casting: "cluster" with four patterns-plates set on central runner gate
- Gating of moulds:central runner gate (40x40x400)mm; ingates (20x20x10) mm, 2 pieces.
- Dry quartz sand for cast production:grain size: 0,17 mm; 0,26 mm; 0,35 mm.

3. RESULTS AND DISCUSSION

By controlling the critical process parameters for refractory coats' production and controlling the coat's properties it was determined that the coats of all series comply with conditions for appliance in Lost foam casting process. It was determined that coats were easy to apply on polymer patterns, being equally lining at overflowing and immersion, were easy to been coat with brush, without any mark of brush, leakage, drops and clots' formation. After drying, the coat surface was smooth; coat's layers were of equal thickness everywhere on pattern's surface, without any bubbles, crazing, peelings or attrition. The coat quality and refractory loader's homogeneity in the coat depends on coat preparation. In order to achieve even coat layers' thickness on pattern's surface it is necessary to slowly constantly mix the coat during its applying on patterns, to maintain defined density (2g/cm^3) and temperature (25°C) of coat. On the contrary, the coat composition's inhomogeneity appears, Figure 3.



a) homogenous composition coats

b) non-homogenous composition coats

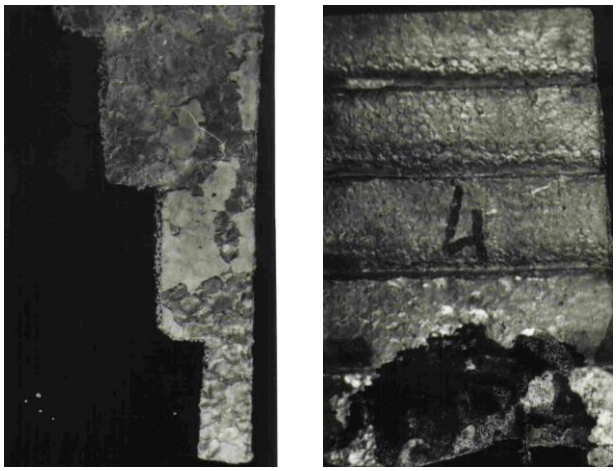
Figure 3. Refractory coats

In order to observe the effects of casting process, evaluation of certain operation phases and analysis of applied refractory coats' influence, a visual control of the obtained castings was done, testing their structural and mechanical properties. After pulling out the founded

"clusters" from the cast, their surface is covered with coat layer which is easy to be broken and removed from it, so the cleaning is not necessary, which significantly reduces the production costs. The refractory coats of all series have demonstrated positive effects on the surface quality – shiny and smooth castings' surfaces were obtained. The castings are true copy of the patterns (dimensionally are precise) which indicates that the decomposition and evaporation of polystyrene pattern was in totality, and that the gating of moulds' solution was satisfactory. It was noted that the lower castings' parts of all series have flat and sharp edges, clean and shiny surface. At some castings from the series with coat layers of higher thickness (above 1,5 mm) the upper castings' surfaces are a bit uneven and folded, and also on certain castings' parts a surface roughness appears, and more often at the castings from the series with patterns' density above 20 kg/m^3.

The study results of castings' structural and mechanical characteristics were within the limits predicted by the standards for this type of alloys. That would be the castings from series with used polystyrene patterns up to 20 kg/m^3, refractory coats of less thickness layers, below 1 mm, applied quartz sand for modeling with its grain size above 0,26 mm, casting temperature within the limits of 1180°C and casting velocity whichenabled even decomposition and evaporation of polystyrene, with complete elimination of gassy products from patterns' evaporation, without any cast falling in and liquid metal penetration into sand.

On the other hand, castings from the series with applied patterns of densities above 20 kg/m^3 and coat thickness above 1,5 mm have expressed subsurface and volumetric porosity too, Figure 4.



d) sintered sand e) metal penetration into sand

Figure 4. Errors on castings

This indicates that the reasons for these type of errors are primarily the polystyrene pattern, and next the refractory coat and high casting velocity.

4. CONCLUSION

In order to attain a quality and cost-effective castings production by the Lost foam casting process, it is necessary to attain the balance in the following system: evaporable polymeric

pattern- liquid metal-refractory coating– sand mold during metal inflow, polymeric pattern decomposition and evapouration, castings formation and solidification.All this points to complexity of the castings solidification conditions by the Lost foam casting process, as well as to the necessity to determine the corelation between the casting parameters, structure and properties of castings.

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ENERGY RESOURCES OF THE REPUBLIC OF SERBIA-ANALYSIS, STATUS AND TRENDS IN THE ENERGY SECTOR IN FUNCTION OF DEVELOPMENT OF THE REPUBLIC OF SERBIA

ENERGETSKI RESURSI REPUBLIKE SRBIJE- ANALIZA, STANJE I TENDENCIJE ENERGETSKOG SEKTORA U FUNKCIJI RAZVOJA REPUBLIKESRBIJE

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Abstract: *The energy resources like natural resources are the primary input energy sector. As this resource is one of the strategic resources of the Republic of Serbia and as such is the driving force of economic development is to assess the availability of necessary resources Energy use, its mode of operation and its management by the companies operating in the energy sector, and analyze the use of the same degree as its condition and prospects.*
Key words: *energy resource, analysis, status, trends, development.*

Apstrakt: *Energetski resursi kao prirodni resursi predstavljaju primarni imut energetskog sektora. Kako je ovaj resurs jedan od strateških resursa Republike Srbije i kao takav predstavlja pokretačku snagu privrednog razvoja neophodno je sagledavanje raspoloživosti energerskih resursa,načina njegove eksploatacije kao i upravljanje istim od strane preduzeca koja posluju u okviru energetskog sektora, odnosno izvršiti analizu stepena korišćenja istog, kao i njegovo stanje i perspektive.*
Ključne reči: *enegetski resursi, analiza, stanje, tendencije, razvoj.*

1. INTRODUCTION

Energy or energetics as a economy sector is based on the exploitation of energy resources as the main inputs of this sector. Regarding the general characteristics of the economic environment of Serbia, it is necessary to base on the resources that should be the main drivers of economic development. In addition to agriculture and the food industry, the energy sector is in theequal degree one of so called sectors of "the growth poles", that by the appropriate use of these resources should contribute to growth and development. In this context, the subject of this research is based on an analysis of the potential of energy resources, the level of its use, as well as their status and potential perspectives.

2. THE ROLE AND IMPORTANCE OF THE ENERGY SECTOR

Energy is one of a strategic resource of the development of economy and society in general, and steady growth in energy prices is a reality[1]. Energy has become the subject of interest, not only of energy experts, but also of a much wider circle of intellectuals [2]. According to the classification of activities, [3] all economic activities are divided into sectors, divisions, groups, and subgroups. In this sense, the energy sector include: sector B- Mining (except for the area 08-other mining and 07- mining of metal ores and branches, except for 071-Mining of metal ores, 072-exploitation of other metal ores), sector C-Manufacturing (area 19-Manufacture of coke and refined crude oil) and sector D-electricity, gas, steam and air conditioning.

Energy as a strategic industry, has a major significance in terms of research because: it is necessary to first have access to energy resources, then to use them in effective and efficient manner,keeping in mind that some of them are exhaustible, and that it requires a large investment in capacity thattakes a longer period of time to bring profit.

3. ANALYSIS OF ENERGY RESOURCES IN SERBIA

The scarcity of energy resources leads to the increasing importance of these resources for the growth of output in the national economy. In that way, for example, a combination of oil, copper and aluminum has on a completely new way created a car, jet and the global market. The energy potential of Serbia is mostly based on the coal reserves, while oil and natural gas are under-represented. Mineable coal reserves account for about 60% of the balance reserves of coal. Balance reserves of oil are very modest, but significantly higher off-balance sheet reserves are significantly higher and are characterized by predominantly good quality. It should be noted that rich oil deposits was found as late as in 1982 deposits.

Regarding the supply of natural gas, 1/3 is balance reserves and the rest are off-balance reserves and potential stock. Also, from the energetic standpoint, thermal energy and mineral springs can be a driver of development because they can be used in agriculture, for therapeutic purposes, recreation, heating and so on. Regarding quantities, Serbia does not have a significant volume of these resources, but has the advantage compared to other countries which do not have any or have it in a smaller degree, and are in almost the same position as the EU countries.

In 2010, compared with 2009, industrial production in Serbia was up by 2.5%. The volume of industrial production in 2010, compared with 2009 grew in 15 divisions with a share in the structure of industrial production of 57%, decrease in 14 divisions with a share of 43%. Observed by sections, in 2010, compared with 2009, the following trends were recorded: in the section Mining and quarrying - an increase of 5.8%; section Manufacturing – increase of 3.9% and in the section of Electricity, Gas, Steam and Air Conditioning Supply - decrease of 4.4%. Data on industrial production by MIGs, in 2010, compared with the previous year, are expressive of a growth in the production of: intermediate goods, except energy, 9.2%, durable consumer goods, by 2.9%, non-durable consumer goods, by 1.9%, while a fall was observed in capital goods, by 6.4%; and energy by 2.3%.

The biggest impact on the growth in industrial production in 2010, compared to 2009 came from: Production of basic metals, Manufacture of chemicals and chemical products, Manufacture of electrical equipment, Manufacture of fabricated metal products, except machinery and equipment and Extraction of crude petroleum and natural gas. The largest share in energy production in the Republic of Serbia in 2009 was that of the production of Coal, 45.76%. Oil and Oil Derivates participated in imports with 58.93% in 2009, and Electricity with 59.18% in exports. In 2009 within final consumption, Coal was most consumed in the industrial sector, 41.06%; Oil Derivates in transport sector, 69.29%; Electricity in household sector, 53.76%; and Natural Gas in industrial sector, 55.96%. [4]

In 2010 basic production of energy as a form that has not been subjected to processing or conversion (as shown in Figure 1) indicates that the potential energy resources coal (74% and hydro-electricity (11%) were not used in full.

Table 1. Primary Energy Production [5]

PRIMARY ENERGY PRODUCTION, 2010

TJ	%	
413572	100	Republic of Serbia
302670	74	Coal
45256	11	Hydro-electricity
38892	9	Crude Oil and Natural Gas Liquid
12188	3	Firewood (registered production)
14342	3	Natural Gas
224	0	Geothermal Energy

If you look at the period from 2007, a slight increase in power generation is observed in 2008 compared to 2007, and since 2008 we have the downward trend of production until 2010 (table 2) as measured by chain indices.

Table 2. Indices of Energetical production, 2007-2011.

	2007	2008	2009	2010	2011
Energy	101,3	101,7	98,8	97,7	106,2

If the same parameters are observed in comparison to 2005, then we can notice the downward trend in energy production since 2009. Therefore, it is important to consider the energy balance in order to reach the appropriate conclusions (table 3).

Total available energy exceeds the value of the consumptions, but the production process through the transformation and energy consumption for our own exceeds beyond the available resources and for this reason the losses occur in energy balance. The losses are mainly caused by irrational use of energy resources, inefficient production and outflow of financial assets for purposes other than investment in capacity and adequate use of this precious natural resource, from which production depends a large part of economic activities. As a result of these

developments it is inevitable to have a rise in energy prices because the demand for them is greater than the supply. However, a problem occurs in the low purchasing power of the population and the illiquidity of the Serbian economy, so our country is "forced" to make a part of this strategic resource "available" to foreign investors instead of having a guided strategy focused on building out own competitiveness and economic development by use of energy resources, especially water.

Table 3. Total Energy balance in 2011 [6]

Total Energy balance in 2011

	Укупно *Total*	Природни гас *Natural gas*	Нафта и деривати нафте *Oil and Oil products*	Хидро електрична енергија *Hidro Energy*	Укупна електрична енергија *Electricity*	Топлота *Heat*	Угаљ и производи од угља *Coal and Coal products*	Геотерма-лна енергија *Geothe-rmal Energy*	Дрвна горива[1] *Wood Fuels*[1]
	TJ	TJ	TJ	TJ	TJ	TJ	TJ	TJ	TJ
Примарна производња / Primary production	440509	18823	46535	33275	-	-	327611	268	13997
Увоз / Import	252305	64732	129426	-	24124	-	33590	-	433
Извоз / Export	40931	-	14184	-	25124	-	315	-	1308
Салдо залиха / Stock changes	7639	4954	-2301	-	-	-	5165	-	-179
Међународна складишта / Bunkers	-	-	-	-	-	-	-	-	-
Статистичка разлика / Statistical difference	-	-	-	-	-	-	-	-	-
Укупно расположива енергија / Gross inland consumption	**659522**	**88509**	**159476**	**33275**	**-1000**	**-**	**366051**	**268**	**12943**
Утрошак за производњу енергије / Transformation input	**486718**	**33516**	**122315**	**-**	**-**	**-**	**329244**	**-**	**1643**
Термоелектране / Thermal power plants	295841	-	-	-	-	-	295841	-	-
Термоелектране - топлане (TE-TO) / CHP	6077	5696	381	-	-	-	-	-	-
Енергане / Autoproducers	21465	6825	7415	-	-	-	7225	-	-
Топлане / District heating plants	28604	20995	4264	-	-	-	3255	-	90
Екстракција нафте и гаса / Oil and gas extraction	-	-	-	-	-	-	-	-	-
Рафинерије / Refineries	108276	-	108276	-	-	-	-	-	-
Петрохемија / Petrochemical refinery	1314	-	1314	-	-	-	-	-	-
Високе пећи / Blast Furnace plants	14547	-	-	-	-	-	14547	-	-
Рудници угља / Coal mines	-	-	-	-	-	-	-	-	-
Прерада угља / Coal transformation	8376	-	-	-	-	-	8376	-	-
Тињуране и реторте / Charcoal kilns and retorts	-	-	-	-	-	-	-	-	276
Произвођачи дрвних пелета / Producers of wood pellets	-	-	-	-	-	-	-	-	1095
Произвођачи дрвних брикета / Producers of wood briquettes	-	-	-	-	-	-	-	-	182
Остали / Other	665	-	665	-	-	-	-	-	-
Производња енергије трансформацијом Transformation output	**276332**	**-**	**107956**	**-**	**105685**	**41440**	**19768**	**-**	**1483**
Хидроелектране / Hydro power plants	-	-	-	-	-	-	-	-	-
Термоелектране / Thermal power plants	105289	-	-	-	103219	2070	-	-	-
Термоелектране - топлане (TE-TO) / CHP	3184	-	-	-	1638	1546	-	-	-
Енергане / Autoproducers	15397	-	-	-	828	14569	-	-	-
Топлане / District heating plants	23255	-	-	-	-	23255	-	-	-
Екстракција нафте и гаса / Oil and gas extraction	-	-	-	-	-	-	-	-	-
Рафинерије / Refineries	105532	-	105532	-	-	-	-	-	-
Петрохемија / Petrochemical refinery	1755	-	1755	-	-	-	-	-	-
Високе пећи / Blast Furnace plants	9779	-	-	-	-	-	9779	-	-
Рудници угља / Coal mines	-	-	-	-	-	-	-	-	-
Прерада угља / Coal transformation	9989	-	-	-	-	-	9989	-	-
Тињуране и реторте / Charcoal kilns and retorts	-	-	-	-	-	-	-	-	245
Произвођачи дрвних пелета / Producers of wood pellets	-	-	-	-	-	-	-	-	1057
Произвођачи дрвних брикета / Producers of wood briquettes	-	-	-	-	-	-	-	-	181
Остали / Other	669	-	669	-	-	-	-	-	-
Размена / Exchanges and transfers, returns	**-**	**-**	**-**	**-33275**	**33275**	**-**	**-**	**-**	**-**
Размењени производи / Products transferred	-	-	-	-33275	33275	-	-	-	-
Интерна размена производа /I nterproduct transfers	-	-	-	-	-	-	-	-	-
Враћено из петрохемије / Returns from petrochemical ind.	-	-	-	-	-	-	-	-	-
Сопствена потрошња у енергетском сектору Consumption in the energy sector	**24204**	**2009**	**5073**	**-**	**16154**	**968**	**-**	**-**	**-**
Хидроелектране / Hydro power plants	220	-	-	-	220	-	-	-	-
Пумпање / Pump storage	3096	-	-	-	3096	-	-	-	-
Термоелектране / Thermal power plants	10911	-	1302	-	9598	11	-	-	-
Термоелектране - топлане (TE-TO) / CHP	233	-	-	-	216	17	-	-	-
Енергане / Autoproducers	72	-	-	-	72	-	-	-	-
Топлане / District heating plants	1638	-	-	-	698	940	-	-	-
Екстракција нафте и гаса / Oil and gas extraction	1712	1712	-	-	-	-	-	-	-
Рафинерије / Refineries	4597	297	3771	-	529	-	-	-	-
Петрохемија / Petrochemical refinery	-	-	-	-	-	-	-	-	-
Високе пећи / Blast Furnace plants	-	-	-	-	-	-	-	-	-
Рудници угља / Coal mines	814	-	-	-	814	-	-	-	-
Прерада угља / Coal transformation	911	-	-	-	911	-	-	-	-
Тињуране и реторте / Charcoal kilns and retorts	-	-	-	-	-	-	-	-	-
Произвођачи дрвних пелета / Producers of wood pellets	-	-	-	-	-	-	-	-	-
Произвођачи дрвних брикета / Producers of wood briquettes	-	-	-	-	-	-	-	-	-
Остали / Other	-	-	-	-	-	-	-	-	-
Губици / Losses	**27758**	**213**	**804**	**-**	**21038**	**3464**	**2233**	**3**	**3**
Енергија расположива за финалну потрошњу Energy available for final consumption	**397968**	**52771**	**140034**	**-**	**100768**	**37008**	**54342**	**265**	**12780**
Финална потрошња / Final consumption	**397968**	**52771**	**140034**	**-**	**100768**	**37008**	**54342**	**265**	**12780**
Финална потрошња за неенергетске сврхе Final Non-Energy consumption	**34888**	**10503**	**23263**	**-**	**-**	**-**	**1122**	**-**	**-**
од тога за хемијску индустрију of wich: Chemical industry	26611	10503	16108	-	-	-	0	-	-
Финална потрошња за енергетске сврхе Final Energy consumption	**363080**	**42268**	**116771**	**-**	**100768**	**37008**	**53220**	**265**	**12780**
Индустрија[2] / Industry[2]	113769	27142	18830	-	25729	15656	20938	-	5474
Грађевинарство / Construction	2381	-	1141	-	1174	-	47	-	19
Саобраћај[3] / Transport [3]	86236	521	83804	-	1904	-	0	-	7
Домаћинства / Households	106553	9877	2943	-	52794	17987	16243	-	6709
Пољопривреда / Agriculture	4911	646	2844	-	1156	-	20	151	94
Остали потрошачи / Other users	49230	4082	7209	-	18011	3365	15972	114	477

Thus, the resources are exploited by the other countries.The prices will rise and the social aspect will be totally neglected and the income earned will drain abroad. In this sense, our country is a cheap source of raw materials, both from the aspect of energy resources and in terms of manpower. Thus, it is not possible to expect growth of national income. It is necessary to improve energy efficiency and energy savings, but also to increase research and use of renewable energy sources, which would alleviate the energy dependence and the need for imported oil and gas. [7]

4. CONCLUSION

Energy as a strategic industry, has a major significance in terms of research because: it is necessary to first have access to energy resources, then to use them in effective and efficient manner,keeping in mind that some of them are exhaustible, and that it requires a large investment in capacity thattakes a longer period of time to bring profit.

Serbia has energy resources, but not to the extent to meet the total needs. Another significant problem is reflected in the off-balance and potential energy sources that are not used. Special dormancy is clearly observed in water resources. Energy resources that are in use are used in an inefficient and uneconomic way, witch long-term use has led to an inability to build capacity in this area. As a result, there is exploitation of these scarce, but strategic resources from other countries (example building of mini-power plant) which is not a significant determinant of growth and development of the Republic of Serbia.

Since the financial resources and investment opportunities in Serbia have long been exhausted, there is no other option then to get in the hands of "foreign investors" and to be a cheap raw material base for other countries.

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GEOTHERMAL RESOURCES OF SERBIA AS A COMPARATIVE ADVANTAGE

GEOTERMALNI RESURSI SRBIJE KAO KOMPARATIVNA PREDNOST

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Abstract: *The economic attractiveness of the geothermal energy as a major geothermal resource can be an important factor of economic growth, not only in tourism and balneology, but also in the agriculture, aquaculture, and industry. Besides in balneology and partly in tourism, expected results have not been achieved. What could have been done differently and what can be done for future prospects to be improved? Despite significant potentials, intensive development and positive results of using geothermal resources worldwide, and the present economic recession, only a small part of such natural treasure has been affected, with no attention paid to direct applications of geothermal energy that could directly contribute to the economic growth and recovery of our economy.*
Keywords: *geothermal resources, comparative advantage, economic growth.*

Apstrakt: *Ekonomska privlačnost geotermalne energije kao glavnog geotermalnog resursa može da predstavlja značajnu osnovu za privredni rast ne samo u turizmu i balneologiji, već i u agro i akvakulturi, ali i u industriji. Osim balneologije i delom turizma, to se do sada nije ostvarilo u očekivanoj meri. Šta je moglo drugačije da se uradi i šta može da se učini da bi se popravili izgledi za budućnost? Uprkos značajnim potencijalima i intezivnom razvoju i pozitivnim rezultatima korišćenja geotermalnih resursa u svetu, i ekonomskoj recesiji, zahvaćen je samo mali deo tog prirodnog blaga, pri čemu se ne posvećuje pažnja neposrednim primenama geotermalne energije koje bi mogle direktno da doprinesu privrednom rastu, odnosno oporavku naše privrede.*
Ključne reči: *geotermalni resursi, komparativna prednost, privredni rast.*

1. INTRODUCTION

The economic attractiveness of geothermal energy as a major geothermal resource may represent a significant basis for economic growth, not only in tourism and balneology, but also in agro and aquaculture, as well as in industry. Besides balneology and a part of tourism, it has not achieved the expected extent. What might otherwise be done and what can be done to improve prospects for the future? China is now investing huge money in green technology and is slowly becoming a leader when it comes to the use of solar energy and wind. In Germany, which is also a leader when it comes to clean energy, have beenopened over three hundred thousand jobs due to the trend of green economy and the use of sustainable energy sources, and our country, although rich in thermal mineral springs, is not using sufficiently this comparative advantage. Thermal mineral springs of Serbia provide economic benefits through comparative advantages of renewable energy sources and environmental benefits due to the reduction of global warming, since the Earth's climate is changing, and global warming is not happening by itself, but is a result of anthropogenic influences.

Thermal mineral spas have evolved around natural thermal mineral water sources. This and other forms of geothermal energy are an important national wealth, especially for replacing a part and even the whole of conventional energy (coal, oil, gas). Projects with direct use of

these energy require higher initial investment, with lower operating costs later, however, the economic benefits depend of the location of the users and the resources, the efficiency of utilization of heat, the annual burden of exploitation of these resources, as well as financing costs, amortization period and inflation rate.This system has a long durability, which is beneficial to their economic viability and economics of geothermal mineral water utilization depends on timely application, the beginning of the exploitation of resources, so the total exploitationlosses are minimized.Despite the significant potential, intensive development and the positive results of using geothermal resources in the world and the economic recession, it is used only a small part of this natural wealth, with no attention paid to the direct application of geothermal energy that could directly contribute to economic growth and recovery of our economy.

2. GEOTHERMAL RESOURCES OF SERBIA AND A NEW APPROACH OF MANAGEMENT

New approach of management and marketing shows that the effect of business is primarily influenced by the resource profile of the organization, while the core of superior performances lies in possessing and using different and difficult imitative or patented resources. Observation of the economy and companies (organizations) based on resources or through a focus on core competencies - comparative advantages, with this new approach shows that the effect was primarily influenced by resource profile of the organization and the economy in general, while the core of superior performance lies in the possession and use of different and difficult imitative or protected resources, but also in the need to be selective in the choice of markets to serve, so that these should be markets in which the resources (assets and capabilities) give organization a chance to be leader. Marketing based on the resources essentially seeks to align the long-term market requirements and the organization's ability to meet them. This does not mean that the organization's resources are considered as a fixed and static, far from it. The market requirements develop over time, and the resource profile of the organization must be constantly improved to provide the company with permanent compete and eventually seizing new opportunities. It is essential to take advantage of opportunities when the organization has an existing or potential advantage through its resources, not only to be 'pushed' ad hoc.

Interest in the thermal mineral water has existed since the first of human encounters with them and can be said that this interest did not cease until the present day. Even at the first contact with them, the human understood the friendly role of thermal mineral water, since they usefully served the humankind from the beginning until nowadays. For these reasons, it is completely reasonable that not only doctors, but also geologists, chemists, tourist experts and economists have been interested for their use, and recently even more, because of the possibility of using thermal energy, these waters are subject of interest tomany others like energy experts, technologists, agronomists etc.,so this great wealth of Serbiacould be used as much as possible wherever natural conditions, scientific and economic justification permit such a use.

Economic strength of any country always lies in the inserts of its citizensand in the natural wealth (resources) which poses, not all, but only the ones who has enough in an era that makes it valuable. The epoch which we are entering, makes the thermal mineral water salvific

valuable because the previous one made all other resources worthless and with them could be settled many things that are lost pompously.The one who has a lot of mineral water in the incoming epoch will be respected and the one who knows how to use everything that could be used will have wealth. In Serbia, we have many of these waters, in the greater amount than we need, others have less than we do but they knew better, and we can be even better of them, if we have the will for it. On the territory of Serbia, in about 60 major regionsthere are about 250 locations with over 1,300 natural and artificial sources of mineral waters, conveniently located on over 60% of the national territory (temperature 16-80 °C, and some even more than 100 °C). It is estimatedthat the water flow out from all existing sources, visible and invisible, is between 5 and 10m^3 per second of water, almost an entire Moravariver.

The use of thermal mineral waters has begun spontaneously with the first humans. Thermal mineral water in our country is used in only three sectors: in balneology, for bottling and symbolically for heating. We are known as a country of spas, there are thirty nominated, and only a few of them represented in the modern sense, others are just named so.It was supposed to be an axis of economic development and tourism in Serbia, but for decades, there is no significant movement. Agricultural production, especially in the environmentally protected area of the spa, heating and other purposes, require a large expenditure of energy. The high price of energy originating from fossil fuels considerably raise the costs of the production, and environmentally is multiple harmful, therefore geothermal water could have significant application in high intensive production of healthy (organic) food, also for heating greenhouses and livestock farms, and other needs (air conditioning - heating and cooling facilities, etc.).

Benefits that are obtained by using geothermal resources are multiple and numerous, and can be divided into three main groups: the socio-economic, environmental and technical and technological. Geothermal energy is a national, autonomous and independent energy. Its exploitation and utilization is independent of the international political, economic, war and other crises. Exploitation and utilization of geothermal energy does not depend on imports. Its use does not create the conditions for political and financial blackmail or conditioning by the historical enemies of the world, as it is the case with oil imports. The use of this power is not influenced by the weather conditions,or floods, earthquakes, drought and storms, andits accumulation cannot be destroyed.

Thermal mineral water can be used also, besides the use for air conditioning and growing all manner of plants, to make an impressive illusion of exotic beauty and virginal purity promised paradise from prosaic places, even the greatest stylists of beauty and environmental aesthetes cannot resist, and therefore, with all that pleasures, the tourists will have the largest selection of elixirs of extended youth and promising longevity. From some rarer and more interesting tame places, using of the thermal water and heat pumps could make a wonderful oasis of exciting experiences of photo safari without the risk of suspicious Africa, Asia, distant or dangerous Amazon. Some of its parts (Obetske ponds) can be transformed into a farm of crocodile, Amazon giant snakes and various monsters for viewing and photography, all of which except horror, lavish and expensive objects can be obtained. As far as is known, such a unique oasis in Europe would not be, even in such a nice, gentle and accessible place.

The possibility of using geothermal resources are numerous: agriculture, aquaculture, heating and district heating, heat for industrial purposes, drying grain and other plant fruits and industrial products, greenhouse, recreation and sports, spas, etc. With further expanding and increasing the utilization of geothermal energy Serbia will become less dependent on imports of other types of energy. A new state or national energy strategy (NES) is needed, made in the form of operating and dynamic document which is open to new insights and new ideas, as well as for global, continental, regional and local changes in the environment. Elaboration of new NES should be made in a such a way that represents a significant shift from the previous strategy, whose weaknesses and failures are reflected in the full light right now. New NES should not be just an energy plan, as well as all previous strategies were. It must be a comprehensive *linking of the both environmental policy and economic policy with the energy policy.*

The territory of Serbia is especially specific and suitable for the use of geothermal energy, and not just because of the amount of heat that can be drawn from ground, but also because the heat is usually located at shallow depths (which is technically and therefore economically available and convenient), and the fact that the conditions and possibilities of its use are evenly spaced on practically the entire surface of Serbia. Geothermal fluids can be transported in thermally insulated pipelines at great distances, even up to 60 km (distance between sites, or geothermal sources and places of use should be as less possible).

Technical and technological benefits of geothermal energy are reflected in its technological rationality and high reliability of exploitation and use, the equipment can be easily and quickly overwhelmed, easily incorporated into new and existing systems and it can easily be stored and accumulated till complete exploitation. Evaluation of reserves in the sites is faster, easier and cheaper than the evaluation and assessment of oil reserves and solid raw material, and its exploitation can begin even before the completion of evaluation of the entire site. The thermal mineral water, as an environmentally resource, can be valorized on the basis of cost evaluation, the relationship between profits and investment, and on the basis of environmental costs - economic effects, and their use must not be outside of the economic and environmental systems. The calculation shows that even those small and of lowest quality sources can bring economic benefits, because they can be exploited complexly at the regional and local level.

3. ECONOMIC ASPECTS OF USE OF GEOTHERMAL RESOURCES

Energy is fundamental for economic systems and life in general. Our equally critical need for energy is partly camouflaged with the modern economy. Measured in the values of the gross domestic product, energy resources represent only about 5 percent of economic output. However, the other 95 percent of the output is absolutely dependent on the input of energy. As the economies develop and become more complex, the need for energy is greatly increased. Historically, as the supplies of firewood and other biomass became insufficient to support the growing economy, people have turned to the use of hydro power, then coal, and finally oil and natural gas as the main sources of the power.In the past 50 years people have begun to use the nuclear energy. From the standpoint of economic analysis, the most important factor that is affecting the power consumption is its market price. Today there are two types of problems related to the use of energy. The first is the depletion of limited supplies of energy resources,

and the other is inevitably creation of waste and pollution from energy use. Energy reserves have a special importance because energy is essential for the extraction of other resources too.

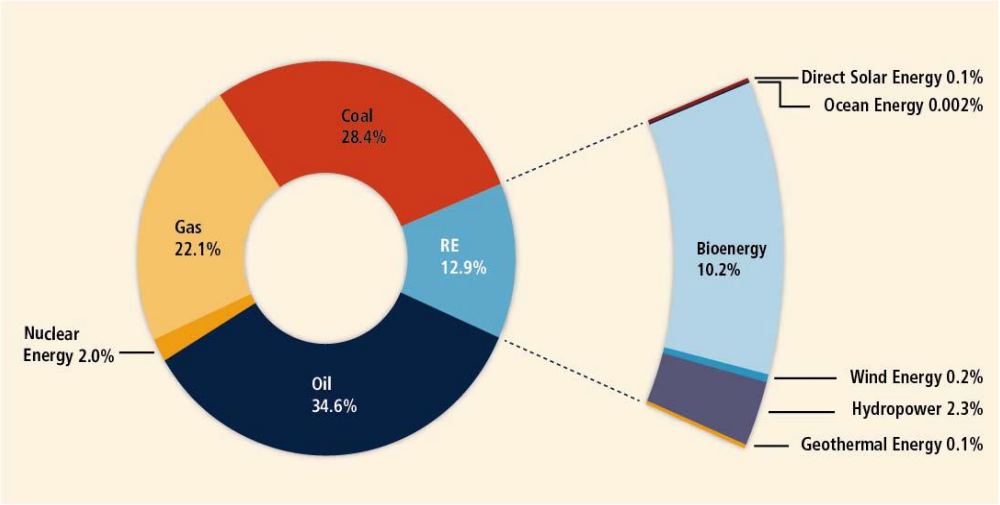

Figure1. Representation of energy sources in global dimensions [7, p. 4]

In the structure of energy consumption in Serbia, low temperature heat consumption represents about 30-35%, and is covered by coal, wood, electricity, oil and gas. Coal is environmentally harmful, wood and electricity is a pity to be wasted for heating, and we do not have own sources of oil and gas. Serbia could cover about 25-30% of the total heat consumption from the geothermal sources.Thermal energy received from geothermal water at temperatures up to 40 °C is 20% cheaper than the thermal energy received from other sources, with a temperature of 60°C is cheaper by 55%, and with a temperature over 80 °C is cheaper to 90-95%, but used in the most primitive way, without heat pumps! Thermal mineral water with the use of the heat pumps could have a huge application in the industry too, particularly in the chemical, cosmetic, dental, brewing, confectionery etc. because they cheapen the production, substitute the substance which is dependent on import or provide a higher quality product (value gained by reducing costs and saving energy and other natural resources, especially through the environmental pollution component directly or by changing climatic factors indirectly), or because they solve all in the same time.

The efficiency of using thermal mineral water can be increased to a great extent with the use of heat pumps, sort of sophisticated technical devices used to redirect the heat energy from underground natural sources. Energy utilization by a heat pump system is several times higher than the mechanical working energy at the entrance. The working principle of the heat pump is similar to the working mode in the fridge - but in the opposite direction through the heat exchanger. Economic benefits and technical characteristics of the implementation of heat pumps in spas are detailed in the paper, through the case studies of two spas of Serbia (Mataruška spa near Kraljevo and Bukovacka Spa in Arandjelovac) [1, p. 1127]. This system has a long lifespan, which is useful for their economic profitability. The economy of utilization of geothermal mineral water depends on the timely implementation and the total losses should be minimized, which can be expressed as follows:

$$W = e^{-rt} [W(id) - W(t)]dt, \text{ [2, p. 137]}$$

where W is the ideal state for thermal mineral water sources with minimal integral loss, W (id) - the ideal level of meeting the needs for this resource in a state of stable social and economic development, W (t) - constant level of meeting the needs for this resource in all periods of time and r - discounted rate at time t.

Above the geothermal water, heat pump can use the heat from the land, at a depth of several meters and even deeper, where the temperature is constant between 11°C and 12°C during the whole year. By using these underground sources, heat pumps separate the energy from the soil and the groundwater with very high level of efficiency, while also achieving a significant reduction of CO_2 emissions in the air. In any way, the heat pump does not produce energy, but it is only transferred, "released" and redirected to the consumer. A heat pump can help to achieve significant fuel savings (costs) as compared to direct electric heating systems (e.g. storage of fuels), gas boilers, oil boilers, and some renewable energy systems, such as biomass because they require no storage space for fuel. Heat pumps are an environmentally friendly alternative to oil and gas. Thus, the heat pump provides more than 2/3 of the energy needs from the free (natural) energy stored in the earth and reduces the heating costs by more than 60%.

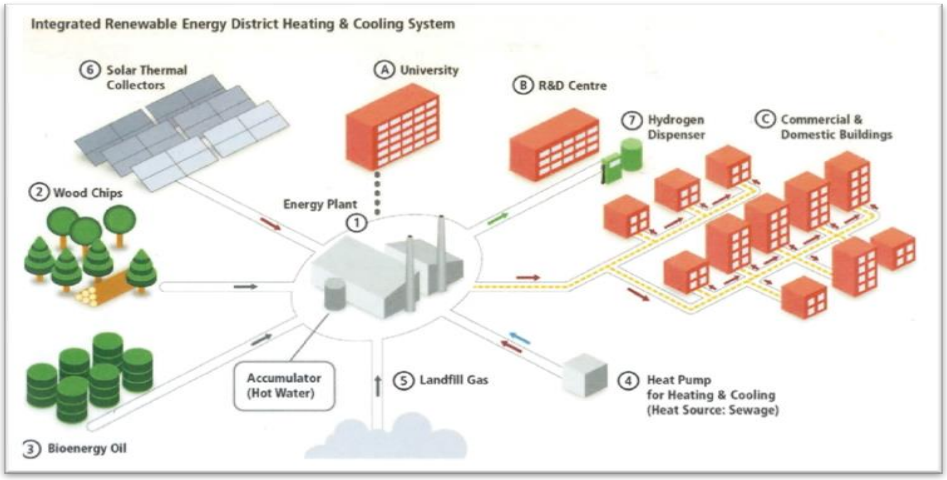

Figure 2. An integrated RE-based energy plant in Lillestrøm, Norway, supplying commercial and domestic buildings [7, p. 15]

Geothermal energy is a national resource that contributes to our energy security and reduces our trade deficit, replacing imported fuels. Using geothermal energy saves foreign funds, because it reduces the amount of expensive imported oil and gas. At the same time, this valuable energy fuels from domestic sites are released for use in the chemical industry, because they are an important raw material in this economy branch. Heat equivalent of geothermal energy from the land given by the thermal water of natural hot springs per year (which is spread out in the atmosphere-air) is about 100,000 tons of oil.Using of geothermal energy save dinar funds also, because the geothermal heating plants are cheaper than the heating plants in which the heat is obtained by burning oil, coal or gas, and because it is cheaper than using other sources of energy. In other words, the unit cost of heat and electricity derived from the geothermal energy is always lower than the unit cost of heat and electricity produced from other fossil fuels energy and they are very stable, practically immutable over time, because they do not depend on foreign and domestic unfavorable impacts, primarily because it is a highly autonomous energy.

Exploitation of geothermal energy costs are very low, and they are the lowest compared to the same in other energy fuels. This is because the operating costs are low, because the thermal equivalent per unit of energy is much lower than the amount of thermal energy exhausted or heat per unit of time. Geothermal sites have a long exploitation period and are much longer than the fossil energy fuels sites. Geothermal energy is renewable and has no tailingsduring the exploitation.

Geothermal energy is characterized by high efficiency in terms of the amount of initial investment, plant maintenance and operating costs, the lifespan of the site and strong profitability (high tech economy - no hidden costs). Hidden costs in the exploitation of fossil energy sources are not very well known, cannot be predicted, nor expressed, because they come mostly because of unfavorable impacts on the environment (nuclear power plant disaster, rehabilitation of surface mining, reclamation of tailings - ash pan, sludge filled accumulation, relocation of villages, cultural property, roads, deforestation, destruction of arable land, climate change, etc. The latest economic demand, as a condition of high competence, the use of energy has become a matter of prestige in conditions of quality life at home and on the world market and it is becoming a key postulate of national economic systems [3, p. 74].

Environmental benefit lies in the fact that geothermal energy is practically harmless to human and animal health, its ecological value is in its easy to control labels and high equifinal coefficient, it is used directly (immediately), which is not the case with fossil fuel. It sets us free from pollutants, because the energy is clean and ready for use – there is no conversion (with the combustion as it is case with the coal, there are harmful wastes), creates no carbon dioxide, also does not cause climate change and the greenhouse effect, neither acid rain – resulting in a fall of the food production, damage to human health, dying forests, destruction of biodiversity, etc. Because of this, ecologically pure energy like geothermal is, must have a growing role in the replacement of fossil fuels, because it is in line with nature. It will be reasonable to say that the Serbian thermal mineral water are promising environmental resource, and therefore a strategic condition of development of more economy branches, which combines within the effect of economic and non-economic factors.

Starting with the real possibility of using these materials in Serbia (the further studies will confirm to what extent it is profitably), bearing in mind the general energy situation and especially the need of protection of human environment, it is necessary for the research and utilization of thermo-mineral, mineral and gas water, as well as geothermal power, to include in the appropriate flows of social planning and construction in the Republic, such as the green plan, energy development plan, utility plan, a plan for the protection of human environment, etc. Because of the low cost and environmental benefits, the use of geothermal resources is the most economically attractive for industrial drying processes, central heating systems, and also agro and aquaculture production.

Exploitation and utilization of geothermal energy should not be hindered by the companies engaged in the production of energy from fossil sources (coal, oil, gas), and according to this the state support to the development of geothermal energy is expected. Reliance on a strategy for Serbia's energy future, based on the combustion of domestic low energy coal and

increasing imports of oil and gas without taking into account the possible environmental problems and constraints, could distract the attention from other development strategies that are based more on a market principles, human resources and ingenuity, and less on the economic attractiveness of domestic resources. Today the situation is different, much more is known about the technical aspects of geothermal resources in general, and also the ways to overcome all technical issues related to the exploitation of geothermal fluids and their geothermal energy are found. Therefore, today the technical risks are much smaller, and the conditions are prepared for the investors to deal with the basic question of marketing and commercial operations, since there has been a rapid progress in business management and marketing.

Geothermal resources in Serbia could play an important role in increasing the supply with the profitable energy that is acceptable from the standpoint of environmental conservation, as well as to help the utilities for their integrated resource planning by enabling them to provide an effective means to manage demand and to reduce the need, or geothermal direct use. Utilization of geothermal resources has a bright future in our country. The first assessment of potentiality of geothermal energy resources were made, which aim of making them was to point to the whole perspective and social interest in geothermal energy, that means, they are the basis for determining the long-term economic policies and strategies of the economy for the use of this energy, and they show that according to the intensive program of geothermal exploration and exploitation until the 2015., could be reached the replacement of at least 500,000 tones of imported liquid fuels annually. If properly exploited geothermal energy can play an important role in energy balance. Low to medium temperature of geothermal resources can solve many local problems and to raise the standard.

4. CONCLUSION

Utilization of geothermal resources in Serbia must be an important basis for economic development. In the present socio-economic conditions, in our opinion, for evaluating the criteria of the success of the venture in a broad range of technical possibilities of using geothermal resources, the more important is the understanding of the mutual action of the elements of economic processes than correctly forecasting the economics of geothermal energy as a resource, or the understanding of the technology used in certain industrial processes. Social, technological and economic advantages or benefits of their use are still significant in comparison with other energy sources, and can do even much more to get on the value, if concern for the increase in CO_2 in the atmosphere leads to economic measures that would discourage the use of fossil fuels. However, this will depend more on our business efficiency, than our competence in other areas, including good marketing, than of geothermal technology itself.

Geothermal energy in Serbia can play an important role both in increasing the supply of cost-effective energy, which is acceptable from the standpoint of environmental protection, as well as assisting the utilities in their integrated resource planning by providing them with an efficient means of consumption management and to reduce the need, which is geothermal direct use. To achieve this, the geothermal energy must be included in the primary energy resources, that means it must be given equal status with coal, oil, hydro power and other fossil

energy sources, it must not continue to hamper. The exploitation and utilization of geothermal energy has to become imperative because it is the most valuable natural energy for the use of which does not require any conversion.

Geothermal energy does not increase the natural greenhouse effect and does not cause climate change, does not destroy the ozone layer and does not lead to the occurrence of acid rain. All these highly harmful effects to the environment of which will significantly depend the survival of the human species, are caused by waste originating from increasing combustion of fossil fuels (CO_2, SO_2, CH_4, NO_2). For this reason geothermal resources should be explored and used in ever greater extent, because it is proven that the direct use of geothermal heat can be an economical and commercial. This application will require strong cooperation between the government and the private sector in the implementation of certain projects.

Geothermal energy can be successfully used in spas to adjust the temperature of the balneotherapy and physiotherapy purposes and to heat nearby buildings using heat pumps. This is the proven energy efficient and economically viable solution and can be used instead of two-thirds or more of the conventional thermal energy. Before making decisions on the exploitation of geothermal resources and before making decisions on the type of their use must be taken into consideration the following facts: the total cost of geothermal heating plants are higher than similar to conventional fuels, but the cost of energy produced in geothermal power stations are smaller than the energy obtained from conventional fuels and the high investments in the construction are rapidly returned by energy cost savings.

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SUSTAINABLE EXPLOITATION OF NICKEL IN SERBIA

ODRŽIVOST EKSPLOATACIJE NIKLA U SRBIJI

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***Abstract**: The research on sustainable exploitation of nickel indicates that there is a particularly dangerous replacement of thesis in the analysis of the key problems arising from the systemic approach in studying these issues. Sustainability-generational justice, does not include the continuation of activities and, if it is proven that the future technology of exploitation and processing of nickel ore is secure, is not in compliance with environmental standards IPPC, BREF and other directives relating to the environment. Geological studies of nickel ore should be continued and its exploitation should be discussed only after determining the total value chain, with the participation of experts of all stakeholders and using business paradigm of social corporate responsibility. For known reasons potentials of Kosovo and Metohija are not included in this study, but the experience of the former known production in Glogovac and Kavadarci is analyzed.*
***Keywords:** sustainability, nikl ore, stakeholders, exploitation, processing, social corporate responsibility*

***Apstrakt:**Istraživanja održivosti eksploatacije nikla upućuju da je ovde naročito opasna zamena teza u analizi suštinskih problema koji proizilaze iz sistemskog pristupa pročavanja navedene problematike.Održivost-generacijska pravda, ne podrazumeva nastavak aktivnosti čak i ako se dokaže da je buduća tehnologija eksploatacije i prerade rude nikla bezbedna - usklađena sa ekološkim standardima IPPC; BREF i ostalim direktivama vezanim za životnu sredinu.Geološka istraživanja niklonosne rude, treba nastaviti tek nakon utvrđivanja ukupnog lanca vrednosti uz učešće stručnjaka svih zainteresovanih učesnika i koristeći poslovnu paradigmu društveno korporativne odgovornosti, onda možemo diskutovati o njegovoj eksploataciji. Iz poznatih razloga potencijale Kosova i Metohije nismo uključili u ova istraživanja.*
***Ključne reči:** održivost, ruda nikla, stejkholderi, eksploatacija, obrada, društvena korporativna odgovornost*

1. INTRODUCTION

Discussion on the issue of nickel in Serbia is revived again. It contains a good side, but much more arbitrary, haste and confusion. Thus, the involvement of all stakeholders: the general public, especially the scientists and experts, regional and local authorities, is need. This is the only way that can contribute to better solutions related to the overall problem of nickel.

Consideration of sustainable management process of nickel exploitation [1] is possible only after a study of the current situation in this field in the world and in our country. Among the important factors that need to be considered simultaneously are the deposits of nickel, their capacity, composition of ores, the process of nickel extraction, the area of use, the prices of nickel, environmental analysis including overall risk analysis.

2. BASIC DATA

Some of the general data on Ni at the end of XX and at the beginning of XXI century will be listed for the purpose of informing. Total reserves of nickel are found in sulphide ores 15%, and oxide (literitic) ores 85%. Volume of nickel production from sulphide ores is 60%, and 40% from oxide ores. 75% of total nickel produced is obtained by pyrometallurgical

processes, and 25% by using hydrometallurgical processes. Regions that have had the largest reserves of nickel are: New Caledonia 15-18%, Cuba 16-18%, USSR 14% and Canada 10-12%. Total projected metallurgical capacities in the world was 1 250 000 tonnes, of which 66.6% metallic nickel, ferronickel 23.7%, NiO 8.7%, other 1%. The designed capacities for obtaining nickel from oxide ores in the world were 576 350 tonnes of nickel, and the structure of production was 52% in the form of ferro-nickel, 24.3% nickel plaque 21.4 hydrometallurgical nickel, other 2.7%. Utilization areas of nickel obtained from oxide ores were: stainless steel 53%, other alloyed steels 12%, non-ferrous metal alloys 22%, nickel plating 8%, other 5% [2].

According to data published by the World Metal Statistics which relate to the former Yugoslavia, based on of mining production during the 90-ies, we were the 5th among 8 countries in Europe and the last among 19 countries in the world. In the same period we were the 7th of 9 countries in Europe and the 21th from 22 countries in the world for the production of Ni metal [3].

3. WORLD AND KNOWN NATIONAL DATA ON NICKEL PRODUCTION

Research is specifically focused on smelters - capacity for nickel extraction from oxide ores in the world and in our country. Only this type of production is considered in the paper due to the fact that there are no nickel sulfide ores in our area and in the Balkans.

The general picture in the world in this matter is as follows: about 15 ferronickel smelter in the world (Colombia, Brazil, etc.) is smelting rich nickel oxide ore (3.8 - 1.6% Ni), and there are ten smelters of poor nickel ore (1.35 to 1.0% Ni), for example Greece, Glogovac, Kavadarci, Pobužka and Mokra Gora. Smelter often do not achieve the projected capacity and some were closed down due to low Ni content.

Depending on the nickel content in the ore, the amount of nickel in ferronickel that would be obtained from one tonne of ore, as well as the quantity of ore for extraction one ton of nickel in ferronickel can be approximately calculated.

Table 1. Ni content in the ore and the amount of metal

Ores	Colombia	Brazil	Greece	Glogovac	Kavadarci	Pobužka	Mokra Gora
% Ni	3.2	1.58	1.2-1.3	1.25-1.3	1.03	0.94	0.6-0.62
kg Ni / t of ores	31.2	15.5	11.7	11.9	9.5	7.8	5.5
t of oresfor 1 t of Ni	32.2	64.5	85.0	84.0	105.0	128.0	181.0

Source: [2]

The data show that the ore Mokra Gora is the poorest in nickel content. Only 5.5 kg of nickel would be extracted from one ton of ore, whose volume would be about 0.65 liters of nickel, with respect to the specific gravity, and extraction of one ton of nickel in ferronickel would require the smeling of about 181 tons of ore. Practice has shown that all of the circumstances

should be examined before deciding to build poor nickel oxide ore smelter. The same is true for other nickel extraction methods.

The region of Serbia is also solidly analyzed [4]. Mines Veluća (Vrnjačka Banja, Trstenik), is estimated to be a very important source of nickel ore in Serbia, which has 30 million tons of ore with 1.15% nickel, 0.05% cobalt and 40% iron, platinum is also detected. Estimated reserves of nickel deposits in Ba village near Ljig are around 1.5 million tonnes with 1.5% of nickel, and some assumptions are 3 million tons.

Resources/appearance ofnickel have also been detectedin the ore field of Fruška Gora. Significant research works on a natural alloy of iron ore with nickel, chromium and cobalt were conducted on Mokra Gora. It was found that 250 million of ore is presenton the Serbian territory, with an average of 0.7% nickel, 2-4% chromium trioxide, cobalt and about 30% iron.

In the area of Lipovac Kolarići near Topola, where also certain investigations on naturally-alloyed iron ore with nickel, chromium, and cobalt were performed, the contents of 1.3% nickel, 0.01% cobalt, 4.2% chromium trioxide and 44% iron were found.

Due to the known reasons, potentials of Kosovo and Metohija are not included in this study.

4. RESEARCH RESULTS, KNOWN FACTS

The analyzed results relating to all aspects of sustainable chain of the nickel exploitation value: geological exploration, mining and metallurgical production, economics, energy, nickel prices, energy consumption, environmental protection, etc.

4.1. Consumption and production of nickel in the world

The vast consumption of nickel became particularly pronounced in the fifties. The consumption of nickel rose from 140.000t/year in that period to 1.200.000t/year in 2003rd. In the fifties, laterite took a part of about 10% and its production rose to 51 % to 2012th [5]. The rising trend of consumption in the beginning of this century is even more pronounced. In 2001st, 1.104 million tons is spent and for 10 years this number rose to 1.572 million tons [6]. In relative terms, that is the annualized rate of 4.2%. Considering regions, Asia is the largest consumer with a share of 65%, where onlyChina consumes 44%. China has the trend of consumption growth of 8% per year.

World production of nickel followed the needs of the market and according to that, in 2007th, the world production reached 1.416 million tons. The global crisis in 2008th and 2009th broke in the production to 1.32 million tons. Production rebounded sharply in 2010th from 1.446 million tons and it reached 1.589 million tons of metal in 2011th, where the annual growth of 3.7% was achievedin that period. The forecast is that the annual growth of 160.000t will be on the order of about 250.000 t in the next 10 years [7]. New facilities, for example: Barro Alto and Onca Puma in Brazil, have a combined capacity of 100.000 t/year. Also, project implementations: Ambatovy in Madagascar, with a capacity of 60.000 tons, Taguang Taung –

Myanmar and facilities in New Caledonia are in progress. Based on known projects in the world that are in different stages of the assessment,at the present time a total capacity of 346.000 t/year is estimated, of which 80% are hydrometallurgical processes [5].

4.2. Domestic market

Considering current circumstances and situation, where metal industry is mostly present,it is not difficult to conclude to what extent nickel traffic is present. Due to the termination of the "Feronikal" and the separation of Kosovo from Serbia, there is no production, so consumption is reduced to a minimum and mainly to the needs of small businesses. Based on data of Serbian Chamber of Commerce, the import and export of nickel and raw materials or products made of it are presentedin the tables 2 and 3.

Table 2. Import of nickel and nickel products

No.	Product	Quantity, t		
		2011^{th} year	2012^{th} year	2013^{th} year
1.	Raw unalloyed nickel	210	180	21
2.	Nickel powders and flakes	-	7	-
3.	Nickel rods and wires	268	43	9
4.	Plates, sheets, strips and foils	2	9	3
5.	Other nickel-based products	11	5	-

Source: Serbian Chamber of Commerce - Center for Informatics and Electronic Management

Table 3. Export of nickel and nickel products

No.	Product	Quantity, t		
		2011^{th} year	2012^{th} year	2013^{th} year
1.	Oxides sintered from nickel	-	19	12
2.	Raw unalloyed nickel	5	5	1
3.	Waste and scrap of nickel alloys	42	10	7
4.	Wires of Ni-alloys	22	74,2	-
5.	Other nickel-based products	2	3	-

Source: Serbian Chamber of Commerce - Center for Informatics and Electronic Management

The above data clearly show that domestic sales of nickel are minor on a world scale.

4.2.1. Existing local experience - the analysis of the past of "Feronikal"

Fate of “Feronikal” is known and the main causes of this situation are [9]:

1. Insufficient adjustment of designed technology for available raw material base, particularly due to an error in the definition of moisture content in the ore (28% of projected and actual humidity was 36-38%). Numerous difficulties and disorders in technology have led to low capacity utilization (achievement of max. 6.800t/year in relation to the projected 12.000t).
2. Significantly lower mean concentration of Ni in exploited ores. Instead of the projected 1.32%, ore had an average of 1.189% Ni.

3. Failure to observe the dynamics of mining production in relation to the implementation project.
4. Wandering in search of opportunities to improve the technology.
5. Ore reserves insufficient for full utilization of capacity in the economic useful project (for 9-10years).
6. A large number of employees (457 more than projected), and only half of the projected productivity and inefficient organization.
7. High energy costs are a function of low capacity utilization.
8. The high oscillations of nickel prices in the short term and the inability to successfully fight the competition.

4.3. Price stability and price of nickel

Over the last fifty years, nickel price significantly varied. Price collapse firstly appeared during the 90-ies, at the time of Eastern Bloc fall. At that moment, nickel price was below 10 000 $/t, which was below cost price, and did not recover until 2006 [7].

Nickel price trend on the London Metal Exchange (LME), in the last 5 years, is shown on Figure 1. As presented, significant price differences occurred during the 2008, affecting not only production capacities, but also led to the closure of certain facilities.LME nickel price trend in last three months is presented on Figure 2, were price oscillations of 10-12% are observed.

In period from year 2001 to 2005, LME stock was relatively stable, and was around 20 000 t. In period from 2007 to 2009, significant increase led to total nickel stock on around 158 000 t, while in year 2011 decrease to around 90 000 t.

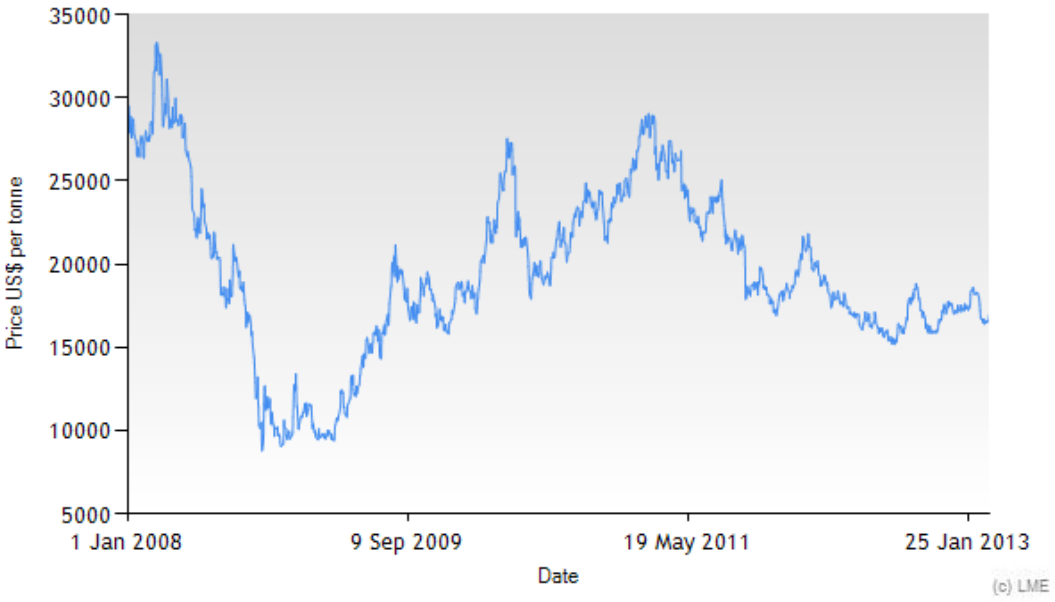

Figure 1. LME nickel price trend in last few years

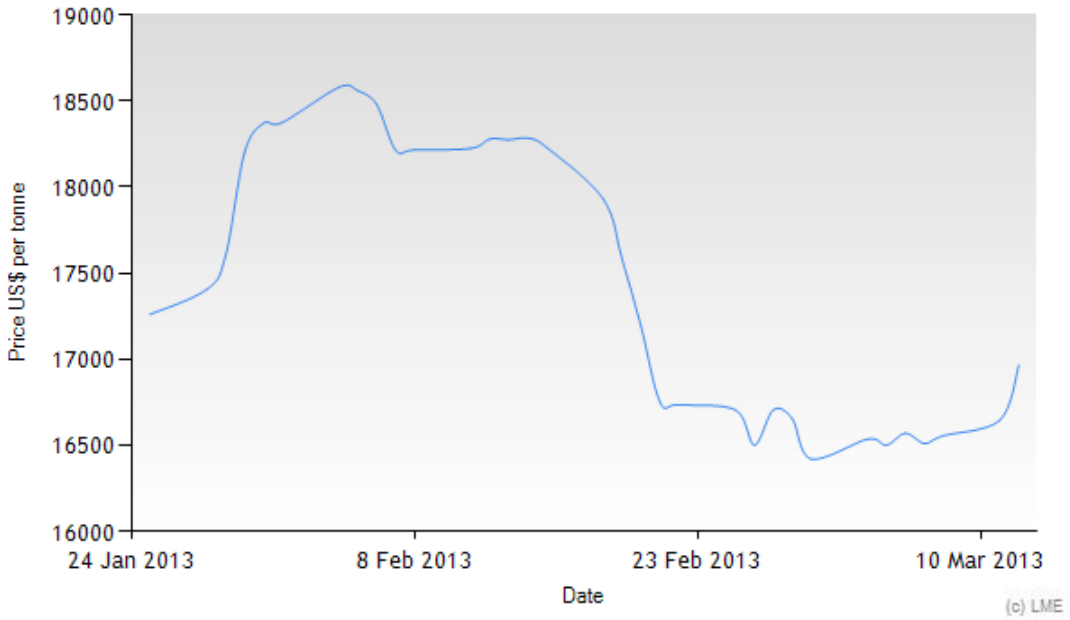

Figure 2. LME nickel price trend in last several months

4.4. Electricity consumption

Generally, comparing to world standards, current domestic price of electricity is quite low. It is difficult to assess whether such situation could be depended on long term, but generally this kind of technology is a large consumer of energy. As an example, Table 3 represent review of energy consumption comparing to various kinds of ores, technologies and producers of nickel.

Table 3. Energy consumption data [3]

No.	Ore processing technology	Ni content, %	Smelter	Energy consumption, kWh/kg Ni
1	Sulfidic concetrates melting	5-15		22
2	Oxide ores melting to fero-nickel	37-55	Kavadarci USA	83 81
3	Hydrometallurgical processing		Cuba Australia Philippines	61 72 83
4	Acidic procedure in autoclave			44
5	Novel process			31-42

Source: [2] adopted

4.5. Environmental aspects

Nickel production, including, mining, drying, roasting, melting, leaching, refining or process residues like slag, mud or gases can cause significant difficulties. For example, Canada's base

metals(including nickel) smelting and refining facilities were analyzed on PCDD and PCDF. Obtained results reviled that their concentrations vary depending on type of system for waste gases conditioning [10].

The most comprehensive document for impact assessment of the future facilities is provided by European Commission, **IPPC** bureau, i.e. **BREF** document for non-ferrous metal industries.

4.6. Risks

Process for base metals treatment may be affected by various factors, which are specific for each country. In that manner, appropriate Risk assessment for developing project of domestic nickel production is necessary. The study would have to include analysis of the following factors:

- Political risks
- Technical-technological risks regarding mining and metallurgical processes
- Environmental protection risks
- Financial risks
- Market and economic risks, including supply and demand as well as price changes
- Project realization risks

5. DISCUSSION

All up to date discussions related to problems of sustainable nickel exploitation, aren't adequately focused on nickel metallurgy. For these reasons, dozens of articles, papers and research projects, presented by authors, briefly analyze this matter, processes and indicators for its studying and solution.This is caused by an impression that there is an understanding that after building the plant, nickel will flow smoothly, without taking in account experiences and difficulties of nickel metallurgy in the country and the world.

In literature, analysis of various examples could be found, of which some, according to our opinion characteristic examples, are analyzed.

First example represent uncritical emphasizing of heap leaching of nickel bearing ores using sulfuric acid, as already applied in Turkey, following the similar process for copper recovery on sandy ground,applied in USA. In Serbia, this process on ground could not be applied under any circumstances. Application of this process would led to serious ground contamination, affecting the poisoning of flora and fauna, even many years after the termination of the project, already presented by Prof. D.Vitorović (SANU), followed by public reaction. In case of Mokra Gora nickel bearing ore, this processing option is unacceptable. As already mentioned, applying of leaching process would allow production of only 5.5 kg of pure nickel from one ton of nickel bearing ore with average nickel content of 0,60-0,62 %, i.e. for production of one ton of pure nickel, 181 tons of nickel bearing ore should be leached, without taking into consideration waste rock striping. Therefore autoclave process is recommended, emphasizing that such process does not exist in EU.

Another thing: there are ferronickel melting facilities in Glogovac and Karadarci that can be used as an example for ferronickel melting from ore with 1,0-1,3% nickel content. As already stated, there are several, mostly poor, nickel ore ledges. If those had been copper ledges, it would have been possible to get 20-22% copper concentrates using flotation process, which would then have been transported to one melting facility. However, this type of parallel is not possible, as oxide nickel ores cannot be flotated.

Third thing: the price. What proposes of building melting facilities usually do is mentioning the most favourable prices of nickel for that period. However, they can vary a lot – double, or even triple the price stated, e.g. from 10000-20000 $/t, which can cause big difficulties to melting facilities and lead to periodical non-profitability and production suspensions.

Fourth thing is an employment. It is usually mentioned as a unidirectional term. It is stated that the employment will increase during the operation of the facility, but it is not said what will happen if a facility stops working due to non-profitability.

Fifth thing that needs to be taken care of is the problem of building the facility as it is. The problem of building such facility, for nickel, or any other metal, production, didn't use to attract such attention and concern of the population and their regional organizations. It is understandable, as they would have objects which would pollute the atmosphere, water, flora and fauna, close to their houses and which could endanger their health. All parts of one society should be consulted about such issue and should take part in making decisions.

After all that's been exposed here, experts need to perform all the necessary studies and analysis, in a rational and experience-based way, when decisions are being made about all the opportunities to organize nickel production in Serbia.

Geological research of nickel ore, hence, should be continued. Basically, none of the explorations started until now, including nickel exploration, are polluting the environment, and they are all very useful and it is necessary to intensify the geo-exploration of other metals on the territory of Serbia. Mineral resources management strategy is projecting that mineral resources should soon reach 4-5% of GDP. That is primarily conditioned by increasing demand of raw materials on the world market, as well as by objective domestic potential reserves. There are over 900 metallic, more than 1200 non-metallic and over 150 coal and oil slate bearings. Objectively, investors are mostly interested in lithium, boron, nickel, cobalt, gold and other resources available in Serbia.

6. CONCLUSION

Since the mid of last century, nickel demand in the world is growing by the rate of 4% with the estimation that this rate will grow in the next decade due to the expansion of Asian economy, especially in steel area. World experts think this progress is based primarily on the laterite ore exploitation.

A Strategy for Sustainable Development of Serbia, with its three main parts: knowledge-based economy, socio-economic prosperity and the protection of the environment and natural

resources, needs to be a base for any long-term prediction of the sustainable nickel exploitation in the country.

Current debates and tensions caused by division who is for, and who's against domestic nickel production, have enough time to go down during 9-10 year period, needed to go from the explorations, stock certification and developing necessary studies to the realisation of the process.

Geo-research should be continued with no reserve. Only a clear picture with precise data of what country disposes of, in matter of quality and quantity of the raw material and the commercial and technical movements can be a good base for the final decision about ore refinery and nickel production.

There are both large mines and large hidro and pyrometallurgical capacities, but evident and constant growth of demand for nickel, makes the idea of technological rounding of nickel production process in domestic conditions, realistic.

Fear and resistance, that exist in the area of environment protection, are not realistic, as such technologies already do exist in the world and all that needs to be done is to rely on good practice and an experience that already exists in that area.

Taking into account the current demand for other metals, primarily Li, B, Sb, Au, and Co in specific period, the final word about the primate will be given by portfolio of the analysis of national economy interests.

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COST-BENEFIT ANALYSIS OF BIOMASS USE AT THE TERITORY OF ZAJECAR AND BOR DISTRICTS

ANALIZA ISPLATIVOSTI UPOTREBE BIOMASE NA TERITORIJI ZAJEČARSKOG I BORSKOG OKRUGA

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Abstract: *Biomass is one of the most significant sources of renewable energy and its potential that could be exploited for energy purposes at the territory of Zajecar and Bor Districts is not less than 100 million tons. Financial effect of biomass exploitation as energy would be equivalent to 21 billion euros pointing to the fact that the total annual biomass potential at this territory would be sufficient to meet the heating needs for 4-5 years.*
Key words: *analysis, biomass, energy effectiveness*

Apstrakt:*Biomasa predstavlja jedan od značajnijih izvora obnovljive energije, a njen potencijal koji bi se mogao koristiti u energetske svrhe, na teritoriji Zaječarskog i Borskog okruga iznosi ne manje od 100 miliona tona. finansijski efekat upotrebe biomase kao energenta bi bio ekvivalent 21 milijarda evra iz čega proizilazi da bi ukupan godišnji potencijal biomase na ovoj teritoriji bio dovoljan da zadovolji potrebe grejanja za 4-5 godina*.
Ključne reči*: analiza, biomasa, energetska isplativost*

1. BIOMASS AS ENERGY POTENTIAL

Biomass as a living matter or until recently the living matter of plant or animal origin that could be exploited as fuel or for industry production is one of the most significant sources of renewable energy which, when being burned, unlike the fossil fuels, does not increase the quantity of CO_2 in the atmosphere.

As the source of renewable energy biomass can be divided into: [1]

- Harvest residues (wheat straw, corn, etc.)
- Wood biomass (sawdust, pruning trees residues, etc.)
- Animal waste and residue (animal feces, animal carcasses, etc.)
- Biomass from waste (green fraction of household waste, sludge form water treatment collectors, etc.)

According to the data from 2009, it is estimated that the total potential of biomass from farming in Serbia is about 12,5 million tons per year; however, one should take into account that, according to the analyses of experts from various fields, a conclusion has been made that it is not reasonable to use all biomass generated from agricultural production residues for energy purposes. [2]. A compromise solution could be to use ¼ of biomass for ploughing in or through bedding to return it to the field, ¼ for producing animal feed, ¼ for heating of buildings and ¼ for other purposes (alcohol industry, construction materials, paper, packages, cosmetics, etc.).

In terms of the above stated, the analysis of energy potential of biomass from agricultural production residues in Serbia would give the following results:

Table 1. The analysis of energy potential of biomass from agricultural production residues in Serbia.

	Biomass	Biomass for burning (25% of total) (10^3 t)	Lower thermal power (MJ/kg)	Equivalent amount of light fuel oil (10^3t)
1.	Wheat straw	743,75	14	247,92
2.	Barley straw	103,13	14,2	34,87
3.	Oats straw	6,4	14,5	2,21
4.	Rye straw	3	14	1
5.	Corn	1787,5	13,5	574,55
6.	Corn from seed corn	21,56	13,85	7,11
7.	Spike residue	357	14,7	124,95
8.	Sunflower stalks	200	14,5	69,05
9.	Sunflower seed shells	30	17,55	12,54
10.	Soya straw	80	15,7	29,9
11.	Oilseed rape straw	75	17,4	31,07
12.	Hops stems	1,98	14	0,66
13.	Tobacco stems	0,26	13,85	0,09
14.	Pruning orchards residues	289,44	14,15	97,5
15.	Pruning vineyard residues	71,55	14	23,85
16.	Manure	110	23	60,24
	TOTAL:	3880,57	14,26	1317,51

Source:[3]

Wood stock in woods of Serbia is about 235 million m^3, i.e. 101.6 m^3/ha and current (annual) volumetric growth is about 6.2 million m^3, i.e. 2.67 m^3/ha. The estimated quantity of wood biomass in Serbia that could be used as fuel is about 1,65 million m^3 per year, while the energy potential of the wood biomass left to decompose after the production of wooden assortment is estimated to 15,6 million GJ per year.

Livestock production residues are also potentially interesting source of renewable energy in Serbia. To the greatest extent, the livestock production residues refer to the animal feces that can be used as raw material for production of biogas.

The estimated quantities of biogas that can be generated from certain types of organic matter are the following:

Table 2.The estimated quantities of biogas that can be generated from certain types of organic matter

Organic material	Biogas quantity m^3/l
Beef manure	90 - 310
Pig manure	340 - 550
Chicken manure	310 - 620
Livestock manure	175 - 280

Source:[3]

According to the statistical data it can be calculated that Serbia could produce such a quantity of biogas from animal husbandry only, to compensate about 20% of the imported natural gas. And, the last but not the least, Serbia has large areas of land left uncultivated that are potentially interesting for cultivation of the so called energy plants. For example, plant called "mishantus" has the potential for the annual yield of over 10 tons of dry biomass per hectare and its calorie value is at the level of brown coal. [4]

2. ZAJECAR DISTRICT PROFILE

According to the data from 2009, the total number of registered farms at the territory of the Republic of Serbia is 441.908; 19.236 registered farms are in Zajecar and Bor Districts which is 4,35% of the total number of registered farms in Serbia. Spatial distribution of farming land is as follows:

Table 3. Spatial distribution of farming land

	fields	gardens	orchards	vineyards	meadows	pastures	Total
Zajecar district	113063	642	6234	4537	34927	48486	207888
lower hills	44352	265	1544	2520	5678	6156	60514
hilly	41375	238	2834	1523	14210	6587	6767
mountainous	27336	139	1855	495	15039	5743	70607

Source: [5]

Total area under woods in Timok Region is 325.600 ha, total volume of woods is 48.724.800 m^3 and total volumetric growth is 1.138.340 m^3. The average volume is 145 m^3/ha and the average volumetric growth is 3,39 m^3/ha. Of total volume, 54% refers to the state-owned woods, 46% is privately owned woods while the total volumetric growth implies equal share of state and privately-owned woods. The average volume is far higher in the state-owned woods and is 184 m^3/ha, while in privately-owned woods it is 123 m^3/ha.

According to the first results of the census of agriculture from 2012, at the territory of Zajecar District there are 16.675 farms using 76.815 ha of farming land, while at the territory of Bor District there are 12.572 farms using 71.871 ha of farming land. The census of livestock results in the following numbers:

Table 4. Spatial distribution of farming land

District	No. of cattle	No. of pigs	No. of goats	No. of sheep	No. of poultry
Zajecar	21 056	67 666	10. 0935	47.671	244.125
Bor	14 705	34 519	6.724	31.127	186.116

Source:[6]

3. BIOMASS POTENTIAL

A rough estimate of the potential of biomass from various sources, i.e. categories at the territory of Zajecar and Bor Districts will be as follows: [6]

Biomass from agricultural production residues:

1. Fields (54% of used farming land)
   80.290,44 ha with the average yield of 4t/ha = 321.161,76
2. Orchards (3% of used farming land)
   4.460,58 ha with the average yield of 1,05t/ha = 4.683,61
3. Vineyards (2,18% used farming land)
   with the average yield of 0,95t/ha = 3.241,35

The total would be 329.086,72 tons of biomass. If, according to the prevailing opinion of experts, ¼ were used for energy purposes (82.271,68) with the average lower calorific value of 14 Mg/kg this quantity of biomass would be equivalent to over 25 million tons of light coal.

Taking into account the fact that Timok Region covers an area of 7.130 km^2 and that an average of 45% of that area is cultivable, and if we particularly have in mind the reduction in the cultivated farming land during the period from 2009 to 2012 we can freely say that there is at least 200.000 ha of cultivable but uncultivated land that can be used for planting energy plants.

Wood biomass

The volume of woods of 48.724.800 $m^3$with the total volumetric growth of 1.138.340 m^3can provide about 4 million m^3 of wood biomass that can be used as fuel.

Biomass from animal waste:

Relying on the results of the census from 2012 we can calculate that the listed livestock can provide at least 4 million cubic meters of liquid manure that with the level of exploitation of 0,35% would generate nearly 160 GWh of electric power, which is an average consumption of 30.000 households. Besides, emission of about 30.000 cubic meters of methane would be prevented.

4. CONCLUSION

Total potential of biomass that could be used for energy purposes at the territory of Zajecar and Bor Districts is not less than 100 million tons which is an equivalent for about 300 million tons of light coal. Since the lowest price of coal is 70 euros, financial effect of using biomass as energy would be equivalent to 21 billion euros. Since the average daily consumption for previous heating season in Zajecar was 35 tons of fuel oil, total annual potential of biomass would be sufficient to meet the needs for heating for 4-5 years.

To use biomass instead of the existing energy, certain investments are needed. First, there must be an organized system of collection, transportation and storage of biomass, whereby the price of a set of biomass collecting machines is about half-a-million euros and transportation at the distance up to 50 km is about 10 euros per ton. In addition, it is needed to introduce the adequate technology for processing and burning of biomass (the price of briquetting machine, capacity of 300 kg briquettes per hour, is about 30.000 euros). And, finally, the greatest effect would be achieved by a complete central heating system in urban areas, which will, particularly in Zajecar District, require significant investments into secondary heating network.

Taking into account all the presented data, a conclusion can be made that the investment into central heating by burning biomass at Zajecar and Bor District would pay-off in 2-3 heating seasons maximum.

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USE OLD TIRES AS A FUEL

UPOTREBA STARIH GUMA KAO GORIVA

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***Abstract**: The recovery of energy applied is suitable for control of large amounts of old tires, from the standpoint of convenience, cost control and timeliness. With regard to energy recovery technology, the two processes are discussed in this paper include: direct combustion and pyrolysis.*
***Keywords**: energy recovery, incineration, rubber, tire, pyrolysis.*

***Apstrakt:** Postupak obnavljanja energije primenjivan je zbog podesne kontrole velikih količina starih pneumatika, posmatrano sa stanovišta praktičnosti, kontrole troškova i blagovremenosti. Vezano za tehnologiju obnavljanja energije, razmatraju se dva procesa u ovom radu i to: direktno spaljivanje i piroliza.*
***Ključne reči:** obnavljanje energije, spaljivanje, guma, pneumatik, piroliza.*

1. RENEWAL OF ENERGY USING OLD TYRES

Tires are composed of approximately 60% of hydrocarbons, which are a great source of energy that is obtained by burning.

In many developed countries, like the U.S., Japan, Germany, the Scandinavian countries, due to the strong economic and environmental reasons, the best alternative to solve the problem of old tire was considered a regeneration of energy.

1.1. Direct burning

The greatest potential for reducing the use of waste tires is to use it as an alternative fuel in cement factories and power plants.

Distributions using old tires as fuel:
• Cement industry 41%,
• Processing meat and paper 20%
• Electricity production 18%
• Steam boilers in industry and institutions 13%
• Local facilities for the use of tires as fuel 8%

1.2. Burning tires in cement factories

In the United States each year in cement factories consumed about 53 million old tires. Cement industry burns old tires as fuel in furnaces that are used to obtain clinker - the primary component of portland cement. Cement furnaces are the traditional furnace in which limestone, clay and shale heated to extreme temperatures and transformed in chemical reactions in the clinker. Clinker is basis with gypsum for portland cement. The use of whole

tires for this purpose is possible for some types of furnaces. The advantage in the use of whole tires is to reduce costs because it does not grind. Removing steel is unnecessary because there is a need for steel in this process.

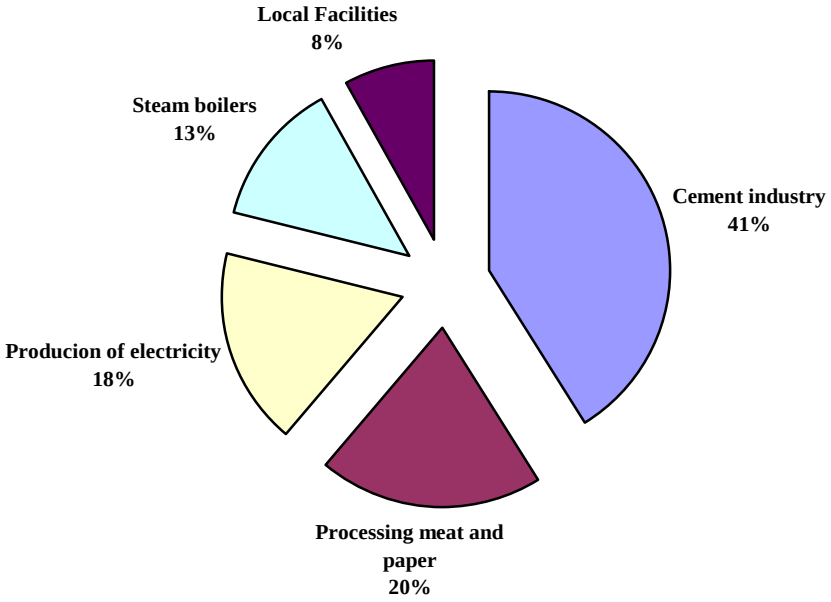

Figure 1. Showing the distribution of use of old tires

Caloric value of old tires is similar caloric value of coal, and they sometimes have an advantage over coal. Used pneumatics could partly and directly replace coal in cement factories. Using old tires to replace coal is not only effective waste management practice, but also reduces tire wear non-renewable energy sources. Besides, there are other benefits obtained through the quality of the product, due to the presence of steel in the shape of the tire steel cord (used for reinforcement).

Using old tires as an alternative fuel in cement factories are faced with a problem: there is a need for large quantities of tires and great importance is their continuous delivery.

Due to the generally accepted hierarchy of all types of alternative waste management (reduction, reuse, recycling, recovery and then storing) higher priority should be given to recycling of materials from energy recovery.

With the introduction of new European regulations on air pollution, shall be a lot of pressure on the cement factories to adhere to these regulations. These changes in standards may also increase the cost of installing and maintaining adequate control equipment. Due to increased interest in recycling old tires will be used to decrease the use of tires in cement and increase recycling of materials in all developed countries.

1.3. Power Plants

Old tires are used as fuel in power plants due to lower costs. In thermal power boilers are typical for coal. Old tires are often used as supplemental fuel because of the high heat

capacity, low NOx emissions and good prices compared to coal. Only certain types of boilers are suitable for burning tires. Cyclone boilers are the most suitable. Of additional equipment required is infinite tape. Cyclone boilers can not accept whole tires (max. size pieces 1 x 1 inch and must be without wires). It is suitable use of automatic stokers. For automated boilers, the longer the time spent fuel in the boiler and can be used pieces up to size 2 squareinches. This lowers the cost of fuel and it is more economical.

1.4. Industrial and institutional boilers

For use in industrial boilers tires must be shredded. Not all boilers are suitable for the use of old tires. Existence of steel, if not removed prior to combustion, can cause problems in storage of ash. It must be assessed whether the tires are used for discharge of pollutants into the air during combustion and disposal of ashes. Industrial facilities must provide the appropriate license from the relevant authorities for burning old tires.

2. PYROLYSIS

Pyrolysis is the thermal degradation of heat without oxygen. Gas, oil, grime and steel are products of pyrolysis tires. Oil obtained by pyrolysis of old tires, after further purification, can be used as a supplement to gasoline to increase the octane number or as fuel. The resulting grime can be used in the manufacture of rubber and plastic, for the production of high-qualitymolds, ink and paint. Waste steel that remains after pyrolysis of waste tires is an obstacle in the process and management.

During the pyrolysis process we obtain: pyrolysis gas - 5%, liquid residue (pyrolytic oil) - 50%, the solid residue of pyrolysis of metal - 45%. The result of the process is to get from tons of processed tire 50 m^3 of gas.

The main components of the pyrolytic gas chromatographically determined are: hydrogen - 17.9%, 30.4% methane, ethane - 14.3%, propane - 5.0%, butane - 1.0%, isobutane - 2.1%, carbon dioxide - 4.2%, carbon oxide (4) - 9.9%.

Solid residue produced by processing using tire pyrolysis product is relatively brittle black. The characteristics of this residue compared with anthracite are as follows (in brackets are the values for hard coal): The mass fraction of moisture - 13% (0.7-3%), salt - 13.2% (-), mass fraction of sulfur content - 2.31% (-), sulfur solid state - 2.36% (-), volatile matter 4.0% (-), pure carbon 95.5% (94-97%), higher heating value (kJ / kg) - 34 131 (33520-35516). The figures given show that the solid residue of pyrolysis can be used as a good fuel. [47]

Pyrolysis of old tires as a way to manage waste is entirely dependent on crude oil prices. This can be a limitation for the application of pyrolysis. Although there are several factories for pyrolysis in the UK and Canada, these processes are still experimental and not yet shown that they themselves commercially viable.

3. PRODUCTION TYRE DISSOLUTION IN ORGANIC SOLVENTS

Technology is based on the method of polymer degradation under the action of high temperature, in an organic solvent. Beginning of the process temperature is 240-250^{0}C, and no more than 280-290^{0}C, pressure up to 6.1 MPa. In the reactor, the effect of temperature and pressure in the presence of organic solvent, dissolving the tire occurs, resulting in the first phase: mineral oil 50%, technical carbon 30%and metal (KORD) 20%.

In rectificationcolumn, synthetic oil breaks down into two fractions: 65% petrol and 35% fuel oil. By mixing the gasoline fraction with pure gasoline to diesel gets petrol 92-95.

In the process going to refinement of carbon, so that a technical characteristic conductivity of carbon or carbonaceous materials that can be used in metallurgy.

Metal (Steel cord) again blends.

From one ton of rubber tires, we get the following materials:

1. gasoline fractions 325kg,
2. oil fuel 175kg,
3. technical carbon 300kg,
4. metal (steel) waste 200kg.

In one year this plant can process 36,288 tons of discarded tires. [2]

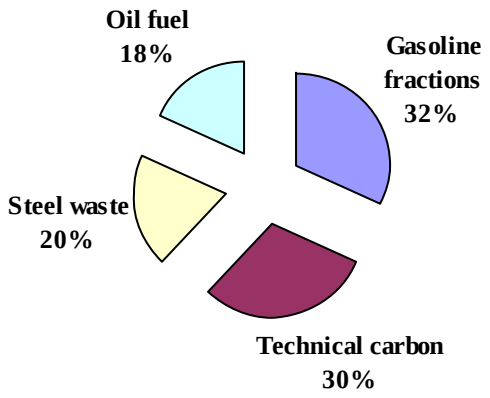

Figure 2. Percentage of different materials

4. EMISSIONS TO AIR WITH TDF (tire-derived fiel)

Discarded tires have properties that are suitable as an alternative fuel in some industries. Whole or in pieces (known as tire-derived fuel or TDF) are used as fuel in industries of

Europe and Japan for many years. In the U.S., more than 30 states have passed legislation that TDF is accepted as a substitute fuel.

To control emissions are using electrostatic precipitators and pre-filters.

According to the USEPA obtained in the pilot study, where the tires burned without controlling the combustion process, with the exception of zinc, did not show any increase in greenhouse gas emissions compared to coal combustion. And zinc emissions can be controlled if the equipment has appropriate. It was found that the level of some elements whose emissions are monitored, there was significantly lower than that of coal combustion (eg. mercury).

5. CONCLUSION

There are numerous examples of other industries that use old tires as an alternative fuel worldwide. Metal processing, wood processing industry in a certain volume of the rubber industry use old tires as fuel in order to get the money that is used in the production process. Similarly, waste wood or paper, waste tires are an alternative fuel in the production of lime.

Small amounts of old tires are mixed with municipal waste and incinerated in furnaces when the caloric value of the waste small.

During the direct burning need to take care of the harmful gases caused by burning old tires in cement plants, power plants, furnaces for burning or in other industries. Volatile hydrocarbons (benzene, chloroform, 1,2-dihloroeten, methylene chloride) and heavy metals (lead, mercury, chromium, and zinc) are most commonly used in harmful fumes when burning tires. Degradation products (dioxins and furans), are generated due to incomplete combustion. Pollution control equipment may not work 100% effective, no matter how new and was right, for the processing of all greenhouse gases. In addition, like any other equipment may malfunction before the deadline which would lead to the release of harmful gases into the atmosphere.

The analysis shows that due to the generally accepted hierarchy of all types of alternative waste management (reduction, reuse, recycling, recovery and then storing) higher priority should be given to recycling of materials from the recycling which is partly shown in this paper.

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RANKING OF THE POWER PLANT PROJECTS

RANGIRANJE PROJEKTA IZGRADNJE POSTROJENJA ZA PROIZVODNJU ELEKTRIČNE ENERGIJE

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Abstract: *Electricity is the driving force of modern industry. Over the past decade, electricity consumption per capita has been an indicator of living standards. The energy crisis and the impact of production and consumption of electricity on the environment creates a need for further industrial development to be brought to the level that is environmentally friendly in scope and form. The cleaner production methods include renewable and alternative energy sources, and the eco-friendly development concept requires reduction of energy losses, introduction of the methods and devices for downsizing it, the use of power electronic devices and the application of computers and advanced control algorithms and systems.The paper presents the methodology of ranking the power plant projects using ELECTRE Imethod. The selection is applied to the projects of small hydro, wind and biomass power plants.*
Keywords: *electric power, manufacturing, project, and ELECTRE I method.*

Apstrakt: *Električna energija je pokretač savremene industrije. Tokom proteklih decenija, potrošnja električne energije po glavi stanovnika bila je pokazatelj životnog standarda. Energetska kriza kao i uticaj proizvodnje i utroška električne energije na okolinu stvaraju potrebu da se dalji industrijski razvoj dovede na nivo koji je po svom obimu i formi ekološki prihvatljiv. Čistiji načini prozvodnje električne energije uključuju obnovljive i alternativne izvore energije, dok koncept ekološki prihvatljivog razvoja zahteva umanjenje gubitaka električne energije, uvođenje metoda i naprava za njenu uštedu, korišćenje uređaja energetske elektronike i primenu računara i savremenih upravljačkih algoritama i sistema. U radu će biti prikazana metodologija rangiranja projekta izgradnje postrojenja za proizvodnju električne energije primenom ELECTRE I metode. Projekti između koji se izbor vrši su male hidroelektrane, vetrogeneratori i elektrane na biomasu*.
Ključne reči: *električna energija, proizvodnja, projekat, ELECTRE I metod.*

1. INTRODUCTION

Electricity is one of the most important transformed energy forms. The energy that we consume in our homes is produced in power plants. Depending on the type of primary energy for electricity production, there are different power plants such as hydro, thermal and nuclear power plants. In addition to these plants, electricity can be produced from alternative sources, in small hydro, biomass, wind power, solar and geothermal power plants.

Small hydroelectric plants are the plants in which the potential energy of water is first converted into kinetic energy (in the turbine stator) and then into mechanical energy (in the turbine rotor) rotating the turbine shaft, and finally into electrical energy in the generator.
Small and mini hydropower plants, which produce between 100 kW and 10 MW of electricity, can generate enough electricity to be integrated into the power net. These plants do not require a reservoir and do not disturb the flow of the river or stream, and can be very effective in energy supply network in the areas where there are watercourses or waterfalls.[1]

The use of hydro potential is the most important alternative to fossil fuels in power generation. The main benefits of small hydro power plants are reflected in low maintenance

costs, employment of local industry, as well as its contribution to the atractiveness of the tourist environment. Besides, small reservoirs actively participate in the protection of large reservoirs, balanced using up of high water in the spring and autumn.[2]

Wind energy is currently the most common form of using renewable energy in the world. The benefits of using wind power which is converted into electricity are, first of all, the inexhaustible amount of energy, as well as the economic viability of using it. Shortage and high price of fossil fuels opens scope for the use of wind power. Therefore, the production of wind turbines has been increasing.

Wind turbine is a machine that converts kinetic wind energy into mechanical energy. If the mechanical energy goes directly to machines, such as pumps or machines for grinding grain, then it is about the wind mills. If the mechanical energy is converted into electricity, it is the wind turbines. The efficiency of wind turbines depends on wind speed and frequency. Operation of wind turbines can be significantly increased if it is set between two obstacles or two mountain slopes (tunnel effect). One of the common methods of locating wind turbines is on hilltops where density and velocity of air flow is increased.

Biomass and waste to energy power plants are such a kind of thermal power plants in which instead of conventional, mostly fossil fuels (such as coal and oil, biomass and waste) are burnt, which are in the category of renewable energy.[3]

Biomass is a renewable energy source, both of human and natural origin. The advantage of biomass is that it uses up the same equipment which exists in power plants on fossil fuels,to produce electricity. Biomass is an important source of energy and the most important fuel worldwide, after coal, oil and natural gas.

The production of biomass for energy purposes involves the use of large areas, whichtogether with the usual way of using agricultural techniques creates a substantial impact on biodiversity and the manner of its production. Therefore, the use of crop residues to produce electricity, heat and biodiesel, regardless of its source (sugar beet, rice husks or straw and other waste from crops, forestry activities or production of vegetable oils, etc..), is one of the best ways of sustainable energy production, as long as it does not significantly prevent the other ways of using agricultural waste, such as soil conservation, for example.

2. THE ELECTRE I METHOD

Multi-criteria decision-making (MCDM) is one of the most widely used decision methodologies in the sciences, business, government and engineering world. The typical MCDM problem is concerned with the task of ranking a finite number of decision alternatives, each of which is explicitly described in terms of different characteristics (also often called attributes, decision criteria, or objectives) which have to be taken into account simultaneously.[4-8] Data for MCDM problems can be determined by direct observation (if they are easily quantifiable), or by indirect means if they are qualitative. [9,10]

One of the best known methods of multicriteria analysis is ELECTRE methods.The ELECTRE Method (ELimination and Et Choice Translating REality) was first published in, and has four versions (ELECTRE I-IV). [11] The simplest method of the ELECTRE family is the ELECTRE I, whose characteristics is that it is used to construct a partial ranking and choose a set of promising alternatives. [12 - 17]

The ELECTRE I Method is iterative and is developed through a certain number of steps. Before the first step, it is necessary to determine a starting matrix of decision-making.

General form of the starting decision-making matrix (information table) is expressed in the following form:

Table 1. The information table of ELECTRE

Alternatives	C_1	C_2	. . .	C_n
A_1	x_{11}	x_{12}	. . .	x_{1n}
A_2	x_{21}	x_{22}	. . .	x_{2n}
.	.	.	.	.
.	.	.	.	.
.	.	.	.	.
A_m	x_{m1}	x_{m2}	. . .	x_{mn}
W	w_1	w_2	. . .	w_n

where:
A (1-n) – alternative
C (1 – m) – criteriai
w – criterium weight
The first step of the ELECTRE Method involves determining a normalized decision-making matrix according to the expression:

$$n_{ij} = \frac{x_{ij}}{\sqrt{\sum_{j=1}^{m} x_{ij}^2}} \tag{1}$$

at attribute of the type *max*, and

$$n_{ij} = 1 - \frac{x_{ij}}{\sqrt{\sum_{j=1}^{m} x_{ij}^2}} \tag{2}$$

at the attribute of the type *min*,

where $n_{ij}$is normalized element of the decision-making matrix.

Normalized decision-making matrix in general case has the following form:

$$N = \begin{bmatrix} n_{11} & n_{12} & \dots & n_{1n} \\ n_{21} & n_{22} & \dots & n_{2n} \\ \dots & \dots & \dots & \dots \\ n_{m1} & n_{m2} & \dots & n_{mn} \end{bmatrix}$$

The second step is calculating weight normalized decision-making matrix, where a decision-maker actively participates in the procedure of solving the problem by determining preferences, or weight of criteria. The weight normalized decision-making matrix is calculated by the following pattern:

$$\mathrm{V} = \mathrm{W} \cdot \mathrm{N} \tag{3}$$

while general form of this matrix is as follows:

$$V = \begin{bmatrix} w_1 \cdot n_{11} & w_2 \cdot n_{12} & \dots & w_n \cdot n_{1n} \\ w_1 \cdot n_{21} & w_2 \cdot n_{22} & \dots & w_n \cdot n_{2n} \\ \dots & \dots & \dots & \dots \\ w_1 \cdot n_{m1} & w_2 \cdot n_{m2} & \dots & w_n \cdot n_{mn} \end{bmatrix} = \begin{bmatrix} v_{11} & v_{12} & \dots & v_{1n} \\ v_{21} & v_{22} & \dots & v_{2n} \\ \dots & \dots & \dots & \dots \\ v_{m1} & v_{m2} & \dots & v_{mn} \end{bmatrix}$$

In the third step of the ELECTRE Method, the concordance and discordance sets are determined according to the following:

$$C_{pr} = \{j |\ xpj \geq xrj\} \tag{4}$$

$$D_{pr} = J - S_{pr} = \{j |\ xpj < xrj\} \tag{5}$$

In the fourth step,the concordance matrix is determined on the basis of the set of concordance. The elements of the concordance matrix are the concordance indeces, and they are calculated as a sum of criteria weights involved in a certain sets of agreement.

$$C_{pr} = \sum_{j \in Spr} t_j \tag{6}$$

The fifth step refers to determining discordance matrix on the basis of the set of discordance. The elements of the discordance matrix are indices of discordance.

$$D_{pr} = \frac{\max\limits_{j \in NSpr} \left[tn_{pj} - tn_{rj} \right]}{\max\limits_{j \in J} \left[tn_{pj} - tn_{rj} \right]} \tag{7}$$

In the sixth step, the matrix of concordance domination is determined according to the formula:

$$AIC = \sum_{p=1}^{m}\sum_{r=1}^{m} \frac{c_{pr}}{m(m-1)} \quad where \quad p \neq r \tag{8}$$

on the basis of the following criteria:

$$aic_{pr} = 1 \quad for \quad c_{pr} \geq AIC \tag{9}$$

$$aic_{pr} = 0 \quad for \quad c_{pr} < AIC \tag{10}$$

The next step is determining the matrix of discordance domination, analogously to the matrix of concordance domination:

$$AID = \sum_{p=1}^{m}\sum_{r=1}^{m} \frac{d_{pr}}{m(m-1)} \quad where \quad p \neq r \tag{11}$$

on the basis of the following criteria

$$mdd_{pr} = 1 \quad for \quad c_{pr} \leq AID \tag{12}$$

$$mdd_{pr} = 0 \quad for \quad c_{pr} > AID \tag{13}$$

In the eighth step, the matrix of aggregate domination is determined. Its elements are equal to the product of elements on a certain position in matrices of agreement and disagreement domination.

$$mad_{pr} = mcd_{pr} \cdot mdd_{pr} \tag{14}$$

Finally, in the ninth step, less desirable actions are eliminated, while one or more alternatives are separated as most desirable. In the practical procedure of eliminating less desirable actions, it is necessary to examine the state of domination for all the possible combinations of pairs of actions, and in that way, to obtain the most favourable one.

3. A NUMERIC APPLICATION

Theintroductionpoints out theimportanceof electricityfor humanityand the advantagesof its productionfrom renewablesources, whichare primarily reflectedin the preservation ofa healthy environmentand reducing theconsumptionof non-renewableresourcesfrom the primaryreserves.The followingwill showthe rankingof projectsto generate electricity. The three projects,amongwhich theselectionwill be made,are: small hydropower plants, wind generators andbiomass power plants. The maincriteria forselectionwill be:costs of plant construction (€/kWh), price of electricity (c€/kWh), return on investment (in years), cost of maintenance (c€/kWh) and average cost of electricity production (c€/kWh). Table 1 shows the alternatives and criteria values for each.

Table 2. Alternatives and criteria

	Costs of plant construction	Price of electric power	Return of investment	Costs of maintenance	Average cost of production
	min	min	min	min	min
Small hydro-electric power plants	2000	9	6	1	4
Windmills	1500	10	7	3	5
Electric power plants on biomass	2500	14	7	3	7

This can be shown by the following matrix:

$$N = \begin{bmatrix} 2000 & 9 & 6 & 1 & 4 \\ 1500 & 10 & 7 & 3 & 5 \\ 2500 & 14 & 7 & 3 & 7 \end{bmatrix}$$

Based on formula (2) the following weighted normalized matrix can be obtained:

$$N = \begin{bmatrix} 0{,}5657 & 0{,}4635 & 0{,}5183 & 0{,}2294 & 0{,}4216 \\ 0{,}4243 & 0{,}5150 & 0{,}6047 & 0{,}6882 & 0{,}5270 \\ 0{,}7071 & 0{,}7210 & 0{,}6047 & 0{,}6882 & 0{,}7379 \end{bmatrix}$$

The next step is to calculate the weighted normalized matrix, which requires that each criterion is assigned a weighting coefficient. In this case, three energy experts have been consulted about the assignment of weighting coefficients and, according to their opinion, the following weighting coefficient values have been obtained:

	C1	C2	C3	C4	C5
Weight	0.361	0.178	0.121	0.228	0.112

Based on these weights, the formula (3) gives the weighted normalized matrix as follows:

$$V = \begin{bmatrix} 0{,}2042 & 0{,}0825 & 0{,}0627 & 0{,}0523 & 0{,}0472 \\ 0{,}1532 & 0{,}0917 & 0{,}0732 & 0{,}1569 & 0{,}0590 \\ 0{,}2553 & 0{,}1283 & 0{,}0732 & 0{,}1569 & 0{,}0826 \end{bmatrix}$$

Based on the forms (4) and (5) indices of concordance and discordance were obtained, and based on that concordance matrix (C) and disconcordance matrix (D) are calculated.

$$C = \begin{bmatrix} 0 & 0{,}639 & 1 \\ 0.361 & 0 & 1 \\ 0 & 0{,}349 & 0 \end{bmatrix} \quad D = \begin{bmatrix} 0 & 0{,}488 & 0 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$$

Matrix of concordance domination (MCD) and matrix of discocordance domination (MDD) are obtained from the formula (8) and (11).

$$MCD = \begin{bmatrix} 0 & 1 & 1 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix} \quad MDD = \begin{bmatrix} 0 & 1 & 1 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix}$$

The last step is to calculate the matrix of aggregate domination (MAD) based on the formula (14)

$$MAD = \begin{bmatrix} a_1 & 1 & 1 \\ 0 & a_2 & 1 \\ 0 & 0 & a_3 \end{bmatrix}$$

The analysis of this matrix can show the following:

- action a1dominates the actions a2 and a3,
- action a2 dominates the action a3
- action a3 does not dominate any action.

4. CONCLUSION

In recent years the issue of energy security and stability has become the fundamental question of the global economic and social system. With the aim to preserve the safety, the renewable energy resources have become a current issue in every developed country. Electricity production from renewable sources has almost no negative impact on the environment, which is a great advantage over other sources, so the implementation of such projects is more common.

As well as in other areas, here, too, the theory of decision-making is of great importance in making decisions about the cost-effectiveness of investments and project selection. In this case, the project selection method which is used is multi-criteria decision-making method, ELECTRE I, whose application is, from an economic point of view, the optimal solution for the selection of the construction of plants to produce electricity. The analysis of aggregate dominance matrix shows that the alternative a1, the project of the construction of a small hydropower plant, dominates the other alternatives, which means that it is best to invest in this project.

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POTENTIAL AND UTILIZATION DEGREE OF GEOTHERMAL SOURCES IN THE AREA OF TIMOK REGION

POTENCIJAL I STEPEN ISKORIŠĆENOSTI GEOTERMALNIH IZVORA NA PODRUČJU TIMOČKE KRAJNE

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Abstract: *Geothermal energy in Serbia is used in very small quantities, although geothermal, it is one of the richest countries by geothermal potential. According to the previous research results in Serbia there are 60 sites of geothermal water with temperature higher than 15°C to a depth of 3000m. In Serbia, only geothermal energy is used from geothermal and mineral water, mainly in a traditional way, and the most in balneological and sports-recreation purposes. The use of geothermal energy for heating and other energy purposes is at an early stage and it is very modest. The hottest sources are in Vranjska Spa (96°C), followed by Jošanička Spa (78°C), Sijerinska Spa (72°C). In Timok Region, the known sources are in the zone of Soko Spa, Brestovacka Spa and Gamzigradska Spa, villages Sarbanovac, Sumrakovac, Nikolicevo, Grlište, Rgošte and other .*
Keywords*: natural resources, renewable energy sources, geothermal energy*

Apstrakt: *Geotermalna energija u Srbiji se koristi u izuzetno malim količinama mada po geotermalnom potencijalu spada u bogatije zemlje. Prema dosadašnjim rezultatima istraživanja u Srbiji postoji 60 nalazišta geotermalnih voda sa temperaturom većom od 15°C do dubine od 3000m. U Srbiji se koristi samo geotermalna energija iz geotermalnih-mineralnih voda, uglavnom na tradicionalan način, najviše u balneološke i sportsko-rekreativne svrhe. Korišćenje geotermalne energije za grejanje i druge energetske svrhe je u početnoj fazi i veoma je skromno. Najtopliji su izvori u Vranjskoj banji (96°C), zatim u Jošaničkoj Banji (78°C), Sijerinskoj Banji (72°C). U Timočkoj Krajni poznati izvori se nalaze u zoni Sokobanje, Brestovačke i Gamzigradske banje, sela Šarbanovca, Sumrakovca, Nikoličeva, Grlišta, Rgošta i drugih.*
Ključne reči: *prirodni resursi, obnovljivi izvori energije, geotremalna energija.*

1. INTRODUCTION

Geothermal energy in the Earth has originated since the creationof our planet 4.5 billion years ago. The temperature in the center of the Earth is about 6000°C and there the thermonuclear reactions have been still developing. The heat from a hot core moves towards the surface of the Earth crust. We have available only a small part of that energy in the surface part of depth up to several kilometers. Geothermal energy contained in the Earth crust, i.e. in rocks, underground water, underground water vapor and magma. Depending on the environment where it is, the geothermal energy is called hydrogeothermal, petrogeothermal and magmogeothermal. Hydrogeothermal energy is accumulated in the underground thermal waters whose temperature is higher than 10°C. Its exploitation is done from springs or boreholes. Petrogeothermal energy is contained in the dry rocks that do not contain free groundwater. These years, the commercial production of electricity has started from power plants that use the energy of hot rocks. For this application, it is necessary that the temperature of rocks is higher than 100°C. Magmogeothermal energy is accumulated in the red-hot magma and the experiments are successfully conducted that should allow its exploitation. Potential of geothermal energy of a particular area can be displayed by density of geothermal heat flow (the amount of geothermal heat that in every second through an area of $1m^2$is coms

from inside the Earth to its surface. The average values in Europe are about 60MW/m^2, while in Serbia these values are much higher: over 100MW/m^2.

Geothermal energy in Serbia is used in very small quantities, but it is one of the richest countries according to its geothermal potential. According to the previous research results in Serbia there are 60 sites of geothermal water with temperature higher than 15°C to a depth of 3000m.

In Serbia, only geothermal energy is used from geothermal and mineral water, mainly in a traditional way, and the most in balneological and sports-recreation purposes. The use of geothermal energy for heating and other energy purposes is at an early stage and it is very modest.Geothermal energy due to its large potentials presents the energy of future and it is necessary that people treat it environmentally friendly. To achieve such a goal, also the systems have to be introduced which are developed for the exploitation of geothermal water. The experts, whose knowledge may contribute to the fact that in Serbia this energy source would be increasingly used, are now being challenged. Proper utilization of geothermal resources would ensure development of the entire economy. With growth of economy, the habits of population would be changed.

2. RENEWABLE ENERGY SOURCES

" Mass and energy are unchangeable and permanent."
A. Einstein

Renewable energy sources (abbreviation English *RES)* formerly denoted as the permanent energy sources are the energy sources used to generate the electricity or thermal energy, or any useful work with reserves that are constantly or cyclically renewed.

The name itself a renewable and sustainable, comes from the fact that the energy is consumed in an amount not exceeding the rate at which it is formed in nature. Some time between renewable energy sources are classified those sources which are said to have so many reserves that can be exploited for millions of years. This is in contrast to non-renewable sources whose reserves are estimated to be tens or hundreds of years, until their creation was tens of millions of years.

The renewable energy sources are:

1 Biomass energy
2 Energy of the Sun (solar energy)
3 Water energy (hydro energy)
4 Wind Energy
5 Geothermal Energy
6 Tidal energy

All of these types of energy are indestructible and therefore they should be fully used, on one side because they are renewable, and on the other side it is the energy that does not produce

waste, does not create pollution, does not create problems related to clean air, clean environment and clean water, and does not affect the sustainable development [1].

Development of renewable energy sources is important for several reasons:

- Renewable energy sources play an important role in reduction the carbon dioxide emission into the atmosphere,
- Increasing the share of renewable energy sources, the energy stability of system increases. It also helps in improving the security of power supply by reducing the dependence on import the energy resources and electric energy,
- It is expected that renewable energy sources will become economically competitive to the conventional energy resources in the near future [2].

3. GEOTHERMAL ENERGY

The word geothermal has the origin in two Greek words ***geo*** (earth) and ***therme*** (heat) and it means the Earth heat, and therefore the heat energy of the Earth is also called geothermal energy. Geothermal energy is the heat energy of the planet Earth, and in the narrow sense includes only that part of the energy from the depths of the Earth, which in the form of hot or warm geothermal medium (water or steam) comes to the Earth surface and is suitable for use in its original form (for bathing, healing and etc.) or for conversion into other forms (electricity, heat in the heating systems, etc.).

Geothermal energy is the result of various processes occurring in the depths of the Earth (nuclear reaction of decaying the isotopes, etc.), where the temperature is above 4000°C, and the resulting heat through the layers of Earth crust leads to the universe. Temperature changes with depth of layers is called the geothermal gradient, which in Europe has the average of 0.03°C/m, while in the Pannonian region it is about 0. 04°C/m. Otherwise, to the depth of 30m, the heat of Earth surface is caused by the Sun radiation, and the temperature is almost constant in these layers.

It is estimated that the heat flow from the interior to the surface of the Earth is 42TW. Thereby 8TW comes from the Earth crust (representing only 2% of total volume, but it is reach with radoactive isotopes), 32.3 TW of the sheath (82% of volume), and only 1.7 TW from the core (representing 16% of volume, but there is no isotope). Complete tgeothermal energy of the Earth (i.e. the Earth as a planet) can be estimated as 12.6×1.024MJ and crust at 5.4×1.021MJ. Therefore, only a small part of all of it could be efficiently utilized.

Geothermal energy in the Earth is situated everywhere, almost immediately below the surface in:

1. non-porous or very slightly porous dry rocks;
2. significantly porous rocks whose pores are filled with water or steam (free groundwater thermal water or hot water steam);
3. molten rocks - magma (volcanic lava).

In relation to these areas where it is situated power, the geothermal energy is divided into:

1. hydrogeothermal (geothermal energy accumulated in the underground thermal waters whose temperature is higher than 10°C);
2. petrogeothermal (geothermal energy accumulated in dry rocks below the depth at which their temperature is the average of about 10°C);
3. magmogeotheremal energy (geothermal energy accumulated in magma).

Geothermal energy has advantages over the fossil - non-renewable energy sources. That is why its use is stimulated in developed countries. Contribution to the use of geothermal energy to the standard of living in the regions and countries, where it has long and extensively use, is huge. It enhances the quality of life by improving the quality of housing, recreational opportunities, quality of living environment and contributes to the economic development.
Geothermal energy is domestic, autonomous. Its exploitation and use result into avoidance the political and financial blackmails or conditions, as it is the case, for example, to import of oil. According to the state in 1993, eight countries have 81% of the world total oil reserves, the six countries are the owners of 70% of gas reserves, and eight countries have 89% of the world total coal reserves.

Geothermal energy is a domestic resource that could contribute to our energy security and reduce our trade deficit, replacing the imported fuels. For example, the thermal equivalent of geothermal energy in our country for a year, and that is scattered in the atmosphere, is about 250,000 tons of oil. That amount is 38% of its total current domestic production. Geothermal heating plants are cheaper than heating plants in which the heat is generated by burning of oil, coal and gas.

The unit prices of heat and electricity from geothermal energy are always lower than the unit prices of heat and electricity from the fossil energy sources. The sites of geothermal energy have a long life of exploitation, which is longer than the sites of fossil energy fuels. This is because the geothermal energy is renewable and there is no “waste rock” during exploitation [3].

4. ENERGY POTENTIAL OF GEOTHERMAL RESOURCES IN SERBIA

Geothermal energy in Serbia is symbolically used, Only with 86MW, although potential Serbia is one of the richest countries by heothermal potential. Its use and exploitation have to become more intense because the following factors force: tension of oil-energy imbalance, imminent transition to a market economy, asteady increase in deficit of fossil and nuclear fuels, deterioration of environmental situation and increase the costs for environmental protection. The greatest importance for Serbia will have a direct use of geothermal energy for heating the rural and urban settlements and development of agriculture and tourism.

Geothermal characteristics of the territory of Serbia are very interesting. This is due to the favorable geological structure of the terrain and favorable hydrological and geothermal characteristics of the terrain. Geothermal flux density is the main parameter, based on which, the geothermal potential of an area is assessed. It represents the amount of geothermal heat that every second comes through an area of 1 m^2 from the Earth interior to its surface. At the

largest portion of the territory of Serbia, the geothermal heat flux density is higher than its average value for continental part of Europe, which is about 60 mW/m^2. The highest values of more than 100 mW/m^2 are in the PannonianBasin, the central part of southern Serbia and central Serbia. At the territory of Serbia, out of the PannonianBasin, there are 160 natural springs of geothermal water with temperature above 15°C. The highest temperature have water sources in Vranjska Spa (96°C), followed by Jošanička Spa (78°C), Sijerinska Spa (72°C), etc.

Total abundance of all natural geothermal sources is about 4,000 l/s. To our knowledge, in the territory of Serbia, there are 60 sites of geothermal water with temperature higher than 15°C to a depth of 3,000 m. Total amount of heat that is accumulated in the sites of geothermal waters in Serbia to a depth of 3 km, is about two times higher than the equivalent thermal energy that could be obtained by burning all types of coal from all their deposits in Serbia. The abundance of 62 artificial geothermal sources, i.e. geothermal boreholes, in the area of Vojvodina is about 550 l/s, and the thermal power is about 50 MW, and the rest of Serbia from 48 boreholes is 108 MW. At the territory of Serbia, in addition to favorable opportunities for the exploitation of thermal energy and other geothermal resources of geothermal waters, there are good opportunities for exploitation the geothermal energy from the "dry" rocks, i.e. rocks that do not contain free groundwater. In this case, the water is pumped into the underground hot rocks where it is heated. By pumping such heated water, the energy transfer from hot rocks is realized. Exploitation of energy from this resource will not begin in due course taking into account the current minimum use of natural springs of hot and healing water, although the technologies for this application are developed in the world [4].

4.1. ENERGY EFFICIENCY

In Serbia, very significant problem is a lack of sufficient energy efficiency and irrational use of existing sources or bore holes that are in exploitation. In thermal spas, there is not paid any attention to energy efficiency and large amounts of hot water are discharged as useless, although it is possible to extract enough energy for space heating or pools from them using the heat pumps.

At the same time the space is heated by coal, oil or electricity. If the rationalization of use the heat energy from hot springs in spa will be made, then the same sources of energy could supply the new and attractive facilities. Also, the future users of the currently sealed bore holes should be introduced in time with the ways of rational use maximum energy potential which will be shown by favourable results of financial analyses [5].

5. POTENTIAL AND UTILIZATION DEGREE OF GEOTHERMAL SOURCES IN THE AREA OF TIMOK REGION RESOURCES

One of the most significant geothermal resources in Timok Region are undoubtedly the thermomineral, mineral and thermal waters. Different localities of sources with specific characteristics are the basis for development of tourism in the spa-climatic places. Their diversity by physical and chemical composition, temperature, abundance of sources and others make the area attractive and appealing.

Based on geomorphological and geological-tectonic conditions, the hydrogeological conditions are complex, and the mineral springs are numerous. Within the Timok Region are separated two regions for easier viewing and displaying the certain characteristics and distribution of mineral water.

Dacian Basin includes the Danube Ključ and Negotin Plain, limited by the Danube on the north-east and extends on the west to the edge of the mountains Miroc and Deli Jovan. On this line, several deep exploratory bore holes were done with registered, among other things, the occurrences of hydrogeothermal water. The presented data indicate that in the deepest parts of the widespread Tertiary sediments (depth 1,000 m) are highly mineralized thermal water with a value of dry residue up to 92 g/l, out of which 85 g/l is NaCl, which confirms that this is alkaline water. Thermometric measurements in bore holes show the registered temperatures between 44 to 80.5ºC. These data suggest that further research should be intensified in this region.

Carpatho-Balkan Region covers the territory of the south and southeast Serbia. It is characterized by complex hydrogeological conditions, which indicate the existence of numerous mineral, thermomineral and thermal waters.

The known localities of source deposits are in the zone of Soko Spa, Brestovacka Spa and Gamzigradska Spa, villages of Sarbanovac, Sumrakovac, Nikolicevo, Grlište, Rgošte, Jošanačk Spa and others. Physical characteristics of thermomineral water from these sources indicate that the water are mostly clear, without color, odor and taste. Based on temperatures, ranging from 26-60°C, they can be classified into hypotermal, homeothermal and hyperthermal water.

Based on anions, different classes of these waters are observed as well as different groups within the class, which vary based on the content of cations. Based on different cationic composition, the following types of water were formed: ***alkaline*** and ***earthly alkaline***. In the alkaline water, sodium and potassium prevail, which include the Brestovačka spas, Gamzigradska Spa and Šarbanovac. In earthly alkaline water, calcium prevails, which include the Sokob Spa and Rgoška Spa. Radioactivity may be insignificant to emphasized. The latter is characterized by water in Soko Spa and it is 68.69 Bq, and in the Niska Spa is 202.028 Bq. The basic gas composition of the water indicates that they are nitric. The amount of nitrogen is up to 68% by volume [6].

The importance of thermomineral water is multifunctional for development of spa tourism, basically for balneotherapy as a form of treatment. The basis of balneotherapy make mineral water, mud and climate. Contemporary understood balneotherapy is a complex therapeutic discipline that in many factors acts on the body as a whole and in the whole is a change in the environment, diet regime, active and passive psychophysical vacation [7].

The health tourism in spas is unjustified and unnecessary fully equated with spa tourism [8]. It is certainly the oldest form of tourism in spas is health tourism, but not the only, but one of the many types of tourism. Besides this, some spas are urban centers, centers of picknik, excursion, cultural-sports, cultural events organizing and congress tourism, then the third age

tourism and transit tourism. This kind of thinking is demonstrated by the fact of the length of stay in spas. From the earliest 20-25 days, the average stay was reduced to 5-7 days. It is more clearly confirmed by the differences in length of stay of visitors of specialized institutes and rehabilitation centers in relation to the visitors of spa hotels and other accommodation facilities [9].

6. SPA AND CLIMATIC PLACES

Spas are resorts that have a number of specifics which resulted from location with thermal and mineral sources and efforts to exploit the value of sources for treatment and recreation [8]. Thus, in order to be able to successfully develop the basic functions of spa (curative and recreational), more requirements and tasks would have to be met.

-***The first requirement*** is to ensure the protection and rational use of primary and specific phenomena - thermomineral springs, which present the primary natural rarity and value, the main feature of spa individuality and center point of the spatial organization of spa places.

-***The second,*** the specific requirement is the protection and improvement the spa environment, which is a condition of maintaining their health and recreational role.

-***The third requirement*** is the planned establishment a harmonious spatial balance between construction and architectural structures and natural landscapes (vegetation and park green), with an intention to achieve the result that is unique and individually distinctive spa environment, i.e. visual spatial identity, which should be the image of each spa [10].

6.1. SOKO SPA

Soko Spa is a town and administrative center, balneological center, situated on the edge of Sokobanjska valley, at the foot of mountain Ozren. It was developed at the altitude of 400 m, and it is accessible from direction of Aleksinac, Knjaževac and Boljevca. It was named after the old fortSokograd, with 19,500 inhabitants distributed in 25 villages. Soko Spa is one of the most radioactive spas in Serbia. It has several sources of mineral water of different temperatures, which outbreak along the fault. Radioactive water contains up to 13 Mach units per liter and gases 33.7 to 50 Mach units. Hot springs are the "***Preobraženje"*** and ***"Saint Archangel."*** The first is located east of the bathroom and it is in the form of a well, depth of ten meters. Gases constantly erupt from it. The second source is the building of bathroom where the gases erupt and plenty of hot mineral water. Temperature of mineral water is 40 to 46.5°C, source capacity is about 3,000 liters of water and 6-7 liters of gas per minute. The main source gives 28 liters of water per second. Mineral water in Soko Spa comes from a great depth, and shallower layers, due to the cold water temperature of 16ºC. The main source of "Preobraženje", in a liter of water of 6°C, contains mostly calcium (0.0972 g), sodium (0.0168 g), magnesium (0.0140 g.) and potassium (0.0023 g)and of cations and anions it has mostly hydrocarbonate (0.3970 g) and sulfate (0.0214 g). Radioactivity of this water sourceis 6.10 Mach units [11].

6.2. GAMZIGRADSKA SPA

Gamzigradska Spa is situated next to the road Paracin-Zajecar on both sides of the composite valley of Crni Timok, surrounded by the Kucaj mountain on the west, Deli Jovan on the north, Stara Planina on the east Tupižnica on the south. Gamzigradska Spa has typically five thermal sources, temperature of 32, 41 and 6°C and a source of drinking water, temperature 17°C. Abundance of source is 5 l/s. The water has radioactive elements radium and uranium. The reaction of water is 7.2, and it is one of the neutral and does not affect the acidity in the body. Total mineralization is negligible, with the absence of iron, with increased content of chlorine, calcium and sodium. The healing properties are the content of rubidium, barium, phosphorus, copper and fluorine, as well as elevated temperature. In the riber bed, the sources have abundance of 2.5-2.8 l/s, temperature 41ºC and they can only be used during low water level. Sources at the bank of river have abundance of 2.5-5.5 l/s, temperature of 37 - 40°C, where the bathroom was built, which Crni Timok floods after major rainfall, and the pools must be cleaned after withdrawal of river. These sources are not used for room heating due to the aggressive water [11].

6.3. BRESTOVAČKA SPA

Brestovačka Spa is situated in the valley of the BorRiver, left tributary of the Crni Timok, located on the northwest of the village of Brestovac and southwest of Bor, under the best-preserved paleovolcanic cup of Tilva Njagra, at the mouth of CrnovrskaRiver and stream Pujica in BanjskaRiver, at the altitude of 385m. Brestovacke spa has 10 sources and they are located at relatively small area, with smaller and average annual abundance of 0.2-0.5 l/ s, out of which seven are in the pools, and one is used for bath charging. According to ttotal abundance of 8.4 l/s, the water facilities of spa are relatively rich in abundance of mineral water, temperaturebetween 32 and 40°C. Thermomineral water of Brestovacke spa occurs at ten natural sources, two shallower probes and a deeper geological borehole. Water temperature reaches 40.7°C, and the abundance varies between 7.9 and 8.5 liters per second. Water of mineral sources is weakly mineralized acrotherma, weakly chemically sulphatic, i.e. a little sulphuric, ferruginuos, carbonic-acidic and weakly radioactive. Brestovačka mineral water cures rheumatic diseases of joints and muscles, sciatica, neuralgia and neurasthenia, paralysis, anemia, insomnia, fatigue, arteriosclerosis and other diseases [11].

7. DEVELOPMENT OF HEALTH TOURISM

The successful development of spa tourism and better structuring of integrated and complex touristic offer should be based on such economic principles that will cover many market segments. In this sense, from the point of view of design the integrated and complex touristic product, it is necessary to define some priorities for development of these places, based on comparative advantages, namely:

- Specialized routing the wellness spa and health offer of spas, based on natural healing and health factors with a long tradition and a highly skilled staff;

- The possibility of organizing a combined spa-mountain tourism and spa tourism to tourism on nearby lakes, including the rich cultural-historical and ethnographic heritage;
- Program enrichment of spas, combining national with modern, year-round;
- Favorable geographical position with environmentally sound environment and unique local gastronomy;
- Relatively low price of therapeutic and other programs;

In development of new forms of spa tourism in Timok Region by modification the existing offer, it is necessary to define the following:

- A detailed plan to restructure the spas, separately, according to the current condition;
- Create the quality standards and brands according to the specifics of each spa in the field of products and other activities of health and recreational tourism;
- Improving the quality and specialization of hotel services with specifics of local gastronomy;
- State to define a unified model of spa privatization;
- Improving the quality of services creating the innovative plans and programs;

Possibilities of complementary development of spa-mountain tourism exist in Timok Region. The advantage in this direction has Soko Spa with mountain Ozren, landscape unit, characterized by the originality of the natural landscape, high degree of nature conservation, especially of protected nature reserves and landscaped picnic areas, and already it has some experiences and specific programs and contents of stays, trips and recreation, which combined include: spa climate; warm-sedative, soothing and mountain; recreational-stimulating, invigorating and refreshing, possibly with the mountain Rtanj.

Good transport links and proximity to the mountain Ozren allows inclusion of this type of tourism in the offer. Brestovačka Spa with the mountain Stol, Dubasnica and the Zlot cave, arranged for tourists (Lazar and Vernjikica caves), the Zlot source with motel in the coastal, canyon of the Lazar valley and volcanic cups Tilva Njagra and Tilva Mika and large andesite massif Crni vrh, have an excellent chance of complementary tourism development in the future. Also, Gamzigradska Spa with Stara Planina, are important archaeological remains of the Roman imperial city Romuliana Felix, which is arranged for tourist visits, rich cultural and historical heritage of the Radul-beg shelter and the National Museum with rich exponents in Zajecar in the immediate environment of Gamzigradska Spa, which confer the greatest anthropogenic, archaeological, cultural and historical value among spas in Timok Region [11].

8. CONCLUSION

Since the estimated total amount of geothermal energy that could be used is much more than the overall quantity of energy sources based on oil, coal and natural gas, the geothermal energy should certainly havemore importance. Especially, if it is taken into consideration that it is a cheap, renewable source of energy, which is also the environmentally friendly. Since geothermal energy is not readily available everywhere, the places where the energy is readily

available (the edges of tectonic plates) should be used and so reduce a little the pressure on fossil fuels and thus help the country to recover from toxic gases. Geothermal energy due to its large potential presents the energy of future and requires the man to treat it environmentally friendly. To achieve such a goal, it is necessary to be familiar with systems that are developed for exploitation the geothermal water. The challenges are in front of experts whose knowledge may contribute to the fact that in Serbia this energy source could provide the future survival of the living. Proper utilization the geothermal resources would provide a development of entire economy. With the growth of the economy, the habits of population would be changed.

One of the most significant geothermal resources in Timok Region are undoubtedly the thermomineral, mineral and thermal waters. The level of exploration the mineral water in Timok Region is unsatisfactory, and a degree of utilization the water is mixed. Higher level of exploration is caused by construction of a certain number of health facilities with modern balneotherapy treatment of patients and recreational activities. In recent years, some explorations were conducted in various locations of narrower zone of appearances, and they were directed mainly at the elementary data on abundance, physical and chemical composition, temperature, etc. In the future, the systematic and detailed investigations have to be continued with the aim of discovering new phenomena and sites, but also to explore, control and protect the existing resources that are already in the touristic exploitation.

Regarding to the basic natural values and their dominant functional features, the spas of the Timok Region present the image high functional health and recreational touristic centers. Timok region has the sources of thermomineral, gas and radioactive water with long tradition in the treatment, rehabilitation and recreation, and their touristic component is emphasized with a tendency of further development.

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DISTRIBUTION OF ENDEMIC FISH SPECIES IN EASTERN HERZEGOVINA

RASPROSTRANJENJE ENDEMIČNIH VRSTA RIBA ISTOČNE HERCEGOVINE

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***Abstract**: Fish represent significant component of total biodiversity and are indicators of the state of aquatic habitats. Of particular importance are the endemic species that usually have a small and limited distribution and represent a valuable genetic resource. This paper reviews the distribution of endemic minnows Telestes metohiensis and Delminichthys ghetaldii in Eastern Herzegovina, including a number of watercourses in the region. The results showed that striped pijor (Telestes metohiensis) was present at a number of sites and has a wider range, unlike Delminichthys ghetaldii which was found in a few investigated sites.*
***Key words:** endemic species, minnows, distribution.*

***Apstrakt:** Ribe predstavljaju značajnu komponentu ukupnog biodiverziteta i jedan od pokazetelja ekološkog stanja vodenih staništa. Od posebnog su značaja endemične vrste koje najčešće imaju mali i ograničen areal rasprostranjenja i predstavljaju vrijedan genetički resurs. U radu je dat pregled istraživanja rasprostranjenja endemičnih vrsta gaovica Telestes metohiensis i Delminichthys ghetaldii na području Istočne Hercegovine, pri čemi je obuhvaćen veći broj vodotoka ovog regiona. Rezultati pokazuju da je gatačka gaovica (Telestes metohiensis) zastupljena na većem broju lokaliteta i da ima širi areal, za razliku od vrste Delminichthys ghetaldii koja je ustanovljena na manjem broju istraživanih lokaliteta.*
***Ključne riječi**: endemi, gaovice, rasprostranjenje.*

1. INTRODUCTION

Fauna of freshwater fishes of Bosnia and Herzegovina is characterized by significant species richness and diversity. According to Sofradžija [1] biodiversity of freshwater Cyclostomata and fishes is manifested with 118 species, from which 105 species are autochthonous and 13 allochthonous. It is necessary to emphasize that biosystematic status and position of certain species suffered significant changes lately. In total ichthyofauna special place occupy endemic species which have narrow areal of distribution [2] and very often inhabit only specific regions. This species are associated with ecological factors of its habitat and have less ability to adapt to environmental changes. Minnows, endemic fish species inhabiting Eastern Herzegovina and which systematic status has been changed significantly, also belong to endemic representatives of ichthyofauna of Bosnia and Herzegovina.

According to earlier used systematics, species were named: striped pijor (*Paraphoxinus metohiensis*, Steindachner, 1901), trebinje minnow (*Paraphoxinus pstrossi*, Steindachner, 1882) and popovo minnow (*Paraphoxinus ghetaldii*, Steindachner, 1882), which later changed names in *Phoxynellus metohiensis*, *Phoxynellus pstrossi*, *Phoxynellus ghetaldii*. Recent systematics classify minnows from this area in two species: *Telestes metohiensis* (striped pijor) and *Delminichthys ghetaldii* (trebinje and popovo minnow) [3]

Some new research [4] show that there are morphological variations within the species *Telestes metohiensis* and that individuals, classified into one species, can be classified in three distinct species: already existing *Telestes metohiensis* and two new species *Telestes dabar* and *Telestes miloradi*.

Telestes metohiensis and *Delminichthys ghetaldii* are present in red book of endangered species, and to largest on line base of this data, WCMC and IUCN, classify them into first category, species that have insufficiently data about and are threatened with disappearance, due to environmental changes caused by anthropogenic influence.

Habitats of this species are situated in karst area which is characterized by specific hydrological regime. During spring and autumn large amount of water appears, while during summer months some watercourses dry up, where water retains in underground systems. These species were among the most numerous species in Dabar, Fatničko and Popovo filed and in watercourses in that area, according to biomass, and had great importance in people's everyday life [5]. In this research distribution of Telestes metohiensis and *Delminichthys ghetaldii* in Easters Herzegovina was monitored.

2. MATERIAL AND METHODS

Distribution of endemic species in Eastern Herzegovina was monitored in a few watercourses and accumulations in this area. Earlier data about distribution of this species are used, and also the data which were collected during research of this area and minnows in period 2004-2013., with occasional sampling. For fish collecting was used transportable electroshocker IG 600 with power 1.2 kW, as well as nets with different diameter and sport fishing techinques. Besides determining presence of minnows in analyzed waterbodies, morphometric, biochemical and ecophysiological researches of minnows were conducted. Researches were done in Bileća water reservoir, in rivers: Vrijeka, Opačica, Pribitul, Trebišnjica, Sušica, Zalomka, Mušnica, and streams Suško and Ljubomir. Some individuals were also collected in Fatničko field after water spills.

3. RESULTS AND DISCUSSION

Research showed that striped pijor (*Telestes metohiensis*) had significantly wider areal and that was recorded in most of analyzed watercourses and accumulations. So its presence was recorded in Bileća water reservoir in significant measure during research conducted in period 2004-2006. Also, this species was determined in watercourses of Dabar field: Vrijeka, Opačica, Suški stream and Pribitul during research in 2010, 2011, 2012 and 2013. In significant measure its presence was also recorded in river Mušnica in Gacko municipality and river Zalomka in Nevesinje municipality [6].

According to literary data striped pijor was widespread in karst rivers and springs in the area of Gacko, then Nevesinje field, area of Cavtat and in some other waters of Herzegovina and Dalmatia [7].

In the same time Kottelat and Freyhoff [3] stated that striped pijor was present in waters of Nevesinje, Gacko, Cerničko, Dabarsko and Lukovac filed in Bosnia and Herzegovina, and in river Ljuta in Croatia. Old findings in river Ljuta were not confirmed so it is considered regionally extinct [8].

Čučković [9] also state the presence of this species in river Gračanica (Gacko municipality), and especially around estavel Vjetrenik where individuals hide during drought period. Estavel represent areas where during the flood water comes out, while during its withdrawal water descent through these openings. With water occurrence in such places the minnows come out in surface waters.

According to Sofradžija [1] parent population in Gatačko filed is very sparse so in can be considered highly endangered.

Distribution of *Delminichthys ghetaldii* (according to new systematic trebinje and popovo minnow are consolidated in one species) was also monitored on localities of Eastern Herzegovina. According to our research this species was recorded in area of Fatničko field after water outflow and flooding the field. Also, it was recorded after water outflow from estavel Obod and its retain in bed through Fatničko filed. Its presence was also determined in Ljubomir stream.

Figure 1. Fatničko field

When it comes to distribution of trebinje minnow according to Sofradžija [1], it was present in underground waters of Herzegovina, Dalmatia, Bosnia and Lika, and was numerous in waters of Popovo filed once, while popovo minnow was widespread in limited area around Trebinje, respectively in underground waters: Trebišnjica, Ljubomir stream, Čepelica. The same author states the estimation that population of this species is scarce and as such is highly endangered.

According to Čučković [9] trebinje minnow was present in wells around Trebinje, Ljubomir stream, respectively its blue zone, then in Maravića and Lodža well. The same author stated

that was present in Čepelnica once, and that its number significantly reduced and in the end it disappeared. Also it was stated that it number was high in water that came from estavels and flooded Mokro filed.

Population of trebinje minnow is decreasing, and in the previous period was significantly present in upper part of river Trebišnjica, while popovo minnow was distributed in waters of Herzegovina, Dalmatia and Bosnia[7]. This author states that this species was also recorded in river Kasindol which flows in river Željeznica, tributary of Bosna [7].

4. CONCLUSION

When it comes to distribution of minnows based on data collected during the research it can be concluded that minnows were present in analyzed localities in significant number, but with different distribution and specific phenology.

Striped pijor (*Telestes metohiensis*, Steindachner, 1901) has wide areal and appears in most of analyzed localities, while trebinje minnow (*Delminichthys ghetaldii*, Steindachner, 1882) has very narrow areal and its appearance is connected with changes of hydrological characteristics.

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MICROBIOLOGICAL WATER QUALITY OF THE LAKE PELAGIĆEVO

MIKROBIOLOŠKI KVALITET VODE JEZERA PELAGIĆEVO

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Abstract: *Microbiological indicators of water quality show a nature and intensity of the pollution and whether it is present permanent or current impact of some pollutants. They tell us about saprobic level and eutrophysation, as well as the potential power of self-purification (autopurification). Water sampling at Lake Pelagićevo was done twice, at three sites, in a depth profile. In addition to basic microbiological parameters, analyses of phytoplankton and zooplancton were conducted. Results of these analyses showed that water for the Lake Pelagićevo belonged to second quality class which was also confirmed by the results of saprobiological analysis.*
Key words: *microbiology, Pelagićevo, water.*

Apstrakt:*Mikrobiološki indikatori stanja i kvaliteta vode ukazuju nam na prirodu i intenzitet zagađenja, kao i na to da li se radi o trajnom ili trenutnom uticaju nekih zagađivača. Takođe nam ukazuju na stepen saprobnosti i eutrofizacije tih voda, kao i na potencijalnu moć samoprečišćavanja (autopurifikacije) vode. Uzorkovanje vode iz jezera Pelagićevo vršeno je dva puta, na tri različita lokaliteta, po dubinskim profilima. Pored osnovnih mikobioloških parametara urađena je i analiza fito i zooplanktona. Rezultati mikobioloških analiza pokazuju da voda jezera Pelegićevo pripada drugoj klasi kvaliteta, što potvrđuje i rezultati saprobiološke analize.*
Ključne riječi*: mikrobiologija, Pelagićevo, voda.*

1. INTRODUCTION

Biological component represent significant indicator of ecological conditions of aquatic environment and gives complete picture about permanence of these parameters. Animals are sensitive to changes in physico-chemical parameters of water, so species composition and abundance represent base for characterization and estimation of ecological status of rivers and lakes. Composition of biological communities is conditioned on the one hand, by a long-term stabile conditions, and on the other by biological modifications of environment on short-term base [1].

Nature and intensity of pollution, levels of saprobity and eutrophisation, autopurification ability, and whether the pollution is permanent or temporary, can be determined based on microbiological indicators of state and water quality. For complex and credible analysis of surface water quality it is recommended conducting research simultaneously at all levels, so it is necessary to monitor physico-chemical, microbiological and biological indicators of quality [2]. The aim of this research is related to determination of water quality based on microbiological characteristics and saprobity level based on phytoplankton.

2. MATERIAL AND METHODS

Water sampling was done on three localities of LakePelagićevo, from surface and in depth profile, on 21st and 26th of July 2012. On locality 1 and 2 samples were collected form surface

and at a depth of 1 m and 2 m, while on locality 3 sampling was done on surface and at 1 and 1.5 m. Sampling was conducted early in the morning.

Samples were taken in sterile containers in aseptic terms according to prescribed procedure [3], [4]. Presence of certain bacterial groups is determined by indirect cultivation methods [5], [6], [7], [2], [4]. Basic microbiological parameters prescribed by Regulation on hygienic quality of drinking water [8]: number of psychrophilic and mesophilic aerobic organotrophs, total and fecal coliforms, fecal *Streptococcus* and *Enterococcus*, and presence of potentially pathogen bacteria: *Escherichia coli*, *Pseudomonas aeruginosa*, *Clostridium*, *Proteus*, *Salmonella* and *Shigella* were determined. Total bacteria count and number of facultative oligotrophic bacteria was also determined beside parameters prescribed by the Rulebook [2].

3. RESULTS AND DISCUSSION

3.1. MICROBIOLOGIC WATER CHARACTERISTICS

Microbiologic characteristics of water from Lake Pelagićevo by localities and analyzed profiles are presented in tables 1, 2 and 3.

Table 1. Values of microbiological parameters on locality 1

Parameter	Locality 1					
	21.07.2012.			26.07.2012.		
	surface	1 m	2 m	surface	1 m	2 m
aerobic heterotrophic psychrophilic bacteria (col/ml)	5000	2880	5000	3230	2850	4500
aerobic heterotrophic mesophilic bacteria (col/ml)	158	100	175	230	170	565
total coliform bacteria count (col/ml)	10	not isolated	22	2	not isolated	not isolated
Escherichia coli (col/ml)	not isolated	not isolated	not isolated	1	not isolated	not isolated
Fecal *Streptococcus* (kol/ml)	1	not isolated	4	not isolated	3	2
*Salmonella*and *Shigella*	not isolated	not isolated	not isolated	not isolated	not isolated	not isolated
Clostridium	not isolated	not isolated	not isolated	not isolated	not isolated	not isolated
Proteolytic bacteria (col/ml)	1225	1000	1450	1100	1100	1320
Saccharolytic bacteria (col/ml)	980	1050	1100	870	965	1450
Lypolitic bacteria (col/ml)	466	450	650	305	313	420

Number of aerobic heterotrophic psychrophilic bacteria, total coliforms and fecal *Streptococcus* indicated water of II quality class according to the Regulation on Classification

and Categorization of Water and Water courses [9]. Total coliform bacteria were isolated just in surface layer, and among them was also isolated *Escherichia coli*, while fecal Streptococcus were isolated only at a depth of 1 and 2 m. Presence of E. coli in small number (1 col/ml) indicates insignificant presence of fresh fecal substances on this locality. Potentially pathogens: *Salmonella*, *Shigella* and *Clostridium* were not isolated in any of the depth profile.

In surface layer and at a depth of 1 m dominated proteolytic bactera, while at depth of 2 m is slightly higher number of bacteria that decompose carbohydrates.

Table 2. Values of microbiological parameters on locality 2

Parameter	Locality 2					
	21.07.2012.			26.07.2012.		
	surface	1 m	2 m	surface	1 m	2 m
aerobic heterotrophic psychrophilic bacteria (col/ml)	2580	2088	2450	2733	2450	4800
aerobic heterotrophic mesophilic bacteria (col/ml)	149	170	162	220	620	2000
total coliform bacteria count (col/ml)	18	not isolated	16	6	9	11
Escherichia coli (col/ml)	not isolated	not isolated	not isolated	not isolated	not isolated	not isolated
Fecal *Streptococcus* (kol/ml)	not isolated	not isolated	3	not isolated	13	14
Salmonella and *Shigella*	not isolated	not isolated	not isolated	not isolated	not isolated	not isolated
Clostridium	isolated	isolated	not isolated	not isolated	isolated	isolated
Proteolytic bacteria (col/ml)	660	633	1200	585	633	720
Saccharolytic bacteria (col/ml)	700	620	915	610	540	766
Lypolitic bacteria (col/ml)	120	174	385	118	150	300

Total aerobic heterotrophic psychrophilic bacteria count indicated water of II quality class by Kohl and according to the Regulation on Classification and Categorization of Water and Water courses. Distribution of coliforms and potentially patogenic bacteria is identical as the one on locality 1, with difference that here was recorded slightly higher number of fecal *Streptococcus*.

When it comes to physiological groups of bacteria, bacteria that decompose proteins and carbohydrates dominated, while lipolytic bacteria count was slightly lower. All monitored groups of bacteria were most numerous at a depth of 2 m, just above the bottom.

Table 3. Values of microbiological parameters on locality 3

Parameter	Locality 3					
	21.07.2012.			26.07.2012.		
	surface	1 m	2 m	surface	1 m	1.5 m
aerobic heterotrophic psychrophilic bacteria (col/ml)	1780	3000	4100	3420	2850	3600
aerobic heterotrophic mesophilic bacteria (col/ml)	126	460	580	190	280	450
total coliform bacteria count (col/ml)	not isolated	not isolated	not isolated	5	10	10
Escherichia coli (col/ml)	not isolated	not isolated	not isolated	not isolated	not isolated	not isolated
Fecal *Streptococcus* (kol/ml)	3	not isolated	3	not isolated	5	6
Salmonella and *Shigella*	not isolated	not isolated	not isolated	not isolated	not isolated	not isolated
Clostridium	not isolated	isolated	not isolated	not isolated	isolated	isolated
Proteolytic bacteria (col/ml)	733	750	1026	925	860	1100
Saccharolytic bacteria (col/ml)	710	786	800	700	725	833
Lypolitic bacteria (col/ml)	310	225	333	240	180	215

Total organotrophic psychrophilic bacteria count was highest at the bottom and corresponded to II quality class by Kohl [10] and II class according to the Regulation on Classification and Categorization of Water and Water courses [9]. Among them the highest number showed proteolytic activity, while the lowest were lipid decomposers. Number of potentially patogenic aerobic mesophilic bacteria is low at all three depths. Total coliforms were isolated in all three samples, but their number was not exceeded 1000 col/100 ml whch also corresponded to II class water. Among coliforms *E. coli* was not isolated in any of the samples. From fecal bacteria only fecal *Streptococcus*was isolated, at depth of 1 and 1.5 m.

3.2. PHYTOPLANKTON

In the aim of more complete estimation of water quality and the state of ecosystem analyses of plankton organisms were also conducted, and based on its indicator values and frequency saprobic indices and saprobity level were calculated. Obtained results are present in table 4.

Table 4. Results of saprobiological analysis (26.07.2012.)

Species	Indicator value (Wegl, 1983)	Locality 1	Locality 2	Locality 3
Cyanobacteria				
Anabaena solitaria	1.7			1
Microcystis aeruginosa	2.0	1	1	1
Microcystis flos-aquae	2.0	1		
Ceratium hirundinella	1.3	3	3	3
Peridinium cinctum	1.6	5	5	5
Euglenophyta				
Euglena gracilis	1.3	1	1	
Euglena oxyuris	2.5		1	1
Lepocinclis sp.	2.3	1		1
Phacus helicoides	2.5		1	
Phacus longicauda	2.6	1	1	1
Phacus orbicularis	2.2	1	1	1
Trachelomonas hispida	2.0		1	
Bacillariophyta				
Cyclotella sp.	1.5		1	1
Melosira sp.	2.0	1	1	1
Navicula sp.	2.0	1	1	
Pinullaria sp.	1.2		1	
Chlorophyta				
Coelastrum proboscideum	1.3		1	
Cosmarium sp.	1.8	1	1	
Eudorina elegans	2.2	1	1	
Oocystis solitaria	1.7		1	
Pediastrum duplex	2.2	1		1
Pediastrum gracillinum	2.2	1	1	1
Pediastrum simplex	1.5		1	
Pediastrum tetras	1.8	1		
Staurastrum tetracerum	1.4	1	1	
Chrysophyta				
Mallomonas sp.	1.7	1		1
Xanthophyta				
Tribonema sp.	1.6	3	3	3
Saprobity index		1.78	1.74	1.80
Saprobity level		ß- mesosaprobic	ß- mesosaprobic	ß- mesosaprobic

Saprobity index on all localities was uniform and indicated β-mesosaprobic water that corresponded to II water quality class. On all three localities bloom of *PyrrophytaPeridinium cinctum* (according to new systematic it belongs to *Dinoflagellata*) was expressed which caused supersaturation in surface layers of the water. Beside this species, presence of one more Pyrrophyta was significant – *Ceratium hirundinella,* and also yellow-green algae from

genus *Tribonema*. Every othes species are present in significantly lower number. When it comes to quantitative distribution, the most number of taxons belong to green algae (9 taxons) and *Euglenophyta* (7 taxons), while *Bacillariophyta* were represented with 4, *Cyanobacteria* with 3, *Pyrrophyta* with 2 and *Chrysophyta* with 1 taxon.

Reanalysis of phytoplankton sampled on 06.08.2012. showed that number of *Peridinium cinctum* and *Ceratium hirundinella* reduced, and that there Cyanobacteria dveloped, mostly *Microcystisaeruginosa, Aphanizomem flos aquae* and *Anabaena solitaria.* Appearance of this species is common in this period of the year, where it should take care about its overgrowth because its massive mortality may cause some consequences.

4. CONSLUSION

Based on total organotrophic psychrophilic bacteria count on all three analyzed localities water of second quality class was determined.

Distribution of indicators of fecal pollution indicated that there was no permanent flow of fresh fecal substances, except on first locality where results showed insignificant presence of fresh fecal substances. Potentially patogenic bacteria from groups Salmonella and Shigella were not isollated in any of the samples. Potentially patogenic bacteria from Clostridium group, which are normal habitant of aquatic ecosystems were isolated at certain depths on second and third locality.

Based on results of phytoplankton analysis it can be concluded that distribution of phytoplankton is not favorable for habitats that are rich with fish because a relatively small number of species was present, where quantitatively dominate species that contain celulose armour and cn not be used as food for zooplankton. On the other hand, representatives of Chlorophyta, which presence is desirable in fishponds, is low qualitatively and quantitatively. Gree algae Spirogyra was only recorded in intestinal content of the fish, but not in the free water. It is a species that is peryphyta, but it can be present in plankton where it formes filamentous clumps.

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SUSTAINABLE USE OF NATURAL RECOURCES IN FUNCTION OF AGRICULTURE DEVELOPMENT IN THE REPUBLIC OF SERBIA

ODRŽIVO KORIŠĆENJE PRIRODNIH RESURSA U FUNKCIJI UNAPREĐIVANJA RAZVOJA POLJOPRIVREDE U REPUBLICI SRBIJI

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Abstract: *The paper explores and analyzes the relevant economic issues of the sustainable use of natural resources and possibilities of improvement of agriculture in the Republic of Serbia, as well as the representation of the basic natural resources (climate, agricultural land, water resources, biodiversity, etc.) and their ecological and economic characteristics. It also analyzes the characteristics and current limiting factors in the use of agricultural resources and capabilities of various countries to promote and develop agriculture. In particular it highlights the environmental consequences of pollution and degradation of natural resources and the possibility of their rehabilitation in development of methods and application of sustainable agricultural development.*
Keywords: *natural resources, agriculture, agrarian, sustainable development and the market*

Apstrakt*: U radu se izučavaju i analiziraju relevantna pitanja ekonomije održivog korišćenja prirodnih resursa i mogućnosti unapređivanja poljoprivrede u Republici Srbiji, kao i zastupljenost osnovnih prirodnih resrusa (klimatski, poljoprivredno zemljište, vodni resursi, biodiverzitet i dr) i njihova ekološka i ekonomska obeležja. Sagledavaju se karakteristike i ograničavajući činioci dosadašnjeg korištenja poljoprivrednih resursa raznih zemalja i mogućnosti unapređivanja i razvijanja poljoprivrede. Posebno se ukazuje na ekološke posledice degradacije i zagađivanja prirodnih resursa i mogućnosti njihove revitalizacije u funkciji unapređivanja i primene metoda održivog razvoja poljoprivrede.*
Ključne reči*: prirodni resursi, poljoprivreda, agrotehnologija, održivi razvoj i tržište.*

1. INTRODUCTION

The prevalence and characteristics of sustainable development of natural resources, especially soil, undoubtedly determines ways to improve sustainable agricultural development in the Republic of Serbia. Recent scientific and technological findings indicate that the successful application of the economics of natural resources can be achieved on the concept and method of sustainable agriculture and agro-industry. This method requires the development of harmonization of environmental and economic policies. In order to achieve this, such conditions should be developed that allow the economic effects of agricultural growth and agricultural production to be achieved only on the principles of sustainable use, reproduction, and effective protection of natural resources, especially soil.

Study of agricultural development and environmental protection has been unilaterally approached for a long time, consodering those two to be opposed and mutually contradictory, with no possibility to be seen in uniform basis and resolved, hence the two approaches:
In the longer term, the economic development researchers were mainly finding out some of the technologies and processes that affect the growth of labor productivity and the physical volume of production in order to obtain favorable economic effects. This approach did not

take account of the fact that the under-oriented development adversely affects the rationality of use of natural resources and neglected the fact that a significant part of natural resources are non-renewable or slowly restorable.

The goal of any rational approach is to develop harmonious relations, in which social system stabilizes natural resources through concrete and priority activities aimed at the preservation of nature and the conditions for sustainable development in the planning system for sustainable development [1]. In order to maintain the balance in nature and provide a rational and sustainable use of natural resources in development of agriculture, it is necessary to respect following principles:

The principle of historicity (monitoring environmental change history)

Systematicity principle (respecting interactions betweeneconomy and ecology)

Biosphere principles (ethical value of biosphere preservation and development of humanistic concepts)

The principle of species adaptation to any habitual environment in (the driving force of evolutionary and economic development)

The principle of planetary unity (fundamentally significant for international activity in the field of environmental protection and rehabilitation of natural resources)

The principle of priority without endangering the environment (indicating that economic and social programs must be scrutinized through the sustainable use of natural resources).

From a theoretical point of view, sustainable use of natural resources creates strategic opportunities for harmonization of sustainable agricultural development and environmental protection.

2. THE TERRITORY OF THE REPUBLIC OF SERBIA - SIZE AND CHARACTERISTICS

The territory of the Republic of Serbia covers 88,361 km^2, out of which area of Vojvodina covers about 21.506 km^2 or 24.4%, Kosovo and Metohija 10,887 km^2 or 12.3% and central Serbia 55.968 km2 or 53.2% area.

The area of the Republic of Serbia is characterized by pronounced relief differences (Table 1). Differentiated by the altitude the territory of Republic of Serbia is divided into the following belts:

Table 1. Orographic structure of the Republic of Serbia

No	altitudes	R Serbia km^2 %	Centarl Srbija km^2 %	AP Vojvodina km^2 %	APKosovo км^2 %
1	0 - 200m	32.817 – 37,1	11 849 – 21,2	20 968 – 97,5	
2	200 – 600m	22 712 –25,7	20 082 – 35,9	517 – 2,4	2 113 – 19,4
3	500-1000m	23 246 – 26,3	16 938 – 30,1	21 – 01	6287 –58,2
4	ispod 1000m	9 585 – 10,9	7 099 – 12,8		2 487 – 22,4
Total		88 361 – 100,0	55968–100,0	21 506 -100,0	10887–100,0

The spatial structure of the relief shows four main areas differentiated by elevation: lowland (1), mountain (2), low-mountainous and middle altitude terrain (3) and mountainous terrain (4).

A relatively high proportion (about 63%) plain-hilly terrain (up to 500m) is the hallmark of the relief. Extremely flat ground makes up more than one-third (37%), while the mountainous terrain (above 1000m) accounts for about 10.8% of the area. This land configuration provides favorable conditions for the development of vegetation, or agricultural and forest production in Serbia.

These orographic types of relief are not equally represented in all parts of Serbia, and do not make a homogeneous and uniform regions. Lowland landscape dominates in Vojvodina, making this province a very plain area, while in central Serbia flatland relief covers only 21% of the territory, ie, along with the hilly relief covers about 57% of this part of Serbia, in contrast to the AP Kosovo with over 80% area (about 8770 km^2) at an altitude between 500-1000 and above 1000 m above sea level.

3. CLASSIFICATION AND SUSTAINABLE SOIL USE IN THE DEVELOPMENT OF AGRICULTURE

In the interest of better organization and development of the environment, it is necessary to evaluate the existing land use, identify any present irrationalities, their dimensions, the need and the possibility to change the structure of land use space in the long term. With this information, it is possible to determine the orientation and direction of future development in the area and the possible consequences of the identified adverse trends extension.

The main forms of land use can be classified into two groups: 1. the productive use which results from the productive land area, 2. the unproductive use of land, intended for the general needs of the economy and society.

The productivity of the land is used for two main economic activities – agriculture and forestry. According to data from the year 2003, agricultural land covers about 66%of Serbia, about 84% of Vojvodina and more than 54% of Kosovo and Metohija. The rest are forests and unproductive land.

According to previous research, 5.8 million hectares of productive land or nearly 2/3 of total productive soil is under erosion. 2.25 million hectares of this area is arable land, 100,000 ha vineyards, 1.5 million ha meadows and pastures, and about 2 million hectares degraded

forests. The most vulnerable terrains are located in the basin of river Ibar (Ibarska klisura), the upper and middle Južna Morava (especially Grdelička klisura and edges of Vranje basin), Sandzak and Timok basin (source part), then on the right side of the river Drina (from Bajina Basta to Zvornik), in the mountainous outskirts of Kosovo Polje, in the Šumadija hills and on the northern and southern slopes of Fruska Gora.

Adverse effects of erosion do not only affect the current agricultural production in the mountainous regions. Rinsing soil leads to degradation and reduced production capacity in certain areas for a long time. Surge and floods cause severe damage to the soil and the lower parts of the valleys, also devastating roads, towns, businesses and others.

The exceptional importance of agriculture in the rational use and development of space stems from its absolute dependence on the size of its production area (physical space). Soil is a prerequisite for the development of any productive activity, but the functioning of agriculture is in a very dependent manner. Labour can improve the properties of soil, but not its physical size, or spatial shift and move. For these reasons, the level of rational production and productivity in agriculture largely depends on the territory, as well as funds for the work, which is again conditional on quantitative and qualitative homogeneity (size) surface, the spatial relations of work and place of residence, or processing of agricultural products, transport conditions, etc.

Rational organization of the soil territory also depends on the property relations of production in agriculture, then the natural characteristics of the soil and the extent of knowledge [2]. From the perspective of overall space organisation, it is necessary to take into account some other factors (composition pedological cover, climate, opportunities for irrigation and spatial organization), in relation to centers of consumption, processing and transport infrastructure, and the general arrangement of the conditions of agricultural production. should be added to the overall interests of the economy and society that are in need that particular part of the land area used for other productive and social purposes.

It is necessary, in this case,to compare the ultimate effects achieved by taking advantage of the soil for various purposes. Only in this context it is possible to find socially-justified and rational solutions using physical composition of a relatively limited pedological cover, climate, irrigation possibilities, and spatial organization) of land agricultural land in relation to centers of consumption, processing and transportation infrastructure, ie, the general regulation of agricultural production conditions [3].

4. DISTRIBUTION AND SUSTAINABLE USE OF WATER RESOURCES AS A FACTOR OF SUSTAINABLE DEVELOPMENT OF AGRICULTURE

Water is a natural resource with multiple purposes. Serbia is relatively rich in water. However, its use is incomplete, uneconomical and inefficient. As a result, we still confront the harmful effects of water disruption, a rapid river pollution threatening to destroy life in them and make water unusable. During many years, the process of industrialization and urbanization accelerated pollution of riversso that many waterways or parts thereof become dangerous to human health. The rapid process of river pollution is the result of slow indirect regulation of

the water regime and the slow construction of water infrastructure. Discussions on water conservation and protection began inthe 80s. Water sources are most affected by uncontrolled and accompanying processes of technological revolution, industrialization and urbanization. Therefore, the efforts of the whole society to preserve the natural human environment should first be directed at preserving the usability of water.

According to the results of current studies on water, it is important not to treat this socio-economic factor as a free inexhaustible gift of nature. Increasing consumption of water in developing social and technical division of labor confronts us with the necessity of rational use of water resources.
Water potential, generated in the country is not evenly allocated during the year. Large quantities of water, local resources, are being created in the spring (especially in the first few months) and during autumn (especially in the latter months). These months are treated as typical rainy-snowy months. Transit rivers bring 160.0 km3 of water in Serbia. The total amount of river water is 190.37 km3 or 19 million liters per capita per year.

In addition to surface waters, our country has significant reserves of underground water. Most of these waters are located in the Pannonian basin sediments and the bottom of the vast basins and river valleys. It is estimated that the amount of water in Serbia is 47.48 km3, which is 1.56 times greater than the total native waters of the Republic of Serbia. These waters are particularly important quality natural resource, as characterized by the ability of self-purification.
Despite the indicated characteristics, the quality of water resources in Serbia was threatened several times, which is a reflection of their pollution, waste materials (organic compounds, salts, heavy metals, etc.). The high degree of water pollution is the result of dirty technologies, delivered by transit rivers from the Western Europe.

Pollution of water resources in our country is the result of the great portion of unresolved waste waters, created by industrial processes in urban areas. Only 10% of those are purified. Groundwater resources, particularly in Vojvodina are endangered due to the conversion of wells to septic tanks.

Water quality in our rivers, at many localities, does not match the national standards set forth regulations and international standards [4]. This considerably limits the use of river water for agriculture and aquaculture. In some areas, the quality is compromised by introduction of pollutants through the atmosphere, particularly in areas with large power plants and industrial facilities.

Pollution of rivers, lakes, reservoirs is also done by entering the food remains by suboptimal application of mineral fertilizers, pesticides, herbicides in agricultural production.

5. BIODIVERSITY RESOURCES AS A BASIS FOR STIMULATING AGRICULTURAL DEVELOPMENT

Biodiversity and gene poolsare important natural resources. Their presence, utilization and protection allow the establishment of methods of achieving sustainable development in the

expanding and diversified production and environmental reasons [5]. Therefore, the structure and representation of biodiversity need to be monitored and studied, especially in agricultural sustainable development. This requires the review of the distribution, the role and quality of biological species from the viewpoint of usability and economic welfare.
Republic of Serbia is amongst richest countries in Europe and in the world by the biodiversity and genetic variability. According to the number of plant species, our country is in a third place, according to the abundance of flora.

The higher plant flora of Serbia makes 1.7% of the world's flora. Given that the territory of Serbia makes up only 0.035% of the world's land surface, the stated percentage of its share in the world's flora is remarkably high [6].
Our country is relatively rich in fauna. Its territory is home for about 15,000 different specii. In accordance with the abindance of plants and animals in Serbia, a significant part of the European gene pool is contained in natural populations of plants and animals. However, due to incomplete protection of wealth of biodiversity, the extinction of some plant and animal specii occurs. The loss of biodiversity is accelerated by uncontrolled economic development that it is not based on the respect of ecological balance and application of the concept of sustainable agriculture [7].

All moderate and subtropical plant speciican be successfully grown within Serbia. This enables diversity of the gene pool and the achievements in the selection of cultivated plant specii. Selection created varieties and performed various properties for the cultivation of over 200 specii of cultivated plants. In addition, almost a thousand varieties for more than 80 speciiwere introduced from abroad, and authorized the crop production. Only about 50% of this gene pool is used. Significant farming animals gene pool is also under-used. In general, it can be concluded that the available resources of biodiversity and genetic resources are used on a small scale and poorly protected from the impact of adverse factors arising from contamination beyond the production environment (climate change, acid rains, ozone layer destruction, degradation phenomena of natural plant and animal habitats species, pollution of water, air and soil, as well as the uncontrolled use of certain species of wild flora and fauna, etc.

As an irreplaceable resource, biodiversity and its conservation is the basis for sustainable economic development, sustainable agriculture and sustainable society as a whole. Unfortunately, many industries in our country are not environmentally friendly and are designed to significantly affect degradation and biodivedrziteta in our country. To overcome this situation, it is necessary to adopt a national strategy for the conservation of biodiversity.

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AGRICULTURAL PRODUCTION AS THE BASIS OF SUSTAINABLE DEVELOPMENT OF SERBIAN ECONOMY ON THE EXAMPLE OF COMPANY RESAVA COMMERCE LTD SVILAJNAC

POLJOPRIVREDNA PROIZVODNJA OSNOV ODRŽIVOG RAZVOJA SRBIJE NA PRIMERU PREDUZEĆA RESAVA KOMERC D.O.O SVILAJNAC

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Abstract: *The Serbian economy has been in the process of transition for over a decade. Throughout the transition period, the biggest challenge for Serbia has been finding a new model as well as holders of economic development. Agricultural production profiled as one of the key holders of sustainable economic development. Considering the importance of agriculture for the development of the industrial and service sectors, in future, agricultural productionis the biggest development opportunity of Serbian economy. For many decades, the features of Serbian agriculture have been economic devastation and a reduction in income of farmers. The process of the European Integration did not stop the negative trends in Serbian economy which are particularly manifested in the prevailing position of agriculture as asocial stabilizer. The global financial crisis has only deepened and intensified the problems. However, there are positive examples of organization of agricultural production. One of such examples is the company Resava-komerc ltd from Svilajnac.*
Keywords: *agricultural production, sustainable development, economic development, Serbia.*

Apstrakt: *Srpska privreda se nalazi u procesu tranzicije već više od decenije. Tokom tranzicionog perioda, najveći izazov za Srbiju je pronalaženje novog modela, ali i nosilaca privrednog razvoja. Poljoprivredna proizvodnja profilisana kao jedan od ključnih nosilaca održivog privrednog razvoja. S obzirom na značaj poljoprivrede za razvoj industrije i usluga, u budućnosti, poljoprivredna proizvodnja predstavlja najveću razvojnu šansu srpske privrede. Višedecenijska obeležja poljoprivrede Srbije su ekonomska devastiranost i smanjenje prihoda poljoprivrednika. Proces evropskih integracija nije zaustavio negativne trendove u privredi Srbije, što se naročito ogleda u preovlađujućem položaju poljoprivrede kao socijalnom stabilizatoru. Globalna finansijska kriza je samo produbila i intenzivirala probleme. Međutim, postoje i pozitivni primeri organizovanja poljoprivredne proizvodnje. Jedan od takvih primera je kompanija Resavakomerc doo izSvilajnca.*
Ključne reči: *poljoprivredna proizvodnja, održivi razvoj, privredni razvoj, Srbija.*

1. INTRODUCTION

Seen from today's perspective, the hardest and most complicated tasks to solve for every national economy in the area of economic development are based on identification of the role of individualeconomic sectors in overall economic development. In countries in transition agriculture has an important role in the overall economic development.

The development of agriculture is affected by a number of factors, which are usually systematized into three main groups: natural, demographic and economic. However, it is very difficult to quantify the impact of individual groups of these factors in the methodology, whose role and importance change in the various stages of socio-economic development of a country.

Agricultureis the foundationof sustainable developmentsothe work is focused on agricultural production in Serbiain terms of national socio-economic crisis which is present for decades, which has recently been strengthened by the global financial crisis.

The aim is to draw attention to new thinking about the prospects for the development of agriculture as one of the most important economic activity in the Republic of Serbia, on the example of the company Resava-komerc ltd from Svilajnac. This business area will in the future have a significant impact on the economy of the country and will be the engine of sustainable development.

Data sources include publications of national and international institutions, the results of previous studies of domestic and foreign authors, as well as available database on agriculture.

2. AGRICULTURE AS A FUNCTION OF SUSTAINABLE DEVELOPMENT

Global economic growth and development are unstoppable. Multinational companies expand and win new markets and resources. It is only a matter of compatibility of economic growth and development on the one hand and exploitation of natural resources, on the other hand. That is the essence for consideration of the theory of sustainable development.

By consulting of the literature the definition of sustainable development can be summarized as follows: Sustainable development is a concept based upon the concept of intergenerational equity that is the present generation should not compromise the ability of future generations to meet the "material" needs and enjoy a healthy and beautiful environment [1, p. 22], or the sustainable development presents a concern for future generations, accompanied with a question: What will be the trail that we leave behind and how we will be remembered by future generations?

Problems of sustainable development are exacerbated in late twentieth and early twenty-first century. There are also significant in the area of food production. During the twentieth century, especially in its second half, theories in this area were developed that are often identified with the myths. R. Levins (1986) mentions and criticizes 7 development myths. [2, p. 13-29]

These are: first**, labor-intensive agriculture is regressive, and the capital and energy intensive agriculture is advanced**. This myth is unsustainable because the scientific - technical and thought-intensive agriculture are also labor intensive, where the activity intensity is shifted from the muscular to the thoughtful substance. Second, **diversification is regressive and monoculture is advanced**. This myth has too been abandoned since biodiversity is becoming the most important natural resource. Third, **small property is regressive, large property is modern**. Modern is the property where you can set up economic and agro-ecological optimum (in which the positive effects are maximal and the negative are minimal) and organize farmers' production methods, with adequate representation of crop and livestock production.

Fourth, **it isregressive to subjugate to nature, it is modern to master nature**. The delusion that man can conquer nature should be broken. Man is a product of nature and he should work with it wisely and closely. Fifth, **folk knowledge is regressive, scientific knowledge is modern**. Can tradition and experience accumulated over the centuries be regressive? This

knowledge should be “enhanced” with scientific methods, improved and raised to a higher scientific level.

Sixth, **specialists are modern, generalists are regressive**. The question is how to achieve a synthesis between some specialties. Where is the line between generality and specificity? Seventh, **the narrower the field of research, it is more modern**. Should the research priority be given to the atom, molecule, cell or organism? It is necessary to demystify these myths and it is supporters of the theory of sustainable development who are doing it.

3. SITUATION AND PROBLEMS IN SERBIAN AGRICULTURE

The main feature of decades of Serbia’s agricultural state is economic devastation and permanent reduction in income of farmers. It is manifested with a different intensity and modalities through extraction of surplus value from agriculture generally in favor of the following three sectors: industry, commerce and banking.

The industrial sector economically devastated farm sector for two reasons:

- *First*, the steady increase in prices of agricultural inputs (fertilizer, pesticides, fuel, seed and planting materials, agricultural machinery, veterinary medicines and services) and an increase in price disparities at the expense of farmers and
- *Second*, the relatively low purchasing prices of agricultural products for the employment capacity of the various branches of manufacturing industry (food products, beverages, tobacco, fodder...), which is steadily decreasing the share of farm sector in the structure of the final cost of agricultural-food products, beverages and cigarettes and other products based on raw materials of agricultural origin.

When it comes to trade there are also two reasons contributing to the economic devastation of agriculture, including:

- *First*, the relatively high margins on agricultural and food products and
- *Second*, inappropriately long periods and contractual non-compliance to the payment of goods taken.

In these ways, the trade sector provides interest-free funds for their development and threatens the survival and competitiveness of agricultural and food domestic producers not only on foreign, but also on domestic market.

Under the pretext on the increased risk of doing business in Serbia, which is particularly emphasized by the management of so-called foreign banks, with much higher interest rates and inappropriately high prices of ancillary banking services (loan processing, account servicing...), the banking sector economically devastates all the areas of agriculture since the amount of interest on bank loans is inadequate to long cycles of reproduction and relatively slower turnover of capital in agriculture.

At the same time, it reduces the purchasing power of farmers and their demand for agrarian inputs, which affects the extensiveness of agricultural production, stagnant instability of yields and production volume, relatively low level of capacity utilization of the relevant branches of the processing industry and an even greater reduction in the competitiveness of agribusiness in Serbia on market which is becoming more liberal.[4, p. 3-18]

When it comes to the formation structure of GDP agriculture and food industry participate with 17%, the agricultural production with 10.6% and the food industry with 6.4%. However, if we look at the overall contribution of agriculture to other sectors of the economy, especially the producers and processors of inputs and raw materials, this share exceeds 40% of GDP. In the structure of created value of agricultural production 70% comes from crop production and 30% from livestock production. [9]

In the structure of created value of agricultural production 70% comes fromcrop production and 30% from livestock production. In comparison, in the EU 70% of the value of agriculture is originally from livestock and 30% of crop production. The most important Serbian agricultural products are corn, wheat, sunflowers, sugar beets, soybeans, potatoes, apples, plums, grapes, pork, beef and poultry and milk. [9]

Because of known environmental economic conditions in the territory of former Yugoslavia, particularly in Serbia, FDI is significantly reduced. The largest FDI Serbia has made in 2006with more than 3 billion euros and in 2012 the total FDI inflow amounted to only 232 million. In addition, particular concern is the fact that agriculture, unlike other more profitable sectors of the economy is unattractive for FDI activity, as in the total FDI in Serbia's economy it accounts for less than 1%. [8]

The key reasons for a minor share of agriculture in overall FDI in Serbia are: the low profitability of the sector, unstable economic and climatic conditions for the production, unfavorable agrarian structure, the absence of quality standards and government subsidies necessary for the placement of agricultural-food products in foreign markets . . .

The following table will show the external trade of agricultural products in the years 2011 and 2012.

Table 1. Foreign trade of agricultural and food department, mill. USD

	EXPORT			IMPORT			BALANCE	
Merchandise total	2011	2012	index	2011	2012	index	2011	2012
Agriculture total	11.779,5	11.353,6	96,4	19.861,9	19.013,3	95,7	-8.082,4	-7.659,7
The share of agriculture in total trade	2.696,7	2.716,8	100,7	1.404,7	1.470,2	104,7	1.292	1.246,6

Source: [4]

The data presented clearly show that during the observed period there was a decrease in exports and also a decrease of imports of agricultural products. At the same time, the share of agriculture in total exports increased by 0.7 index points, while the share of agricultural imports in total imports increased by 4.7 index points. One of the key reasons for the decline in exports in this field is the world financial crisis, which is still present in the world flows.

Decades of negative trends in the national economy are further enhanced by the action of the global economic crisis instead of being neutralized by the process of Serbia's joining the EU,

which is particularly manifested in the prevailing social function of agriculture as a "stabilizer".

This is primarily reflected in the general decline in the prices of agricultural products, whose decrease intensity is considerably stronger than the decrease in prices of agricultural inputs and final agricultural-food products.

Also, in times of global economic crisis there is a reduced demand for agricultural-food products which are of higher quality, healthier, securer and more profitable - which negatively affects the quality structure of agricultural production.

It also reduces the overall funding base, particularly for agriculture, since farming households in the economic crisis traditionally avoid the loan borrowing because of market uncertainty and increased business risk. In terms of reduction and price increases for the available financial resources, farmers prefer to reduce the sowing areas and livestock numbers, as well as extensive production which is less financially demanding. And there is also a slowing in the pace of the modernization and international integration of our agriculture. [6, p. 21-34]

In order to promote Serbian Agriculture, Ministry of Agriculture during 2011 adopted the National Programme of Rural Development for years 2011 - 2013. The strategic objectives were presented and explained in detail in the program:

1. Sustainable development of agriculture and the food industry by increasing competition;
2. Improving standards of food safety, veterinary and phyto-sanitary standards in the area of environmental protection and other standards in line with the EU Acquis Communautaire;
3. Sustainable development of rural areas through diversification of the rural economy.

Realizing the objectives for the year 2013 Serbia can expect the arrival of 50 million Euros in grants for the program needs of the rural sector.

As it can be noticed it is intended in the future for agriculture to be one of the key stakeholders of the economic development of Serbia. Also, the present moment shows us many positive examples that agricultural production is the basis of sustainable development of Serbia. The company “Resava-komerc” ltd from Svilajnac is an example of good practice for organization of agricultural production.

4. EXAMPLE OF GOOD PRACTICE OF SUSTAINABLE AGRICULTURE: ENTERPRISE "RESAVA-KOMERC" LTD SVILAJNAC

The history of the enterprise "Resava-komerc" ltd from Svilajnac began during the year 1989, with its founding. In the period following the establishment of "Resava-komerc" it enters a phase of intensive development. Its main activity is the primary and secondary agricultural production and trade of food and chemical goods also, where it takes the leader position in Svilajnac. In addition, the company has a retail store in its structure.

The enterprise "Resava-komerc"has developed its own business strategy based on the business slogan "The company that is growing." This slogan reflects the path of development of the company based on production, processing and preservation of vegetables.

The company employs three full-time employees but because of the seasonal nature of the work it has plenty of seasonal workers. Primary agricultural production means growing paprika, hot peppers, cucumbers and beets. Secondary agricultural production refers to the processing of vegetables and production of finished products: pasteurized cucumbers, hot peppers, paprika, mixed salad and beets.

Production of vegetables is organized on 5 ha of arable land, as follows:[3]

- paprika and hot peppers are grown on 1 ha,
- cucumber are grown on 2 ha,
- beets are grown on 2 ha.

Extensive experience is crowned by an impressive Business Results that will be presented in the following tabulations.

Table 2. Primary agricultural production in the period 2008-2012., in kg

	Cucumber	Paprika	Peppers	Beet
2008.	60.000	4.000	1.300	2.000
2009.	70.000	6.000	1.800	4.000
2010.	80.000	8.000	2.500	6.000
2011.	90.000	10.000	2.900	8.000
2012.	100.000	12.000	3.800	10.000
Total	400.000	40.000	12.300	30.000

Source: [3]

In order to better identify trends in production the presented data will be displayed graphically.

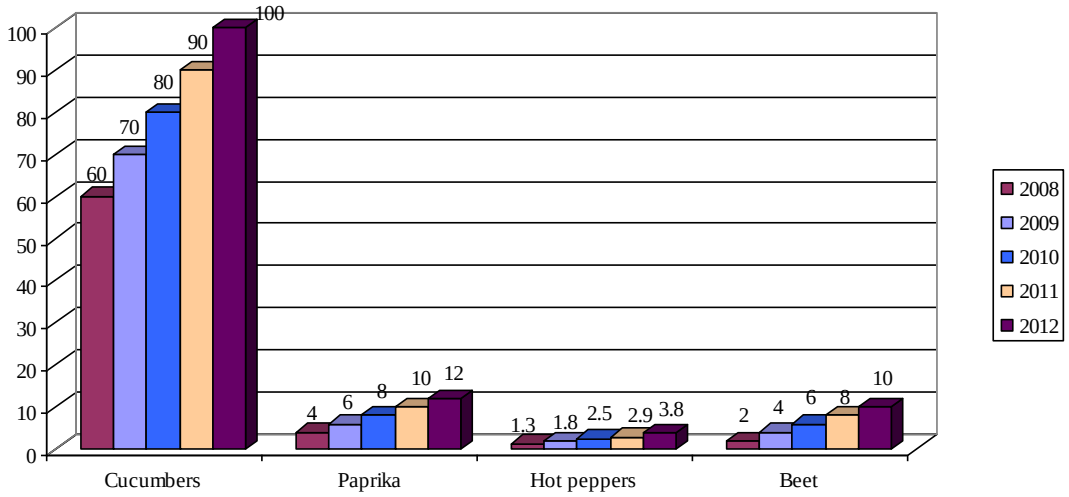

Figure 1. Primary agricultural production in the period 2008-2012, in tons
Source: Own graph based on the data in Table 2

The data presented clearly shows that during the observed period there was an increase in production: production of cucumbers has increased from 60 tons in 2008 to100 tons in 2012, 4 t paprika from 4 tons in 2008 to 12 tons in 2012, beets from 2 tons in the 2008 to10 tons in 2012 and peppers from 1.3 tons in the 2008 to 3.8 tons in the 2012. It can be concluded that cucumber production is the largest and it represents the main product of primary production.

The increase in primary production has also affected the increase in the revenues from the sale of these products. The following table will show the revenue from primary agricultural production in the period 2008-2012.

Table 3. The revenues generated from the primary agricultural production in the period 2008-2012, in RSD

	Cucumber	Paprika	Peppers	Beet
2008.	1.800.000	160.000	50.000	60.000
2009.	2.100.000	240.000	80.000	120.000
2010.	2.400.000	320.000	120.000	180.000
2011.	3.150.000	500.000	180.000	240.000
2012.	4.000.000	700.000	250.000	300.000
Total	13.450.000	1.920.000	680.000	900.000

Source: [3]

Displayed data will be shown graphically to make it easier to spot trends of changes in the revenue from primary agricultural production.

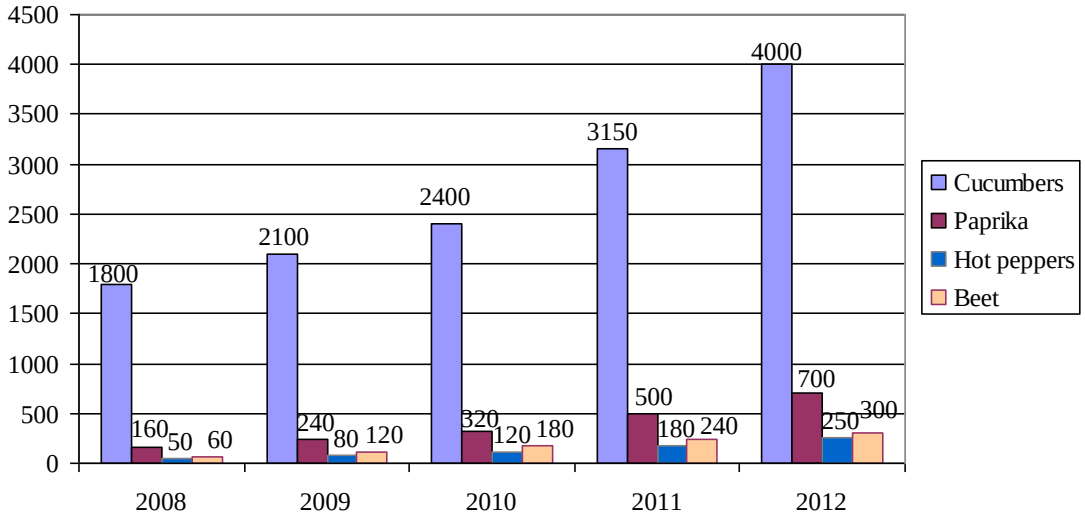

Figure 2. The revenues generated from the primary production in the period 2008-2012, in thousands of RSD
Source: Own graph based on the data in Table 3

Based on the displayed graphics it can be clearly seen that in this period there was an increase in the revenues from primary agricultural production. Revenue from the sale of cucumbers has increased over 50%, revenue from paprika increased around 80% and the proceeds from the sale of peppers and beets for over 500%!

In addition to primary agricultural production, the company "Resava-komerc" ltd is engaged in secondary agricultural production. Achieved secondary agricultural production will be presented in the following table.

Table 4. Secondary agricultural production in the period 2008-2012, in kg

	Pasteurized cucumbers	Hot peppers	Paprika	Mixed salad	Beet
2008.	120.000	2.000	8.000	2.000	4.000
2009.	140.000	4.000	12.000	4.000	8.000
2010.	160.000	5.000	16.000	8.000	12.000
2011.	180.000	6.000	20.000	16.000	16.000
2012.	200.000	7.000	24.000	19.000	20.000

Source: [3]

For easier identifying of trends in the realized secondary agricultural production, the data in Table4. will be shown graphically.

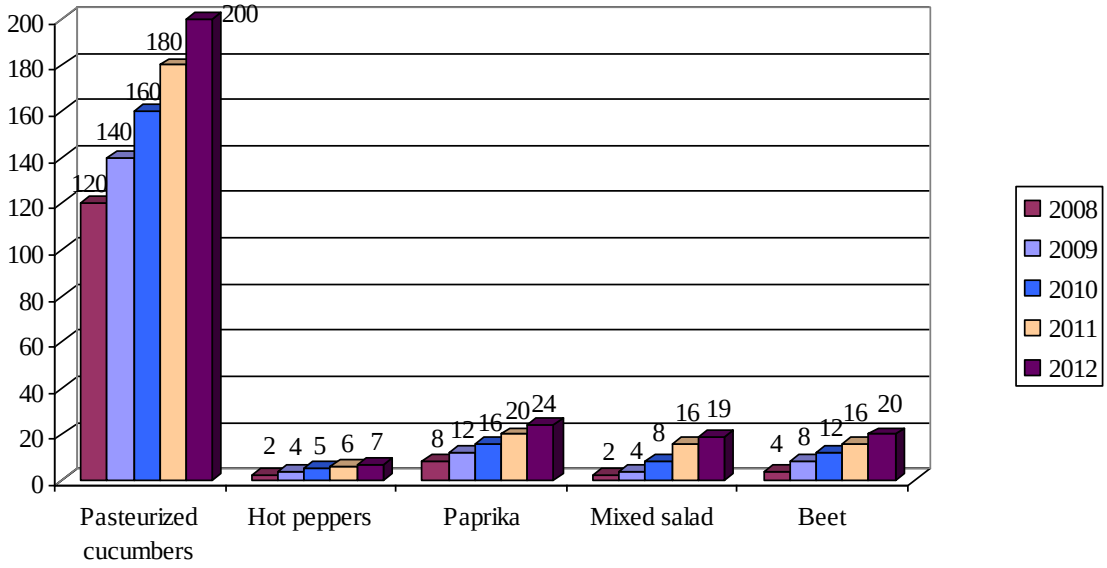

Figure 3. Secondary agricultural production in the period 2008-2012, in kg

Source: Own graph based on the data in Table 4

Based onthe displayed graph it can be clearly seen that in the observed period there was an increase of all of the secondary products from agricultural production. Production of pasteurized cucumber increased from120 in 2008 to 200 tons in the 2012, the production of paprika has increased from 2 tons in 2008 to 7 tons in 2012, the production of peppers has increased from 8 in 2008 to24 tons in 2012, the production of mixed salad increased from 2 in 2008 to 19 tons in 2012 and the production of beets was increased from 4to 20 tons in 2012.

The significant increase in secondary agricultural production resulted in increased sales of these products.The following table will show the revenue.

Table 5.The total revenue from secondary agricultural production
in the period 2008-2012, in RSD

	Pasteurized cucumbers	Hot peppers	Paprika	Mixed salad	Beet
2008.	7.200.000	160.000	560.000	100.000	200.000
2009.	8.400.000	280.000	620.000	200.000	400.000
2010.	9.600.000	350.000	960.000	400.000	600.000
2011.	10.600.000	420.000	1.400.000	800.000	800.000
2012.	13.000.000	490.000	1.900.000	950.000	1.000.000

Source: [3]

Displayed data will be shown graphically to make it easier tos pot trends change in the revenue of the secondary agricultural production.

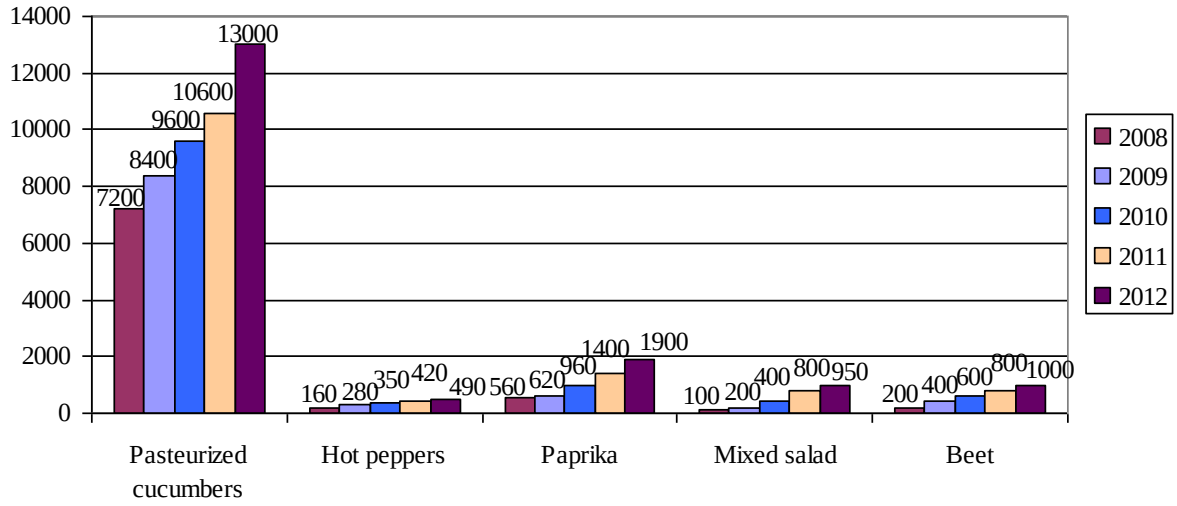

Figure 4. The total revenue from secondary agricultural production
in the period 2008-2012., thousands of RSD
Source: Own graph based on the data in Table 5

Based on the displayed graph it can be clearly seen that in this period there was an increase in the revenues of the secondary agricultural production. Revenue from the sale of pasteurized cucumbers increased about 40%, sales revenue of pepperoni increased over 250%, peppers around 300% and revenues from the sale of mixed salad increased for 950% and revenue from the sale of beetroot increased 500%!

CONCLUSION

Based on the natural and demographic resources Serbian agriculture is a potential export activity, which should be a strategic decision in the design of sustainable economic development. However, it should be noted that Serbian agriculture has been declarative and promoted as a potential export activity. And with secured loans, long tradition and a solid

knowledge of agricultural production, the provided export opportunities are not exploited satisfactorily due to inadequate organization of producers and insufficient economic stimulus measures in our agricultural policy.

In the context of agricultural production as a basis for the sustainable development of Serbia it should be pointed out that:

- development of agriculture is directly related to the development of other economic activities (transport, telecommunications, education and science...);
- macroeconomic stability should be improved and the outflow and increase the inflow of FDI in agriculture and other sectors of agribusinessshould be stopped;
- organize family farms in business sense and revitalize the cooperative sector - as the potentially largest reserves for increasing the scope and competitiveness of this group of companies, with the aim of sustainable development of rural areas;
- promote social responsibility and transparency at all levels of agricultural institutions and subjects in agriculture;
- Production of educational and research organizations should be directed to a significantly greater extent towards agro-enterprises;
- activities in the international integration processes should be aligned with the interests of producers of agricultural and food products and long-term national interests...[7].

Evidence that the agricultural production is base for sustainable development in Serbia is an example of good practice of the company "Resava-komerc" ltd from Svilajnac.

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INVESTMENT VALUE OF GRAPE VINE GROWTH AND WINE PRODUCTION IN SERBIA

INVESTICIONA VREDNOST UZGAJANJA VINOVE LOZE I PROIZVODNJA VINA U SRBIJI

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Abstract: *Grape wine growth and wine production require larger investments in comparison to the production of other plants and are therefore in an unfavourable economic position. What is characteristic of grape growth is that return on investment cannot be seen in a short period of time since the process of growth and production is a long one and the realization of the final products takes time. If the process of grape vine growth and wine production is to be advanced, all production factors have to be engaged, from producers to the state. A lot of things have to be arranged if Serbia is to become a healthy food producer. The long-term strategy of the UE anticipates large sums of money to be invested in agricultural and food industry in the Balkans, primarily in those production lines whose products are scarce in the EU market.*
Key words*: wine, investment, investment analysis, risk.*

Apstrakt: *Uzgajanje vinove loze i proizvodnja vina zahteva znatno veći obim investicija u odnosu na proizvodnju drugih biljnih vrsta, pa je zbog toga u nepovoljnijem ekonomskom položaju. Proizvodnja grožđa odlikuje se sporim obrtom uloženih sredstava, jer je dug period od početka proizvodnje do realizacije finalnih proizvoda.Za unapređenje uzgajanja vinove loze i proizvodnje vina potrebno je angažovanje svih proizvodnih činilaca, počev od proizvođača do države. Potrebno je mnogo toga učiniti kako bi Srbija postala zemlja zdrave hrane. Dugoročna strategija Evropske Unije predviđa značajno ulaganje kapitala u poljoprivrednu i prehrambenu industriju balkanskih zemalja, prvenstveno u linije proizvodnje čiji su proizvodi deficitarni na tržištu EU.*
Ključne reči: *vino, investicije, investiciona analiza, rizik*

INTRODUCTION

By achieving an appropriate image on the domestic market, our wine makers created in the past the possibility to, at a later phase of the strategic development, conquer the international markets again. It is a very difficult task that requires maximum knowledge, abilities and skills in dealing with foreign competition.

The most important factors that may affect our wineries are institutionalized European economic integrations, which promote stronger forms of integration. It involves the creation of a common economic policy, common market, with all the elements of the customs and monetary union.

The comeback to the old ones must be supported by a strong and high quality supply on the one hand, and propaganda or the marketing on the other hand. Strict care must be taken to holding of a standard of quality.

Agrarian interventionism is the reality of the modern world. Agriculture isn't left to the market laws in any country. The state and the market complement each other and the negative effects of the market should be corrected by the State. With a good organization and compilation of all the relevant factors of the modern market economy, Serbia can find its way to important positions on the world wine market. This includes rich and qualitative range of different types of wine. The EU has allowed Serbia to annually exported 65 million bottles of wine. The advantage of such a possibility should be taken in the right way.

1. INVESTMENT ANALYSIS OF VITICULTURE

Funding for capital projects generally cannot be obtained from its own accumulation so then the entire amortization is used. In the event that their own resources are not enough, an additional source of funding is provided through borrowing from financial institutions and international finance.

Loans are granted with relatively short terms and high interest rates, and the production is burdened with high annuities. Lending under adverse conditions is a reason to refrain from investments. For easier getting of credits, you must make an investment project. The investment project should include basic information about the orchard and cost-benefit analysis of such a project and projected profits.

It is viewed as an investment in progress for now until the production value is not higher than the costs of production in one year, or until a profit. In this period no credits are repaid. The costs of growing vines are much higher than in other branches of agriculture. Expensive machinery is necessary for modern production, which requires additional resources. Also, the cost of care and labor are high.[2]

The investment value of crops is calculated by the following formula:

IVZ= Tp + Tn * N – V * M, where:

Tp- costs of plantation
Tn- costs of care
N - number of years of care
V -the value ofsmall harvest
M- the number of years of small harvest

Because the growing of grapes takes place in the open air and that it is influenced by many natural factors, the risk of it is very large.
Risks can be:

- ***Founding risk***
- ***Production Risk***
- ***Market risk***

[2]Vujičić M. " Ekonomika poljoprivrede " Ekonomski fakultet Kragujevac 2001. pages 34-35

Founding risk is present during the planting of vines. During this period, crops are susceptible to various diseases and pests, and drought and frost. In this period it is necessary to provide sufficient soil fertility and use of contemporary agricultural practices.

Production risk is usually determined by characteristics of species of vines and natural conditions. The effect of low temperature, drought, hail, pests and diseases can seriously hinder the cultivation and production of grapes.

Market risk is caused by price changes and changes of consumer tastes. Depending ont he demand and offer, as well as grape varieties, prices vary considerably. There are reported cases that in the fertile years the prices can be very low. Given that consumer tastes are subject to change, and the reorientation of the grape production is impossible in the short term, the market risk is even more pronounced. Market risk is greater with higher production costs, and possibilities for realization are less.

Grape production requires substantial resources, so it is necessary to reduce the risk. The risk can be reduced by raising plantations in optimal climatic conditions, proper selection of species and varieties, and the application of appropriate agricultural practices. The risk can be reduced by insuring the production through insurance companies.[3]

2. SWOT ANALYSIS IN WINE PRODUCTION

SWOT analysis is based on using the SWOT matrix. The aim of this analysis is that by concentrating on the internal strengths and weaknesses and external opportunities and threats, we can determine the future strategy of viticulture and production of the highest quality wine varieties.

Strengths (S)

As main advantages (strengths) for growing grapes and making wine in Serbia the following can be highlighted:

- Favorable agro-ecological conditions (soil, climate, hydrographic, orographic, environmental and other) for growing several varieties of grapes;
- Very favorable agro-ecological conditions for growing of specific grape varieties for which there is growing demand in the world market-in central and southeastern Serbia;
- Built capacities for grape and wine production;
- Relatively well-developed basic infrastructure;
- Developed entrepreneurial spirit and a willingness to invest in new plantations,
- Scientific- research and education institutions (Institute of Fruit and Grape Research Centre, Faculty of Agriculture in Belgrade, Novi Sad, Cacak);
- A relatively large body of knowledge (practical and theoretical) and long-term experiences of wine producers;

[3]Marković P. ; Babović J. " Srbija na pragu novog veka " Ministarstvo poljoprivrede 1998. page 57

- A significant number of high quality professionals in the field of viticulture, which are, due to the process of transition and the collapse of social farms and cooperatives, out of work in their profession in this period;
- a strong tendency for the formation of specialized producers' associations and modern cooperatives on the basis of the market economy;
- Significant opportunities for increased organic production of grapes, which is the result of, in economic terms, one of the cleanest regions in Europe.

It can be concluded that there is significant potential for growing and wine production in Serbia, and all the opportunities that are identified should be used properly. Potential investors should be met with these capabilities and compelling investment projects should be prepared. Projects need to convince investors (domestic or foreign) that the investment profitable-in the long term.

Weaknesses (W)

Weaknesses in grape cultivation and wine production in Serbia are:

- Fragmentation of land ownership, which is especially noticeable in vineyard regions;
- Unfavorable age structure and variety of vineyards and expressed problems in the production of grapes, which negatively affects yield;
- Insufficiently expressed network of local roads;
- Delay in implementation of modern technologies of cultivation of certain types of grapes, technological backwardness of capacities for grape processing;
- Delay in providing the conditions for certification of quality standards that are mandatory condition for exportation of products to the European Union;
- Marketing, lack of brands and products with protected geographical background insufficiently meet the real opportunities for increasing the volume of production in Serbia;
- Lack of experienced and qualified managers;
- The decline of large social plantations and cooperatives goes at a faster rate compared to the increase of private vineyards and interest organization of producers;
- Lack of appropriate strategies and incentives of economic policy for the development of viticulture and uncontrolled import of certain types of wine;
- Wine consumption per capita is lower than in developed countries as a result of improper eating habits and culture of the low per capita income.

These weaknesses are a serious problem for the improvement of wine production in Serbia, and therefore it is needed for them to be adequately dealt with or to significantly reduce any negative trends.

Opportunities (O)

Positive external influences that represent a stimulating environment for viticulture and wine production in our country are:

- State is on the path to become a member of the European Union, and it sees its' chance in the development and improvement of viticulture, which will result in expanding the capacity of the market and create a favorable environment to attract capital;
- Long-term strategy of the European Union provides significant capital investment in agriculture and food industry of the Balkan states, primarily in the production lines whose products are in short supply in the EU market, or to supplement their own range;
- An increase in wine consumption in the internal market is expected as a result of the expected growth in total income and per capita;
- The market economy, transition processes and systems that follow the laws of these processes (Inheritance Law, the Law on restitution to former owners), should allow consolidation of property and raising of large plantations of vines, which would have significantly contributed to the growth of productivity and economic outcomes of production;
- The growing demand for organic products, adopted legislation on organic agriculture in Serbia and favorable ecological conditions and incentive rates are a great opportunity to increase the scope and results of organic production of grapes;
- Economic development of the country creates real opportunities for greater investment in primary production and processing of grapes, under more favorable conditions than the previous were;
- Special opportunity is in the production of those grape varieties for whichSerbia, in agro-ecological terms, has significant competitive advantages, which should be converted into competitive advantages.

All the chances that we find in the wider environment must be seized in order to increase production volume and in order to produce quality wines. Investors are aware of these opportunities and in the near future will be very competitive, in terms of foreign capital, in the area of wine growing and wine production in Serbia.

Threats (T)

The negative external effects which represent a threat to our grape and wine production are as follows:

- In the global market, wine producers from Serbia are exposed to strong competition from producers in highly developed countries in the production of certain wines (France, Italy, Spain, Portugal);
- EU requirements for quality standards of fresh grapes and premium wines are high;
- There is a surplus in the production of certain types of grapes in the EU, which represents a high demand in the increase of yield, to improve the quality while reducing production costs;
- Insufficient capital inflows necessary for investment in primary production in accordanc ewith the requirements of the adopted quality standards (ISO 9000, ISO 14000, HACCP);

- Possible economic recession in the EU, or similar problems that are anticipated, which inevitably leads to a decline in consumption of wine.

These hazards should not be an obstacle to investing in viticulture and wine production. On the contrary, this risk should serve as a guideline to improve some of the activities. To make production cost effective and competitive in the world market, several requirements must be met:

1. Vine plants should be raised with first-class plant materials;
2. Plantation of vines should be raised on the grounds that provide maximum cost-effective production of high-quality grapes;
3. The production technology has to be modern;
4. The purpose of production (processing, for use in the fresh state) should be taken into account in the newly planted vines so the production would be fully economical;
5. The best producers of grapes and wine should be stimulated with credit and other agricultural policies.[4]

Conclusion

For large amount of quality wine to be realized on the international market it is necessary to increase production and change the structure, produce healthy food while meeting regulatory standards. Competitiveness also means investingin marketing and fulfillment of EU standards.

For the improvement of grape and wine production in the Republic of Serbia and the increase in exports it is necessary to:

- Based on scientific – research findings raise the qualityof products,
- During the introduction of new technologies for processing grapes standards must be respected (ISO 9000, HACCP),
- To increase the level of capacity utilization,
- Modernization of existing facilities,
- Pay special attention to the design and aesthetic appearance of the final product,
- Establish a "brand" in the tradition of the world's major producers.

Investment analysis shows the cost-effectiveness of investments in the production of wine and the payback period on the capital invested. With a very short period (about one to1.5 years), investors can expect a relatively good profit for a short period of time. This suggests that it is cost-effective to invest in particular wine cellars that are smaller and more competitive in the domestic market. Impressive results can be achieved with less investment.

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AGRICULTURAL POLICY AS A FACTOR OF STIMULATING INVESTMENT

AGRARNA POLITIKA KAO FAKTOR STIMULISANJA INVESTICIONIH ULAGANJA

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Abstract:*Serbia is a country that has relatively favorable natural conditions for agricultural development. Our country should look for basic reason for the insufficient competitiveness of its agricultural products on the European investments should be put in these two sectors as they will become the holders of economic development market in inadequate economic and political measures. The regulations and standards of the European Union as well as the rules set by the WTO should be a landmark in the creation of laws by our legislature. The Economic Development Strategy of the Republic of Serbia pays special attention to two sectors: agricultural business and health tourism. Therefore all available in the near future.*
Key words: *Agricultural policy, investments, EU.*

Apstrakt:*Srbija je zemlja koja raspolaže relativno povoljnim prirodnim uslovima za razvoj poljoprivrede. Osnovne razloge za nezadovoljavajuću konkurentsku sposobnost svojih poljoprivrednih proizvoda na evropskom tržištu, naša zemlja bi trebalo tražiti u neadekvatnim ekonomskim i političkim merama. Propisi i standardi Evropske Unije kao i pravila propisana od strane WTO treba da predstavljaju orijentir pri kreiranju zakona od strane našeg zakonodavstva. Strategija privrednog razvoja RS posebnu pažnju usmerava na dva sektora:agrarni biznis i zdravstveni turizam. Zbog toga sve raspoložive investicije treba ulagati u ova dva sektora jer će oni postati, u bliskoj budućnosti, nosioci privrednog razvoja.*
Ključne reči: *Agrarna politika, investicije, EU.*

1. INTRODUCTION

Agricultural policy is defined as a program to direct the development of agriculture. Integrative role of agriculture in the process of strengthening regional cooperation and networking of European countries is a significant segment of the agricultural development policy. Regardless of how the economy ismarketable, the role of government policy is important.

The current situation in Serbian agriculture is as follows:

- lack of long-term, consistent and clearly defined policies on agriculture and the lack of long-term export strategy
- high rate of inflation
- Serbia is not a member of the World Trade Organization - WTO, which reduced competitiveness due to higher prices and customs duties. [1]

Balancing and production planning is all the more necessary if the economy is more marketable, but more planning of agricultural policy. Agricultural policy is the most important method of achieving the goals and strategies of development.

Three priorities on which the Ministry of Agriculture is working on:

1. Agricultural development strategy and adequate plans and programs in the ministry,
2. Subsidy payments, premiums, allowances and loans directly to producers,
3. Establishing of a network of agricultural stations and encouraging those skills that will most effectively reach producers.

Registered producers may apply for short-term or long-term loans and can get support from 20 to 50% of the investment. The goal is to promote agriculture and to for it to be productive, rich, respected and competitive in the EU market, but also in other markets.

In the process of carrying out agricultural production are the factors that affect each other and have a retroactive effect in order to achieve the desired effect.

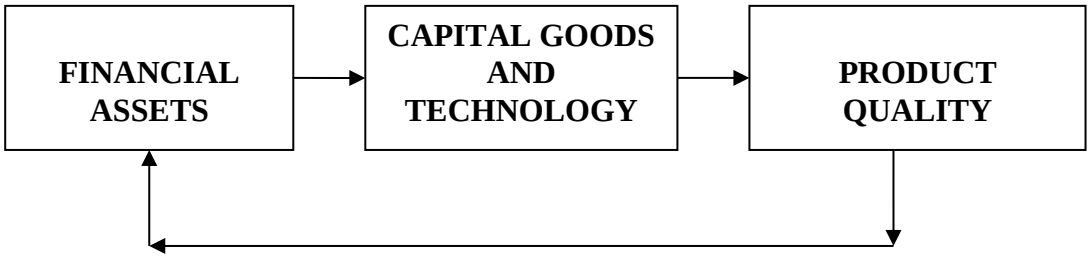

Figure 1. The main factors affecting the performance of agricultural production

2. AGRICULTURAL POLICY AND RURAL DEVELOPMENT IN SERBIA

Without financial funds there are no adequate capital goods and modern technology, without which there is no high-quality agricultural production, which is one of the requirements for disposing of sufficient volume of funds. Acceptance and understanding of these correlations and proper goal setting operations are the basic precondition of market survival, competitiveness and convergence of European mainstream. It is very important to leave the still dominant stereotypes on production volume, yield and areas as performance standards for agricultural systems. [2]

Agricultural policy measures are divided into four groups: [3]

- **Economic measures** (rates, taxes, investments, loans and insurance),
- **Land policy,**
- **Technical - technological measures,**
- **Organizational - administrative measures.**

The government operates with economic measures on five main areas:

1. Providing economic protection for manufacturers through a system of special price,
2. Protection of farmers from monopoly, producers of means of production,

3. Securing the appropriate measures, incentives of some kind of production that contribute to the achievement of strategic objectives,
4. Establishment of appropriate regimes, export incentives, import regime and the complex issues related to foreign trade,
5. Vertically - technological, economic and organizational connection of participants in the production, providing value to all participants.

Agricultural policy and rural development in Serbia includes measures and actions taken by the competent authorities, in order to:

1) Strengthen the competitiveness of agricultural products in the market;
2) To provide high-quality and safe food;
3) Provide support to the living standard of farmers who cannot ensure economic survival in the market with their production;
4) To provide support to rural development;
5) Protection of the environment from the negative impacts of agricultural production.

Agricultural policy and rural development policy in Serbiaare implemented by implementation of the Strategy for Agriculture and Rural Development of the Republic of Serbia, the National Programme for Agriculture and the National Programme for Rural Development.

Strategy for Agriculture and Rural Development of the Republic of Serbia determines the long-term directions of agriculture, including: the establishment of a market economy, increasing the profitability of agriculture of the Republic of Serbia and the concern about the development of rural areas.

With the National program for agriculture determines: medium and short term goals of agricultural policy, method, sequence and deadlines for achieving these objectives, expected results, and the form, type, purpose and scope of incentives. [4]

Management of agricultural policy is not possible without the funds in the agricultural budget. Agricultural budget is one of the most effective elements of economic policy in agriculture. Agricultural budget in the Republic of Serbia in 2005 amounted to 19 billion RSD. 4 - 5% of the total budget is allocated for the agricultural budget. These are very small means, if you take into account that agriculture accounts for 26% of the social product and when supporting activities share is 65%.

One of the essential institutional requirements for improving the competitiveness of the agricultural sector in Serbia is strengthening and modernization of scientific research and educational institutions in the form of initiation and support of various research projects. [5]

Serbian agricultural budget for 2013 is 45 billion RSD, which represents 4.5% of the total budget. 32.8 billion RSD is provided for subsidies, for investments four billion RSD, of which the largest portion is designated for fruit and vegetables, while 10 billion will be for the return for diesel fuel intended for farmers.

The strategic goal is that the agricultural budget in 2014 reaches at least 5% of the Serbian budget. The plan is that investment in agriculture over the next four years to be around one billion euros. Law on incentives in agriculture and rural development is very important and is a pillar of strategy in agricultural policy.

Experts believe that a long-term development strategy is needed inagriculture, so farmers and ranchers can plan production. Year 2012 was marked by drought, which has greatly influenced that the yields are halved, so that ordinary subsidies will not be enough to repair the damage to farmers. The problem is that subsidies cover only ten percent of the farms, and the resources that are committed are not sufficient for a complete soil preparation, seed procurement and implementation of agricultural practices. In the future we may expect a cutback in livestock as feed prices are too high, and interventions from stockpiles don't help here. This is not good, because the proportion of livestock in agricultural production has been reduced to about 25 percent, in which Serbia is the last place in Europe. Therefore, it can be expected that in the future it becomes dependent on imports of meat and meat industry.

3. LENDING TO AGRICULTURE BY THE EU

The European Union in the past ten years through grants and soft loans, approved by Serbia, greatly helped the recovery of the economy and society and contributed to the development of the country as a whole. Every step on the way ofSerbia's approach to EU includes greater access to European funds, intended for development projects. Since 2001 to date Serbia received a grant in the amount of about 3.6 billion eurosfrom the European Union, and the bulk of this amount was invested in the energy and environmental protection. Serbia has received 2.2 billion euros from the European budget and more than a billion was a bilateral assistance from Member States, which is about 400 euros per capita. For the period of 2007 to 2013 Serbia was approved 1.4 billion euros from IPA funds, or 200 million euros a year. These funds are intended for a variety of projects such as the construction of irrigation systems, construction of an Intermodal center in Belgrade, and the provision of medical equipment, the reform of the judiciary and public administration, strengthening of civil society and local government support. With the candidate status Serbia will for the first time be entitled to a grant from the European funds such as the one in the amount of 120 million dedicated to agriculture. This is particularly important because there hasn't been that kind of help until now. With the Serbia's entering into the EU, funds intended for Serbiawould increase manifold, so that European funds could be awarded up to two billion a year.

For the period from 2014 to 2020,14 billion euros are intended for Western Balkan countries which is an increase of 2.6 billion euros compared to the previous funds. During this period, a new program called "Connecting Europe"should be implemented, worth 40 billion euros, intended to link transport corridors and the development of information technology. This is a chance for Serbia, especially for the provision of funds for road and railway "Corridor 10" and Danube "Corridor 7". The loans from the European Investment Bank and the European Bank for Reconstruction and Development of Serbia exceeded the sum of six billion. This means that Serbia, on that basis, received 770 euros per capita. The European Investment Bank should allocate additional 700 million euros of funding for primarily financing of projects for conservation from harmful climate change in the Western Balkans. During the past year the

Bank approved them best loans that can be found on the world market, and Serbia was granted 690 million loan for road infrastructure, as well as for research and development in the public sector, improving the quality of primary and secondary education, promotion of small and medium-sized enterprises. European Bank for Reconstruction and Development in the first half of 2011 funded 23 projects in the Western Balkans, which is a third more than in the same period last year. Total investment amounts to 3.5 billion euros, intended for the sectors of industry, commerce, agriculture, energy and transportation infrastructure.

4. CONCLUSION

Although agriculture is the main export sector, lack of investment and lack of adequate agricultural policy resulted in that its potential is not being fully utilized. Also, productivity is low, modern technology is scarcely applied, and irrigation systems cover only part of the infield. Therefore, it is necessary to increase investment in the sector, in order to increase production and export value, which, according to estimates, could be doubled. In addition, long-term development strategies are necessary, which would ensure that agricultural production is economically and environmentally sustainable, competitive and profitable, which would contribute to rural development.

Getting closer to European standards and increasing pressure from foreign investors to domestic production, the optimal management of financial resources and achieving satisfactory profit will be the first parameter which will position the agricultural sector ofSerbia in the domestic and international markets. Economic Development Strategy RS pays special attention to two sectors.

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ASPECTS OF CONNECTING THE DANUBE WITH AEGEAN SEA

ASPEKTI POVEZIVANJA DUNAVA SA EGEJSKIM MOREM

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Abstract: *Country's wealth is measured by the clever use of its own resources and sustainable development. Integration of the Republic of Serbia into the European Union, and assumes significant projects on connecting and joining in the network of European highways the Rhine-Main-Danube Canal and the further development of the waterway Morava-Vardar-Axios.*
Key words: *natural resources, integration projects, sustainable economic development, intelligent control*

Apstrakt:*Bogatstvo zemlje se meri inteligentnim korišćenjem sopstvenih potencijala i održivim razvojem. Integrisanje Republike Srbije u Evropsku uniju pretpostavlja i značajne projekte na povezivanju i uklapanju u mrežu evropskih magistralnih kanala Rajna-Majna-Dunav i dalju izgradnju plovnog puta Morava-Vardar-Aksios.*
Ključne reči*: prirodni resursi, integrisanje projektima, održivi privredni razvoj, inteligentno upravljanje*

1. INTRODUCTION

Republic of Serbia has specific geo-political and especially transit-geographical location, as central Danube-area country, central-Balkans country and a country across which two major pan-European corridors go (corridor VII – the Danube corridor and corridor X, highway and railroad corridor). Real valorisation of good geographical position of our country is conditioned upon defining new development concept, a strategy and politic of development which is compatible with development concept of European Union and application of most useful industrial solutions which are used today across Europe and world. The importance of this position can be observed trough the fact that even in ancient times, via militaries corridor was going trough territory of today's Serbia, making the shortest land connection between Europe and Asia or Middle East in particular. Serbia is positioned on the connecting spot of large European regions, on the crossing of roads to Central Europe, through Danube basin, Mediterranean, towards South Adriatic, and Alps. By analysing and estimating geo-strategic and geo-political, natural and other factors, as well as comparative advantages of Serbia in broader European space, we can conclude on importance of Serbia in traffic connecting of Western and Central Europe with South-Eastern Europe and Middle East, as well as establishing of connection between Central Europe and Mediterranean (Adriatic, Aegean and Black sea).

As a central state lying on Danube, lying in the middle of Balkan, and as a country through which there are two pan-European corridors (corridor VII – Danube's corridor and corridor X – railway and road corridor), The Republic of Serbia has a specific geopolitical, and especially geographic-transportation position. The true valorisation of ours country position is conditioned by defining new development concept, i.e. development policy in lieu with European Union development concept, and also by application of the best industrial solution, nowadays used in developed countries throughout Europe and world. The true significance of

this position can be observed in the fact that across today's territory of Republic of Serbia there was a corridor dating from period of old Greece – Via militaries. This was the shortest land route between Europe and Asia, which is between Europe and Middle East. Serbia is located very closely with important European regions. It is also on a crossroad on journey to Central Europe. Analyzing and evaluating geo-strategically and geo-political, Serbia, in broader sense we can find the reasons of importance of Serbia in traffic connection with West and Central Europe. Serbian geo-strategic position is completely changed in a last twenty years. After more than 80 years, Serbia was internationally recognized as independent country, gained new neighbours and defined newly founded state borders. The country also has set its political and economic goal – reaching EU, among other things because all the local neighbouring countries, corresponding to Serbian municipalities, are already members of EU or candidates. The necessity of cross-border cooperation (CBC) is one of the most important conditions in front of countries from South-Eastern Europe, i.e. on Balkan which represent the ideal framework for international cooperation. Besides this cooperation the broader concept represents the European frame (European Union and European Council as relevant institutions) and the global or world frame (with United Nations as relevant institution). The core idea of modern Europe is united continent, in political and economic sense,[1] which is enabled through channels of international and regional cooperation. This idea is fulfilled with help of the support of corresponding instruments, measures, guidelines, directions and financial support; there is also CBC in EU and with the non-EU candidate countries, cooperation with neighbours which are not candidates for the EU membership (ENPI)[5]; regional cooperation INTERREG IVC[6]; scientific and IT support ESPON[7].

In the framework of multilayer cooperation the infrastructure, especially road infrastructure, is one of the key instruments of connection and integration into broader surrounding. The basic goals of EU transportation politics have been defined since the First Pan-European Transportation Conference, held in Prague in 1991 where the efficient sustainable transportation concepts have been presented. Their goal was to fulfil social and economic needs of European countries. Effective transportation development guaranteed development of infrastructure which had to be integrated on European level, founded on trans-European network of countries. The creation of transportation corridors which should enable the connection between the countries of Central, Eastern and South-Eastern Europe has been agreed. On the Second Pan-European Transportation Conference, on March 1994, held in Crete, nine pan-European corridors have been identified as necessary. Six was planned to be West-East direction corridors while three of them were North-South corridors. These corridors have represented the part of a three-layer concept by which the infrastructure of pan-

[5]The European Neighbourhood and Partnership Instrument (ENPI) having 15 programs of cross-border cooperation with the idea to promote the cooperation and economic integration between EU and partner countries in areas of management and economic development. Overall budget is 11,18 billion Euros.

[6]Follow up of INTERREG IIIC for period of 2007 until 2013, created for the experience exchange between the EU countries, Switzerland and Norway with two priorities – innovations and "knowledge economy as the first one and as a prevention as a risk prevention. Priorities are in lieu with the EU strategy for the development and increase of employment according to Lisbon agenda.

[7]European Spatial Planning Observation Network – European network for spatial planning, constructed to support development politics and to enhance equal territorially distributed European development. It is cooperation between national institutions for spatial planning focused on trend analysis of regional development and as well financial studies about spatial planning.

European transportation needs to standardised with concepts of short-term (5 years period) and long-term (20 years period) transportation plans for Europe.[2]

Pan-European corridor VII (DanubeRiver) is the only navigable road out of ten corridors. From Kelheim to its confluence in Black Sea near Sulina, 2414 kilometres long, that corridor has the reputation of the European navigable road of international importance. Danube sector, from Bezdan to Timok, 588 kilometres long where the border with Croatia is 137,6 km and border with Romania, 229,35 kilometres, represents main framework of Serbian network of navigable roads. Choosing this as a pan-European corridor came as a confirmation of the international and continental importance of this route and it clearly represents exquisite potential for Serbia. Further connection of Danube with Aegean Sea using Morava and Vardar, across the saddle of Preševo with Axios represents the possibility of integration of various natural resources and enable vast economic potential for the dynamic development of Serbia in next period.[3] The most valuable natural resources are agricultural potential, mineral resources, hydro resources and forest resources. Natural resources, geostrategic position and industrial potential represent excellent foundation for the further economic development if the appropriate modern infrastructure and business environment according to European standards are incorporated. Also it is of vital importance to modernise the production and provide rational use of natural resources and their adequate protection. Of course, important part in realisation of this project is development of transportation infrastructure as well as agriculture with rise of agricultural goods and food industry by enhancing irrigation system and by introduction new technologies into this industry. Also it is necessary to provide enough drinking water and further increase the development of hydro energetic potentials and other renewable energy resources.

2. NAVIGABLE ROUTES

Creating navigable road Morava-Vardar-Axios is the only possible way of improving existing network of European navigable network routes and it is a natural connection of Rhine-Maine-Danube channel and it bears a great importance in further cooperation between countries of Central and Western Europe with the Eastern European countries and Mediterranean countries. In that sense, the river transportation had the important role so far as well, connecting industrial areas rich with resources with the highly developed industry areas.

The length of navigable road along Danube to Black Sea and across Black Sea to reach Aegean Sea is 1880 kilometres, and the length of the navigable road from Belgrade to Aegean Sea would be only 700 kilometres. Only this data clearly implies to the economic importance of this route. Until now there are several studies and project about the navigable road Morava-Vardar-Axios. From 1879, when the first study has been done “Morava, actual condition and navigation possibility” by A. Aleksić from Belgrade. Significant document, “The project of navigable route Danube-Thessaloniki” by Nikola Stamenković came relatively fast for that period, in 1909. This was done as a part of project and with financial support of “American Engineer Company”. In that project financial support was also provided by several interest groups from England and Germany. Political conditions in Europe in that time influenced that Turkish opposition was enough not to start the realisation of this project. After the start of Balkan War in 1912 and because of the necessary after-war build-up influenced that the

project was stopped in its realisation. And it was like that up until 1961 when the idea was reintroduced with a creation of a draft solution "Belgrade – Thessaloniki navigable road" created by Construction Institute of River Transport from Belgrade. Further ideas came in following years. In all of these and the other documents that followed it was showed that this project has the capacity to be implemented as well as it was showed that there is a clear economic gain from the realisation of this project. It was determined the technical parameters, route, hydro and geological conditions and all the necessary object on wider area of Morava and Vardar basin which should enable successful realisation of this navigable route and optimal use of basins of these two rivers.

Republic of Serbia continued in 2012 development of the project and continued with the development for further studies which should, in details, give the solution of all the technical, economic, financial, institutional and legislative problems which exists in such project. This should be done following the strategy of developed European countries, where the river and canal transportation is more and more important due its advantages to other transportations. It is cheaper and it is a mass production transport but also, there is ecological aspect nowadays more and more important, security, the land is more expensive causing other transportation to be more expensive without potential for that to change in year to come. For more details about the price see Table 1.

Table 1. Cost for different transportation (in euro /tkmx1/10.000.)

	Marinetransportati	Railtransportation	Trucktransportatio
Air pollution	**34**	**33**	**236**
Risk	**1**	**12**	**178**
Noise	**1**	**70**	**87**

The last big example of the success of the routes like this is Rhine-Maine-Danube canal, connecting basin of Rhine and Danube with navigable road Maine-Danube. This route would further develop European canal system, as well as Danube-Tisa-Danube canal as it can be connected to route Danube – Aegean Sea.

After the end of World War II the necessity for the navigable canal through Vojvodina got its solution with a creation of Danube-Tisa-Danube canal. The basic idea of that project was the regulation of water system in Vojvodina, flood protection and as well as for irrigation. The special attention is devoted to navigable characteristics of this canal. Development of human built navigable routes in Serbia would be continued with the construction of Danube-Morava-Vardar (Axios) navigable route. This route would spread across Velika Morava, South Morava, Pčinj, and Vardar up until its confluence near Thessaloniki, overall 650 kilometres long. In this way, the road from our marines and ports to Aegean Sea would be shorter for 1200 kilometres. In the same time industrial and economic gain is present as well as the hydrological effects on Morava basin.

Throughput capacity of the complete navigable road (or of its part) represents maximal amount of goods, in tons, that can pass through the navigable route in time (day, month, or some other period) for a defined technical characteristics of road and defined transport organisation with the condition that the probability of omission of vessels in some time period

has to be equal or bigger than defined, as well as that average costs of processing vessels goods do not cross defined level. The amount of goods in tons by the unit of time is the main measure of navigable route's throughput capacity. Another possible measure, even more often used is the number of vessels that pass in the defined amount of time. Throughput capacity of the slowest part of the route defines the throughput capacity of the whole route overall. This capacity primarily depends in technical characteristics of a given navigable route. The data about the canal elements are given in Table 2, and the data about the ship's lock are given in Table 3.

Table 2. The basic elements of the canal

The depth of water in the middle of the profile	4,0 m
The water depth in the channel at the edge of the bottom	3,75 m
Channel width at the water	43,0 m
The minimum width of the level of gas	28,0 m
The slope of the slope to the height of 1 m above the bottom	1:4
The slope of the slope above the height of 1m above the bottom	1:3
The minimum radius of curvature	R=800 m
Minimum dimensions under bridges: - Free height above the normal water level - Single hole under the bridge - Minimum height below transmission VN	 5,25 – 10,0 m 50 – 70 m 10 -13 m

Table 3. The basic elements of locks

Minimum free length	190,0 m
Single beam locks	12,0 m
The water depth at the threshold	3,50 m

The basic dimensions of ship's locks are defined and are the same as for the Rhine-Maine-Danube canal. Throughput capacity of the navigable route represents one of the most important characteristics especially for navigable roads such as this because when they are constructed and when they are used all the other relevant data are derived from throughput capacity. Overall length of the navigable road Morava-Vardar-Axios is 650 kilometres. Start is at the confluence of Velika Morava in Danube (near Smederevo, 50 kilometres from Belgrade) from which canal goes along Velika Morava and then near Stalać continues alongside Južna Morava. On wide plateau near Preševo is the part where Južna Morava continues in the north direction while Vardar-Axios goes south. The route continues in river Pčinj, then Vardar-Axios up until Macedonian-Greek border and further along to Thessaloniki. This route can be seen as a route created from five sections.

3. WATER MANAGEMENT AND AGRICULTURAL PERSPECTIVE

Although, it is assumed that water supply in Serbia is sufficiently enough, the fact is that our country is perceived as one of the scarcest areas of Europe so in the long-run rational consumption of water is necessary condition. Water potential consists of transit water (polluted or bad quality water) and numerous minerals and thermo mineral sources (partly used). About 2/3 of total population have approach to public net of water supply, but with estimate that about 80% of population is even connected to water-net. The system of drainage of water is still not sufficently developed, so about 50% of population is connected to sewerage. As the time goes by water restriction becomes more frequent, especially in summer period. Present problems are consequences caused by: inefficient regulative harmonization,

low investment in water – industry, inadequate price of water, low quality services, irrational water consumption, low level of water filtering, low quality of the surface water, inefficient integral water-managing system, illegal construction in areas of water sources and potentially flooding areas and other.

With certain availability of its surface waters which is around 1500 square meter per resident, Serbia is listed as one of the poorest water countries in Europe. It is considered that 2500 square meter of domestic water per resident is the lower limit. Based on that limit, calculations about self-sufficiency of domestic waters of a country in question are being done. Serbia doesn't meet the standards and the consequences seem to be inevitable: a) water balance is strained, and a re-evaluation which has to include climate changes and tendency toward its deterioration must be made; b) strict measures such as optimal and rational use of water need to be introduced as soon as possible; c) more complex integral measures need to be brought up so as to protect the quality of water,as well as applying those which enable increase of small waters with certain accumulations; d) numerous accumulations with a regulation on a yearly basis are needed; e) certain Serbian areas which gravitate toward transit waters of international rivers have got to rely exclusively on using their own waters Basic problems that Republic of Serbia is facing and has to do with water resources, are the ones which include domicile waters. Since domicile waters exist, that means that water infrastructure has to be based on a very complex integral regulation system. One of them is the use and protection of water along with the use of transit waters, which are by its nature very unstable when it comes to their quality, quantity and time interval. Further on, spatial disparity is unfavorable. Quite populated lowland places in Serbia such as: Pomoravlje, Kolubara, Šumadija, Vojvodina, Kosovo, Southern Serbia, are the richest in land resources but the poorest in water. There are also vast deficient zones such as: Sumadija, Donja Kolubara, Vojvodina, Kosovo, which are bringing down the availability of domestic waters to an extent of a 500 square meters per resident. Those areas have got to be watered from an extra source or transit waters. Places where water is desperately needed are dry, and places like Drina, Starovlaske planine, Sara, Prokletije, Vlasina are teeming from high quality of water resource which further requires long transit systems.

Table 4. Distribution of water flows in the territory of Republic of Serbia (domestic water)

River/basin	Averageflow m^3 / s	Flow total 10^6m^3/yr	Smallwaterm^3 / s
Lepenac, Pčinja, Dragovištica	19,9	626,8	1,4
Beli Drim, Plavska reka	62,2	1.959,3	3,3
Sliv Drine u Srbiji	62,3	1.962,4	14,8
Sliv Save od Drine do ušća u Dunav	26,5	834,7	1,4
Velika Morava	**222,0**	**6.993,0**	**34,0**
Mlava, ušće u Dunav	12,0	378,0	0,7
Sliv Dunava od Mlave do granice sa Bugarskom	51,9	1.634,8	2,1
Banat i Bačka (domaće vode)	39,0	1.228,5	1,3
Srem	13,0	409,5	0,5
The RepublicofSerbia	**508,8**	**16.027,2**	**59,5**

Due to lack of own water Serbia obliged to turn to the use of transit and used waters which came from other territories. There are significantly large (around 5163 m^3/s or 162×109 m^3/year) and without the use of these waters the capacity of Serbian water management.

Table 5.Waters on Serbian border.

River/basin	Averageflow m^3 / s	Flow total $10^6 m^3$/yr
Dunav sa Dravom	2.824	88.956
Tisa sa Begejom	794	25.011
Kanal Baja Bezdan i Plazović	2	63
Tamiš	37	1.165
Brzava, Moravica, Karaš, Nera	35	1.102
Drina sa Limom (dotok u Srbiju)	333	10.489
Sava (dotok u Srbiju)	1.130	35.595
Sliv Nišave (dotok iz Bugarske)	8	252
The RepublicofSerbia	5.163	162.634

Solutions based on the use of transit waters are relatively vulnerable: (a) because of the quality which is often below the acceptable limits; (b) because of intense water consumption in countries up the stream of the river, its flow is lowered. Also, transit rivers have adverse regimes: in some areas they are below 1500 m^3/s.
Therefore assurance of the water from Velika Morava is important, especially bearing in mind the necessities of agricultural development and food industry, i.e. the necessity for irrigation system and ensuring satisfying amount of water. Irrigation systems are unequally distributed throughout the Serbian territory (see Table 6). The majority of irrigation systems are located in Vojvodina and around 70% of them are the one on areas smaller than 500 ha.

Table 6. The existing irrigation[4]

	Constructedirrigation systems		
	number	ha	possible water 10^3 m^3/year
Vojvodina	238	91.083	152.069
Centralna Srbija	41	8.160	14.691
In total	279	99.243	166.760

Existing systems are underused (Table 7), and the annual volume of water abstracted for irrigation is estimated at around 70-75 million m^3 of water.

Table 7. The use of irrigation[5]

Year	Irrigated areas (ha)		
	Vojvodina	Centralna Srbija	In total
2000	30.188	8.160	38.459
2001	21.288	5.557	26.845
2002	25.942	3.746	29.688
2003	32.809	4.208	37.017
2004	25.058	3.014	28.072

Analysis of the current state of irrigation shows that the achieved level of participation in irrigation farming of Serbia does not, and the reasons for this are numerous:

1) Disadvantage of agriculture in general, with unresolved problems in the production, processing and distribution of agricultural products;
2) Inadequate irrigation treatments (additional measure of stabilization of agricultural production, which offset the adverse effects of drought), which resulted in his spurts use and retention of the traditional approach to farming, including sowing structure;
3) Absence of the basic conditions for successful implementation of irrigation: consolidation, regrouping and consolidation properties, and then create the economic conditions for the different organization of production and marketing of surpluses and the like;
4) a number of built systems do not meet project specific work
5) The construction and maintenance of irrigation systems requires considerable resources.

The main objective of the spatial distribution and organization of agriculture is achieving sufficient scale and range of safe quality food products and raw materials for the development of competitive manufacturing industries, according to the heterogeneous nature of territorial and socio-economic benefits and limitations.

4. HYDRO ENERGETIC AND INDUSTRIAL PERSPECTIVE

A variety of natural resources provide an increase in power and dynamic economic development of Serbia in the future. The most significant natural resources are agricultural land, mineral resources, water resources and forest resources. Natural conditions, geographical location and economic capacities built a good basis for the successful development of various economic activities provided to build a modern infrastructure and business environment compatible with European standards, modernize production and operations and ensure the rational management of natural resources and their adequate protection. Especially important sector in development of Republic of Serbia is production of electricity from renewable sources, taking into the account scarcity of reserves of coal, natural gas an oil.Power sector Serbia has particular interest in the construction of hydropower plants on the Upper Drina, Middle Drina (move between Bjelovar and HE HE Zvornik) and Lower Drina (HPP Zvornik move to the south of the river Sava) in accordance with international agreements; [6]

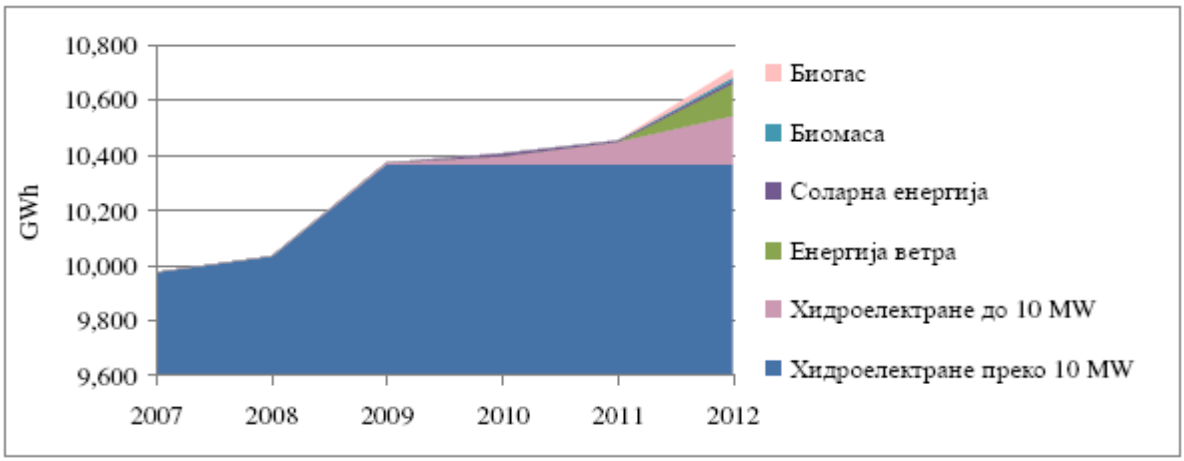

Figure1. The planned production of electricity from renewable energy sources in Serbia, by type [7]

- Construction of pumped-storage hydropower plant Bistrica and Iron Gate 3 and other structures on larger rivers (Great Morava, Ibar and Drina, Sava, Danube, etc..), The Electric Power Industry of Serbia from its own or in collaboration with a strategic partner willing to financially support the implementation of these power plants. Economic, financial, technological, environmental and social acceptability of the justification of the construction of this / these facilities will require the development of complex studies, compliance with the protection of nature and environment and other interests on the site and the neighbourhood cooperation with reliable partners abroad and respect for international instruments binding on Serbia in the field of sustainable energy;
- Construction of medium and small hydropower is a significant potential to reduce demands for electricity, the site future accumulations be protected from unplanned occupation of space by other users until the decision to start construction (river Lim, Moravica West Morava Jošanica Nisava etc.). In the field of renewable planned for development of renewable energy sources for distributed generation of electricity:
- Small hydro power plants (the Cadastre of 1987. There are about 860 locations to be checked at the local level, where many of the already small hydro power given permission);

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PHYSICO-CHEMICAL WATER QUALITY OF THE LAKE PELAGIĆEVO

FIZIČKO-HEMIJSKI PARAMETRI KVALITETA VODE JEZERA PELAGIĆEVO

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Abstract: *Physico-chemical analyses are the best way of estimating the current state of the watercourses. Estimation of water quality based on these parameters was conducted in the Lake Pelagićevo. Samples for analysis were collected at three sites of the Lake Pelagićevo, in a depth profile, and sampling was done twice, with a total of 16 analyzed parameters. Results showed that water from the Lake is of a relatively good quality. But a few parameters, high oxygen saturation rate and COD, indicate a processes that can lead to significant deterioration of water quality and the negative impact on the life in it.*
Key words: *analyses, Pelagićevo, water*.

Apstrakt: *O trenutnom stanju vodenih ekosistema najbolje nam govori analiza fizičko-hemijskih parametara. Procjena kvaliteta vode na osnovu ovih parametra provedena je na jezeru Pelegićevo. Uzorci za analizu su uzimani na tri lokaliteta jezera Pelegićevo, po dubinskim profilima, a uzorkovanje je provedeno dva puta, pri čemu je analizirano ukupno 16 fizičko-hemijskih parametara. Na osnovi dobijenih rezultata može se reći da je voda jezera relativno dobrog kvaliteta, međutim nekoliko parametara, kao što su visoko zasićenje kiseonikom kao i HPK, ukazuju na odvijanje procesa koji mogu da dovedu do značajnog pogoršanja kvaliteta i negativnog uticaja na živi svijet u njemu.*
Ključne riječi: *analize, Pelagićevo, voda*.

1. INTRODUCTION

Determination of physico-chemical water characteristics of certain aquatic ecosystem is of a great importance and gives information about current state of the water body.

Physico-chemical, microbiological and biological methods are used to determine water quality and pollution level of surface freshwater [1], [2], [3], [4]. Physico-chemical water properties are one of determining factors in water quality estimation [5], [6].

Conclusions about water quality can be made by monitoring physico-chemical properties of the water and their interaction with other parameters. Values of certain parameters and their changes indirectly affect the wildlife in aquatic environment.

The most used physico-chemical parameters are temperature, pH, electrical conductivity, dissolved oxygen and saturation, chemical oxygen demand (COD), total suspended substances (TSS) and others. Analyses were conducted in LakePelagićevo to determine water quality from physico-chemical aspect. The lake was formed by gravel extraction and filling the resulted depression with groundwater. After that, the lake was restocked on a few occasions and today is under management of sport fishermen association.

2. MATERIAL AND METHODS

Samples for water analyses were collected at three sites of the LakePelagićevo, from surface and in depth profile on 21st and 26th of July 2012. On locality 1 and 2 samples were collected form surface and at a depth of 1 m and 2 m, while on locality 3 sampling was done on surface and at 1 and 1.5 m. Sampling was conducted early in the morning.

Immediately after sampling determination of water and air temperature, pH value, electrical conductivity, turbidity, concentration of dissolved oxygen and oxygen saturation rate was done [2], [7].

Spectrophotometric determination of ammonia, nitrate, nitrite, sulfates, ortophosphates and total suspended substances in water was performed in the laboratory of the Faculty of Natural Sciences and Mathematics in Banja Luka, where spectrophotometer NASN DR2800 was used.

3. RESULTS AND DISCUSSION

Results of conducted physico-chemical analyses are presented in tables 1, 2 and 3.

Table 1. Values of physico-chemical parameters on locality 1

Parameter	Locality 1					
	21.07.2012.			26.07.2012		
	surface	1 m	2 m	surface	1 m	2 m
water temperature (˚C)	26.0	26.8	27.2	25.7	25.8	25.6
dissolved oxygen(mg/l)	10.44	10.12	8.97	9.32	9.16	7.01
oxygen saturation rate(%)	130.4	128.3	114.6	115.9	114	87
BOD (mg/l)	9.83	9.38	7.99	8.65	7.22	4.61
COD(mg $KMnO_4$/l)				50.3	29.4	25.2
COD(mg O_2/l)				12.73	7.44	6.38
pH	8.72	8.72	8.97	8.5	8.56	8.36
electrical conductivity	309	313	316	353	326	316
turbidity (NTU)	7.14	9.67	9.88	10.52	10.96	10.01
supended substances	10	13	13	11	13	13
transparency (m)	1			1	-	-
depth (m)				2.5		
ammonia nitrogen (mg/l)	0.05	0.00	0.09	0.05	0.01	0.10
nitrate nitrogen (mg/l)	0.3	0.4	0.0	0.5	0.4	0.8
nitrite nitrogen (mg/l)	0.001	0.002	0.006	0.003	0.002	0.004
ortophosphates (mg/l)	0.21	0.58	0.07	0.19	0.28	0.04
sulfates (mg/l)	6	16	4	5	9	5

Decrease in temperature with depth was not recorded on location 1.

Based on the obtained results supersaturation on every profile was recorded, except on 2 m depth on the second day of the research (saturation 87%).

Based on these results, and according to the Regulation on Classification and Categorization of Water and Water courses [8], analyzed water can be cassified in second and third quality class. Concentration of dissolved oxygen at the bottom of this analysed location had value of 3.70 mg/l while saturation rate had value of 45.8 %.

High values of oxygen saturation rate indicate intensive photosintetic activity which is consequence of algal "bloom" which could, in this case, only be confirmed by microscopic analysis.

Values of pH and electrical conductivity indicate slightly alkaline water with moderate ion concentration. Values of electrical conductivity indicate first class quality water according to the Regulation on Classification and Categorization of Water and Water courses. In regard to two other locations, here were recorded significantly lower values of turbidity and concentration of suspended substances which resulted with higher transparency (1 m).

At every three depth profile presence of ammonia, nitrate and nitrite nitrogen was recorded where the highest concentrations were in the layer nearest to the bottom. According to the Regulation on Classification and Categorization of Water and Water courses values of these parameters corresponded to first quality class.

In the surface layer and in 1 m depth slightly higher concentration of orthophosphates was recorded comparing to other samples.

According to obtained values of COD in mg O_2/l water from first location correspond to second and third quality class according to valid regulation [8].

Table 2. Values of physico-chemical parameters on locality 2

Parameter	Locality 2					
	21.07.2012.			26.07.2012.		
	surface	1 m	2 m	surface	1 m	2 m
water temperature (˚C)	27.3	27.2	26.9	26.2	25.8	25.8
dissolved oxygen(mg/l)	9.34	9.13	3.26	8.35	7.49	7.37
oxygen saturation rate(%)	119.8	117.2	41.6	104.9	93.5	91.9
BOD (mg/l)	7.09	6.08	6.11	1.95	7.58	7.5
COD(mg $KMnO_4$/l)				126.4	135.4	128.4
COD(mg O_2/l)				31.99	34.27	32.46
pH	8.27	8.68	8.57	8.46	8.50	8.55
electrical conductivity (μS/cm)	361	267	320	345	315	313

turbidity (NTU)	12.18	14.8	29.3	11.9	19.9	21.9
supended substances (mg/l)	15	17	33	25	46	50
transparency (m)	0.60			0.60	-	-
depth (m)				2.0		
ammonia nitrogen (mg/l)	0.03	0.10	0.05	0.04	0.10	0.10
nitrate nitrogen (mg/l)	0.0	0.0	0.0	0.1	0.0	0.0
nitrite nitrogen (mg/l)	0.000	0.000	0.000	0.000	0.006	0.003
ortophosphates (mg/l)	0.04	0.15	0.04	0.05	0.12	0.04
sulfates (mg/l)	6	9	7	6	9	6

Slightly lower temperature gradient was recorded on locality 2, since the temperature difference between surface layer and at a depth of 2 m was only 0,5°C. Water is also rich in oxygen, but slightly lower values of oxygen saturation rate comparing to locality 1 was recorded, supersaturation was recorded only in superficial layer and in 1 m depth on the first day of sampling. Established results on this locality are also caused by algal "bloom". Based on oxygen supersaturation on surface and in 1 m depth water of second quality class was determined, while other saturation values indicated first quality class. Exemption is just at 2 m depth were value of oxygen saturation rate was 41.6%. Value of dissolved oxygen at the bottom was very low, only 0.75%, with saturation rate of 9.3%.

Values of turbidity and concentration of suspended substances were almost twice lower in surface layer and increase to the bottom, which cause lower water transparency (0.6 m) compared to previous locality. Water was slightly alkaline with relative low concentration of ions, nitrogen and phosphorus compounds. Nitrates were recorded only in surface layer in concentration of only 0.1 mg/l. In the same layer of both analysed days the lowest concentration of ammonia nitrogen was recorded (0.03 and 0.04 mg/l). On the first sampling day presence of nitrites was not recorded, while on the second day they were present in low concentrations at a depth of 1 and 2 m. The highest concentrations of ortophosphates and sulfates were recorded at a depth of 1 m, but the values were very low. Obtained results of COD indicated water of fifth quality class according to the Regulation on Classification and Categorization of Water and Water courses [8].

Table 3. Values of physico-chemical parameters on locality 3

Parameter	Locality 3					
	21.07.2012.			26.07.2012.		
	surface	1 m	2 m	surface	1 m	1.5 m
water temperature (˚C)	27.3	26.7	26.4	27.6	26.4	26.1
dissolved oxygen(mg/l)	10.74	10.83	9.55	12.53	9.63	8.46
oxygen saturation rate(%)	137.4	137	122.4	161.6	121.6	106.1
BOD (mg/l)	6.46	4.87	7.40	11.63	9.08	7.94
COD(mg $KMnO_4$/l)				176.0	56.2	103.5

COD(mg O_2/l)				44.55	14.22	26.20
pH	8.74	8.74	8.78	8.8	8.56	8.49
electrical conductivity (μS/cm)	341	318	300	293	285	304
turbidity (NTU)	20.7	19.9	22.4	29.4	29.1	28.1
supended substances (mg/l)	20	27	32	41	46	46
transparency (m)	0.50			0.50	-	-
depth (m)				1.5		
ammonia nitrogen (mg/l)	0.04	0.02	0.10	0.04	0.02	0.10
nitrate nitrogen (mg/l)	0.3	0.0	0.0	0.1	0.0	0.0
nitrite nitrogen (mg/l)	0.004	0.001	0.001	0.000	0.005	0.011
ortophosphates (mg/l)	0.09	0.37	0.01	0.06	0.14	0.01
sulfates (mg/l)	7	12	6	5	10	6

Surface layer on locality 3 is warmer for 1.5°C than water at a depth of 1.5 m.

Concentration of dissolved oxygen decrease with a depth, but in all three monitored levels supersaturation was recorded, which had values of 137.4% (first day) and 161.65% (second day). According to the Regulation on Classification and Categorization of Water and Water courses [8] obtained values of oxygen supersaturation in most cases indicated third and forth quality class. In this case, also, this high saturation values indicate intensive photosintetic activity which is consequence of algal bloom.

Values of pH also indicate that phytoplankton activity is the highest in surface layer, since there was recorded the highest value of this parameter (pH 8.8).

Value of electrical conductivity was relatively low indicating low ion concentration in water. All obtained values of electrical conductivity indicated first quality class. In all three observed depth slightly higher values of turbidity and concentration of suspended substances were recorded, which caused water transparency of only 0.5 m.

Concentration of basic nutrients in the water is very low because of their consumption due to intensive phytoplankton development. Presence of nitrate nitrogen is recorded only in surface layer with values of 0.3 mg/l (first day) and 0.1 mg/l (second day). The highest concentration of nitrite nitrogen (0.011 mg/l) on the second sampling day was recorded in the deepest layer. Here was also recorded the lowest concentration of ortophosphates (0.01 mg/l).

Obtained results of COD on the third locality showed large fluctuation, and according to their values and valid regulation the water is classified into III, IV and V quality class.

Observing COD values on all localities and sites it can be ascertain that water is loaded with organic substances, which is especially expressed on localities 2 and 3.

4. CONCLUSION

Looking at physico-chemical parameters in the whole water form the LakePelagićevo is of a relatively good quality, however a few parameters indicate ongoing processes which can lead to significant quality deterioration and negative impact on fish. This is primarily referred to high oxygen saturation rate caused by algal bloom and COD which indicates presence of large amounts of organic substances which decomposition cause decline in oxygen concentration that can be very harmful.

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UTILIZATION OF KARST GROUNDWATER FOR THE PURPOSE OF BOTTLING – AN EXAMPLE OF "EUROAQUA" GROUNDWATER SOURCE IN EASTERN SERBIA

KORIŠĆENJE KARSTNIH IZDANSKIH VODA ZA POTREBE FLAŠIRANJA – PRIMER IZVORIŠTA PODZEMNIH VODA "EUROAQUA" U ISTOČNOJ SRBIJI

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Abstract: *Detailed hydrogeological explorations of Buk karst spring catchment area, located in the foot of the Rtanj Mountain in eastern Serbia, were conducted for the purpose of bottling. Biggest part of the spring catchment is composed of karst terrain, characterized with pronounced permeability that combined with other factors generally lead to high groundwater vulnerability and high risk of pollution. For the purpose of providing good quality groundwater with long term stability in physic-chemical parameters, two exploitation wells with depths of over 150 m were installed. Well with capacity of 2 l/s is in use for heating and cooling of the bottling facility, while second well with capacity of 6 l/s is used for production of "Aqua Ultima" bottled water. This paper shows main steps and methodology for hydrogeological research in the purpose of analysis and identification of hydrogeological system in the "Euroaqua" groundwater source area. This analysis is proved to be essential in assessing the potential for multipurpose use of this natural resource.*
Key words: *Hydrogeology, Groundwater quality, Bottled water, Rtanj Mont.*

Apstrakt: *Na prostoru istočne Srbije, u podnožju planine Rtanj, u slivu karstnog vrela Buk sprovedena su detaljna hidrogeološka istraživanja za potrebe flaširanja podzemnih voda. U okviru slivnog područja veliku površinu zauzimaju karstni tereni sa izraženom vodopropusnošću, pa su time i podzemne vode u njima podložnije zagađenju. U cilju dugoročnog obezbeđivanja stabilnosti fizičko-hemijskog sastava i zahvatanja podzemnih voda najvišeg kvaliteta, pristupilo se izradi dva eksploataciona bunara dubine preko 150 m. Bunar kapaciteta 2 l/s se upotrebljava za grejanje odnosno hlađenje objekta punionice vode uz primenu toplotnih pumpi, dok se drugi bunar kapaciteta 6 l/s koristi za flaširanje vode pod tržišnim nazivom „Aqua Ultima". U radu je prikazana metodologija hidrogeoloških istraživanja u cilju sveobuhvatne analize i identifikacije hidrogeološkog sistema u području izvorišta „Euroaqua". Ovakva analiza pokazala se kao neophodna za izbor i projektovanje odgovarajuće metode za eksploataciju podzemnih voda, kao i za analizu mogućnosti višenamenskog korišćenja ovog prirodnog resursa.*
Ključne reči: *Hidrogeologija, Kvalitet podzemnih voda, Flaširane vode, Rtanj.*

1. INTRODUCTION

Providing the water for overgrowing world population will be one of the greatest challenges in the 21st century. From all the "fresh" water at the planet 68.6% is stored in the snow and ice, around 30% as groundwater and only 1% as surface water in lakes and rivers [1]. Groundwater as a resource is at constant stress due to pollution and overexploitation resulting in persistent decrease in availability of good quality groundwater. Specifics of groundwater in relation to other natural resources, such as great importance, difficulties in exploration and exploitation and renewability (groundwater is only geological-mineral resource that is renewable in real time) [2] makes the proper management of this resource very challenging. In Serbia, 75 % of total water demands for public water supply, irrigation and industry are

fulfilled from groundwater. From this amount, around 18 % (≈ 4 m^3/s) are related to karst aquifer, for which is estimated to have a groundwater potential of around 14 m^3/s [3]. Part of the highest quality karst groundwater is in use for bottling. Expansion in production of natural bottled water is apparent on Serbian market in the last decade. Total production of bottled water in Serbia for 2010 is around 635 million liters, which gives average annual consumption rate of 75 liters per inhabitant [4]. In the sailing structure, carbonate water dominate with 72 % in relation to still bottled water [5]. Majority of natural waters that are in use for bottling are related to fractured, crystalline rock aquifers and karst aquifers. Along *Aqua Ultima*, typical HCO_3-Ca-Mg type karst waters are *Eva*, *Jazak*, *Iva* and *Vujić Voda*. Brands like *Duboka* and *Voda Voda* (HCO_3-Ca-Na type) are also taped from limestones but elevated Na^+ concentration, temperature around 20°C and microcomponent composition distinguishes them from typical karst groundwater [5].

"Euroaqua" groundwater source is situated in eastern Serbia, in the catchment area of Buk-Lozica karst spring. It consist of two exploitation wells with depths of 170 m and 116 m, with optimal capacities of 2 l/s and 6 l/s. Deeper well is used for heating/cooling of bottling facility with heat pumps and the other is in use for production of "Aqua Ultima" bottled water. Installations of wells were preceded by monitoring of water quality and yield of the spring, during which instability in the physical-chemical characteristics and microbiological composition of the groundwater was observed. Given that the main purpose of water is for bottling, it is necessary to meet the highest standards of quality, which was the main reason for the abstraction of groundwater over exploitation wells, rather than directly from the spring.

The paper present the methodology of hydrogeological research of karst aquifer, applied at "Euroaqua" groundwater source that resulted in installation of two extraction wells. The main goal of the paper is to provide explanation of the main steps needed for proper quantification and characterization of the groundwater resource. This information is important for appropriate management of the projects related to utilization of this natural resource.

2. STUDY AREA

Study area is located in the catchment of Buk-Lozica spring, in eastern Serbia. Spring is situated on the southern periphery of Krivi Vir valley, mountain depression between south-western parts of Kucaj massive in the North and Rtanj Mountain in the South (figure 1).

Geology and Hydrogeology

In the geological settings of the area, oldest formation is represented with Devonian sandstone and siltstone and Permian age red sandstone. Mesozoic sedimentary complex is composed of Jurassic and Cretaceous age bedded and massive limestone. In the north-eastern part of the study area, Miocene sandstone, sand and clay overly carbonate rock formations. "Buk-Lozica" groundwater body is defined on the bases of reinterpretation of earlier researches and detailed geological and hydrogeological mapping of the area. Natural oligo-mineral waters of "Euroaqua" groundwater source are formed within following formations (figure 1):

- massive and bedded Cretaceous limestones (K_1^{3-4});
- bedded Cretaceouslimestones (K_1^{1-2});
- massive and beddedJurassic limestones (J_3^3).

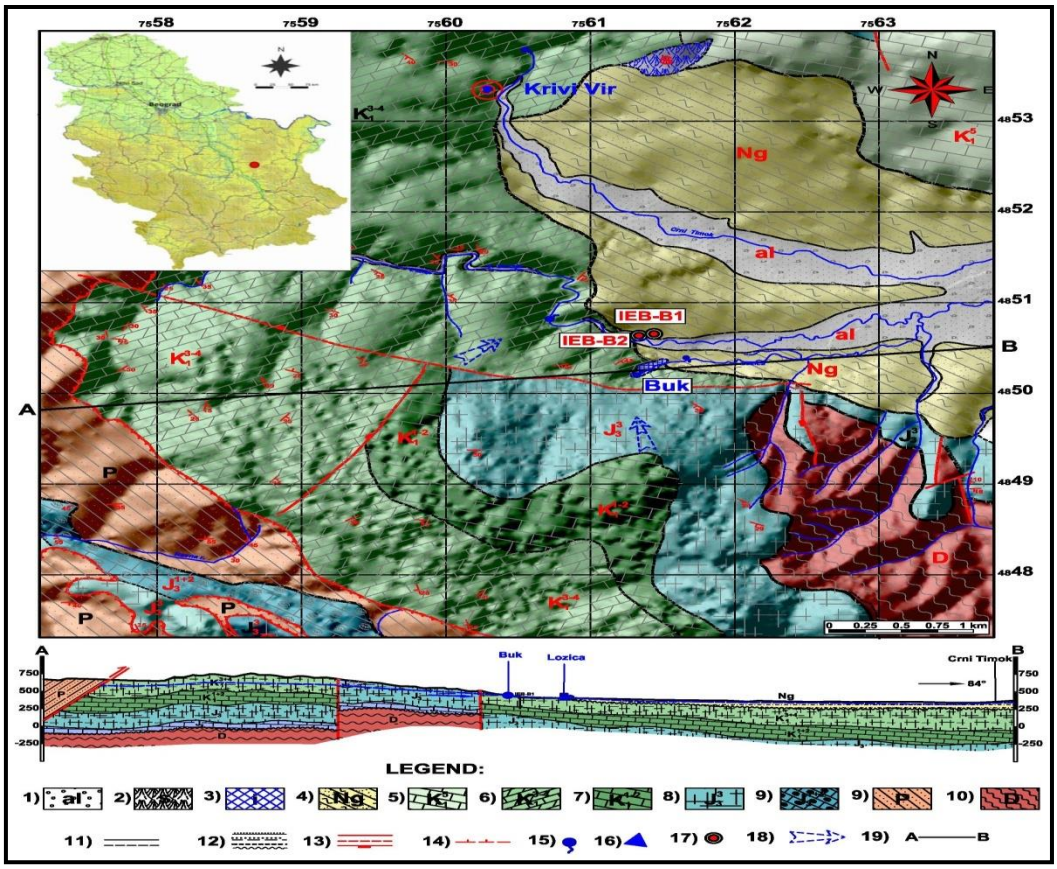

Figure 1.Schematic geological-hydrogeological map of wider area of Buk-Lozica karst spring

Legend: 1. **al**-Sands, gravels (intergranular aquifer); 2. **s**-Travertine (intergranular aquifer); 3. **i**-Traversing (karst aquifer); 4. **Ng**- Sandstones, sand, clays (fissured aquifer); 5. $\mathbf{K_1}^{5}$-Limestones (karst aquifer) 6. $\mathbf{K_1}^{3\text{-}4}$ -Dolomite limestones (karst aquifer); 7. $\mathbf{K_1}^{1\text{-}2}$ - Bedded limestones (karst aquifer); 8. $\mathbf{J_3}^{3}$-Massive limestones (karst aquifer); 9. **P**-Old red sandstones (fissured aquifer); 10. **D**-Sandstones, silstone (impermeable); 11. Geological boundary; 12. Disconformity; 13. Fault; 14. Overthrust; 15. Spring; 16. Thermal spring; 17. Well; 18. GW direction; 19. Cross-section line;

Boundaries of groundwater body on the surface of the terrain are clearly defined by tectonics, terrain morphology, as well as by contacts with non-carbonate less permeable formations. Southern groundwater body boundary is controlled by tectonic contact with overthrust of red Permian sandstone. Northern boundary is contoured by contact with less permeable neogene and quaternary formations of Krivi Vir basin. Western groundwater body boundary is located on the contact with Devonian sandstone and siltstone, while eastern and north-western boundaries are defined on the bases of morphology, i.e. they are contoured by local topographical watershed. Surface of this way contoured groundwater body spreads over 6.3 km^2, with carbonate deposits exposed on the surface on approximately 95% of the area. All mentioned formations contouring the groundwater body (except topographical watersheds) present, in the sense of hydrogeology, less permeable rocks, therefore they are barrier for movement of karst groundwater. The source is characterized by relatively favorable filtration properties with developed karst fracture porosity. Estimated thickness of carbonate complex in the area of Buk massive is up to 700 m (Figure 1 - cross-section) [6].

Due to relatively good collector properties and existence of impermeable and low permeable rock masses in base and sides, the conditions were created for formation of significant reserves of good quality groundwater in limestone complex. The aquifer, which is drained by Buk-Lozica spring, recharges by infiltration of precipitation. Water infiltrates and circulates through system of fissures and cracks into deeper parts of the terrain. The direction of groundwater flow is conditioned by general geological structures, position of impermeable base, by degree of karstification, general hydrogeological conditions etc. The clearest indicators of local directions of groundwater flow are positions of fault structures, slope, position of spring and mechanism of its runoff, yield and similar. Based on this information, presumed general direction of groundwater flow is South-North.

3. METHODOLOGY OF HYDROGEOLOGICAL RESEARCH

Following the analysis and interpretation of previous research and detailed mapping of the terrine, hydrogeological research was conducted including:

- measurements of daily precipitations at the catchment area;
- monitoring of flow rate and temperature of the spring during one hydrological cycle;
- quality monitoring of Buk-Lozica spring through periodical sampling and chemical analysis;
- geophysical measurements in order to define depth and thickness of karst aquifer, fault zones and spatial and vertical distribution of different lithological units;
- drilling, installation and development of exploitation wells;
- pumping tests of two exploitation wells and groundwater sampling for chemical analysis.

Applying the methodology listed above, provided the necessary data for quantification and characterization of groundwater resource, that served as a base for assessing and planning multipurpose use of this natural resource.

4. RESULTS AND DISSCUSION

After definition of groundwater body range in plan and profile, monitoring of Buk-Lozica spring were done. Monitoring of natural oligo-mineral ground waters consisted of measuring of oscillations of Buk-Lozica spring yield in function of time, determining the correlational dependency with precipitations in the monitoring period, as well as determining variation in chemical composition through number of complete and shortened chemical analyses. Monitoring of Buk-Lozica groundwater spring was continuously conducted for the period of one hydrological year.

Water balance

Average monthly yield of Buk-Lozica spring varied in the interval of 5.2 l/s - 50 l/s. Mean annual yield of the spring for the period of monitoring is 21 l/s. Minimum measured yield was 4.9 l/s, while maximum yield was 54.0 l/s, i.e. ratio Q_{min}/Q_{max}=1:11. Average monthly water temperature varied in the interval of 8.6°C- 10.5°C.

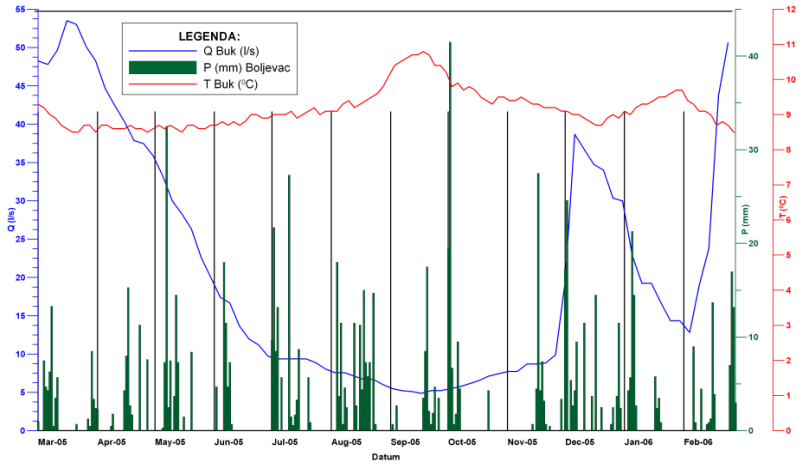

Figure 2. Comparative diagram of spring capacity (Q - l/s) and water temperature (T - ºC) of the spring "Buk"and precipitation (P - mm)

In figure 3 is shown comparative diagram of oscillations of flow rate, groundwater temperature and air temperature. On the diagram, direct dependency can be observed between temperature and spring capacity. Amplitudes of yield directly point out that in the periods of intensive snow melting and high precipitation, yield rises in the very short time, while temperature of groundwater falls.

Data collected by monitoring of Buk-Lozica spring, were used for quantification of water budget. Data about mean monthly and annual precipitation for meteorology station Boljevac, were used for the analysis of precipitation regime. Mean annual precipitation in the monitoring period was 921 mm. Spring discharge measurements showed that, mean yield of the spring was 21 l/s. By application of mentioned results, average perennial values of basic components of water budget equation were defined as follows: **F**-spring catchment area; **P**-precipitation; **E**- evapotranspiration; **h** (mm)- layer of runoff through spring; **ζ** (mm) - rest of losses; **Q**-average spring capacity, **W** ($10m^3$) - annual volume of runoff water; **q** (Q/F) ($l/s/km^2$) - specific yield and**φ** (h/P) - mean year runoff coefficient.

Table 1. Overview of basic elements of water budget - Buk-Lozica spring

F (km^2)	**P** (mm)	**E** (mm)	$\mathbf{h_{pod}}$ (mm)	**ζ** (mm)	**Q** (l/s)	**W** (10^6 m^3)	**q** ($l/s/km^2$)	**φ**
6.31	921	520	105	296.2	21.0	0.66	3.32	0.113

Mean annual specific yield through the spring is 3.32 $l/s/km^2$. Runoff coefficient is: φ=0.113 i.e. 11.3% of precipitation fallen to the surface of the groundwater body outflows through Buk-Lozica spring, while the residue of precipitation goes on other elements of water budget. Evapotranspiration is E=520 mm, i.e. 56% of the precipitation, 105 mm or 11% outflows through Buk-Lozica spring, while 296 mm or 33% goes on overland runoff, groundwater runoff and evaporation from water table.

Geophysics

Geoelectric measurements were conducted by applying the specific electric resistivity method in the variant of geoelectric sounding and geoelectric scanning. These methodologies of geophysical research provided the data about depth and thickness of lithological units and potential aquifer zones.Geoelectric sounding was conducted at 16 points along 3 profiles, with distance between points (AB/2) of 300 m. Based on the measured electric resistivity values, following lithological units are defined:

- Unit 1 – clay, sand, sandstone
- Unit 2 – limestone
- Unit 3 – fractured limestone
- Unit 4 – limestone

In terms of hydrogeology, the most important is fractured limestone unit that probably present aquifer zone. Fractured limestones are detected at depths between 80 – 90 m and 140 – 155 m [7].

Wells installation and pumping tests

Based on the results of geophysical research and delineation of potential aquifer zones, two exploitation wells IEB-B1 and IEB-B2 were constructed. Wells are located some 500 m from the spring, at the internal distance of 100 m. In order to ensure durability and highest water quality, production casing made of stainless steel are installed.

In order to define optimal capacity of the wells and hydraulic parameters of the aquifer, pumping test were conducted. By testing the well IEB-B1 with capacity of 1.8 l/s in duration of 720 h, groundwater level stabilized at depth of 85.6 m, with observed drawdown of 76.4 m [8]. Pumping test on the well IEB-B2 was conducted with capacity of 6 l/s, in duration of 360 h. Groundwater level stabilized at depth of 22.8 m, with drawdown of 8.6 m [9].

Graph-analytical interpretation of the data collected by pumping tests resulted in average value for transmissivity (T) in the zone of the well IEB-B1 of $2 \cdot 10^{-5}$ m^2/s [8], while in the zone of well IEB-B2 calculated T value is higher ($2.1 \cdot 10^{-4}$ m^2/s) [9]. Value for aquifer storativity in the zone of groundwater source is in interval $1.7 \cdot 10^{-4} – 1.5 \cdot 10^{-3}$.

Toward the end of pumping test, groundwater sampling for chemical analysis were conducted.

Groundwater quality

Groundwaters from “Euroaqua” source belong to the group of neutral, low mineralized water, with concentration of total dissolved solids of around 400 mg/l, and pH value in interval 7.1 – 7.5. In cation composition predominant are calcium ions, while from anions, dominant place have bicarbonate ions (figure 2).

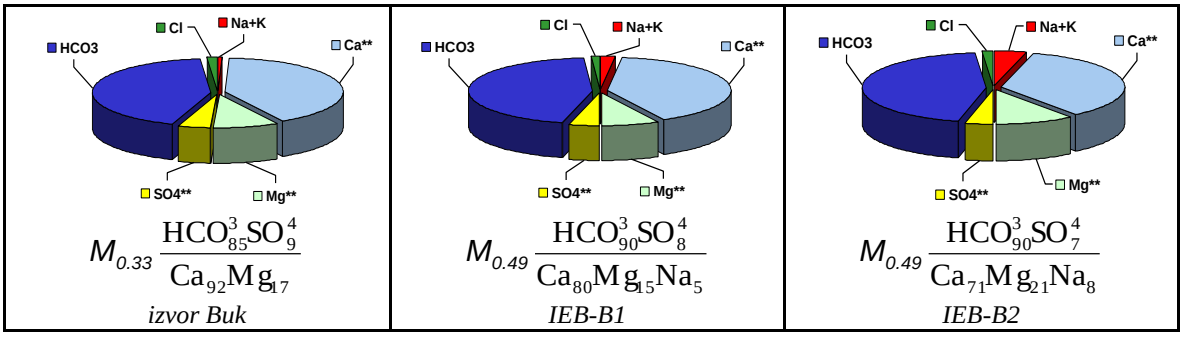

Figure 3. Main ion composition of Buk-Lozica spring and water from wells IEB-B1 and IEB-B2 of "Euroaqua" groundwater source

As illustrated in figure 2, spring groundwater and water from the wells are almost identical according to their chemical composition. Microbiological analysis of groundwater samples from the wells showed that samples are sterile to presence of harmful microorganisms.

Table 2. Chemical composition of some bottled water in Europe

Water name (Country)	**T**	**pH**	**Ca**	**Mg**	**Na**	**K**	**HCO_3**	**SO_4**	**Cl**	**NO_3**	**TDS**
			(mg/l)								
San Benedetto (Scorze-Ita)			46	30	6.8	1.1	293	4.9	2.8		
Fonte Limpija (S. Peleg-Ita)	11.2	7.71	47.2	20.9	0.40	0.11	225.8	11.0	3.5	3.1	196.8
L. di Recoaro (Vicenca-Ita)	6.5	8.1	31.7	12.6	0.50	0.20	155.0	15.0	4.0	4.1	154.0
Evian (Evian-Fr)		7.18	7.8	24	5.0	0.75	357	10.0	2.2	3.8	
Perrier (Vergeze-Fr)		**5.46**	**147.3**	**3.4**	**9.0**	**0.6**	**390**	**33**	**21.5**	**18**	**475**
Volvic (Auverg-Fr)	-	7.0	10.0	6.0	9.0	6.0	65.0	7.0	8.0	1.0	110.0
Spa (Spa Reine-Bel)		6	4.5	1.3	3	0.5	15	4	5	1.9	33
Loutraki (Greece)	-	7.75	4.0	89.9	11.5	0.63	433.1	12.8	26.6	3.1	210.0
Dirfys (Greece)	-	-	62.5	19.9	8.8	0.4	275.6	9.6	14.2	0.0	212.0
Izvor Buk	**9**	**7.5**	**102.2**	**13.2**	**0.8**	**0.5**	**316**	**21.3**	**5.3**	**13.5**	**330**
IEB-B1	**15**	**7.2**	**96**	**10.8**	**4.0**	**1.0**	**334.0**	**18.3**	**5.3**	**<0.1**	**495**
IEB-B2	**13**	**7.1**	**86.1**	**15.0**	**10.0**	**1.4**	**336.0**	**18.0**	**6.4**	**<0.5**	**485**

As it can be easily seen from the table 2, water from "Euroaqua" groundwater source is very similar in the chemical composition to Perrier bottled water, with a difference in more neutral pH value, which makes the water more suitable for everyday consumption. Low sodium concentration (average 10 mg/l) categorizes this water according to Serbian legislations in a group of water with low sodium content. As such, it can be consumed without limits by the people who have high blood pressure.

5. SUMMARY AND CONCLUSION

During the course of hydrogeological study, average yield of the Buk-Lozica spring was 21 l/s that accounts for about 12 % of the received rainfall on the catchment. Monitoring of groundwater quality at the spring confirmed the overall high vulnerability of karst aquifer, which reflected the instability of the groundwater quality. During research period, the idea of

taping the Buk-Lozica spring was abandoned and two exploitation wells were drilled, together giving approximately 8 l/s of very good quality HCO_3-Ca type groundwater. Locations and depths of the wells are designed according to the results of geophysical research and overall knowledge of hydrogeological system. Wells are located in the area were karst aquifer is covered with low permeable rock formations that increase natural protection of groundwater from pollution. This confirms that proper understanding of hydrogeological system and investments in the exploration phase of the Project can be beneficial in the stage of exploitation by lowering the risk for investment, expanding the field of use and providing the base for sustainable utilization of the groundwater resource.

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THE ACCOUNTING ASPECT OF EMPLOYEES AS HUMAN RESOURCES

RAČUNOVODSTVENI ASPEKT ZAPOSLENIH KAO LJUDSKIH RESURSA

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Abstract: *Employees of the company are the specific as sets which determine the development of business processes and achieving the goal of the company. In this respect, speaking in an accounting sense, education, wages, bonuses and other financial compensation for the cost of a company that is recognized in the income statement and reduce liquid assets on which payment is recorded in the Statement of Cash Flows. On the other hand, viewed in the context of development, employed as human resources contribute to increased productivity and efficiency and thus increase the value of business performance and absorb these costs and the paper points to the invisibility of the specific contributions of human resources directly in the accounting statements.*
Key words: *Accounting, human resources, cost.*

Apstrakt: *Zaposleni u kompanijama predstavljaju specifičnu aktivu od kojih zavisi odvijanje poslovnih procesa i ostvarivanje cilja preduzeća.. S tim u vezi, posmatrano u računovodstvenom smislu, obrazovanje, plate, bonusi i druge finansijske kompenzacije predstavljaju trošak za kompaniju koji se iskazuje u računu uspeha i smanjenju likvidnih sredstava po osnovu isplata koji se evidentira u Izveštaju o novčanim tokovima. S druge strane, posmatrano u razvojnom kontekstu, zaposleni kao ljudski resursi doprinose povećanju produktivnosti i efikasnosti poslovanja pa samim tim i povećanju vrednosti poslovnih performansi i absorbovanju pomenutih troškova te je se u radu ukazuje na nevidljivost konkretnih doprinosa ljudskih resursa na direktan nacin u racunovodstvenim izvestajima.*
Ključne reči*: Računovodstvo, ljudski resursi, trošak.*

1. INTRODUCTION

Employees as human resources in contemporary technical literature present the invisible assets of companies which use their specific knowledge, skills and abilities to gain competitive advantage, because that is exactly the aspect most difficult to be copied by competitors. In developed world countries training of managers and professional managers represents an imperative need. In this connection, the source of company's progress is reflected in the continuous education and training of employees at all levels. In the U.S., the need for continuous education accounts for more than $ 30 billion annually, while some countries have introduced an obligation for companies to allocate a certain percentage on an annual basis for permanent education needs. The main goal, for example, of educating a training manager is making adequate decisions based on the knowledge, expertise, science, and not on the basis of available estimates and improvising. Also, in these countries, financial resources invested in education of employees are treated as a cost-effective investment with the fastest returns [1].

In Serbia, the level of investment in education is 3.5% of GDP, while the OECD countries involve 6%. The low level of investment in education is the result of the ensuing economic situation in the country. Namely, our country is characterized by high levels of external debt,

inflation, high interest rates, lack of liquidity of the company [2], increased unemployment and decrease in purchasing power [3]. In these economic conditions, the state has no satisfactory volume of financial resources for an adequate level of investment in training of employees, companies less liquid have no interest in investing in the education and training of employees, while the individuals, whether employed or not, are unable to invest in their own education due to the fall in purchasing power and the circumstances that in recent years a large number of companies has gone into liquidation and bankruptcy. Bearing this in mind, the question is whether to invest in education and training is an expense or an investment, and whether the effects are adequately accounted for in the accounting statements of the enterprise, as they are not directly measurable, and there is no accounting for the contribution to the account in the "achievements of companies" by each of the workers individually.

2. COSTS OF HUMAN RESOURCES IN TERMS OF ACCOUNTING

In the modern world of innovation, traditional skills (finance, marketing and technological capabilities) require continuous learning capacity of the organization. The greater the ability to learn, the more flexible and more successful is the organization in the market [4]. This implies learning and motivation of employees. Human resources as employees represent specific company assets whose value in the books does not manifest directly as is the case with other aspects of labor. Their knowledge, skills and abilities are indirectly reflected in increasing performance of which is reported in the income statement. In order to achieve these positive effects, in terms of the business to get a higher result, there is a request for employees as human resources to require a certain level of education, on one hand, and further education and training as a result of the emergence of new technologies that require specific knowledge and skills. Technology and innovation are the result of continuous accumulation of knowledge, their costs are lower in the larger markets and may be spread over a larger number of consumers, while in developing countries, there are assigned economic activities that have no possibility for technological progress and do not require a highly qualified labor force, and the emphasis is on cheap labor, and it should be borne in mind that in order for people to be consumers, they need to earn.

In an era of dramatic change, the managers are expected to, in "increased level of turbulence conditions and the complexity of the environment in which the organization conducts its business and overall social mission, seek new approaches to the management process" [5] which implies new forms of education and training. In terms of introducing a new organization, the employer is required to provide employee education, vocational education and training [6] which is defined by the Labour Law. According to this law, the costs of education, vocational education and training shall be provided by the employer and other sources, in accordance with the law and the general act. The very provisions of the Act recognize education as a personnel expense.

In accounting terms, each cost represents a category which reduces the operating result. In our Chart of the cost, categories of education and training of employees include the costs of vocational education staff and services related to professional development (seminars, symposiums, etc..), and belongs to the class of expenditure (Class 5) under group Intangible costs (group 55) to account of Costs of education of employees. The above account is debited

to the account payables (class 4). Therefore, from the accounting point of view, education and training of staff is an expense that is recognized in the income statement and the liability that is recorded on its balance sheet. The moment these obligations come onto the scene, there are cash outflows appearing in the Statement of Cash Flows. It is similar with other material compensation, such as profit share, bonuses, benefits... These incentives are recorded as an expense debiting respective account or account of Retained earnings from previous years. In any case, there is a reduction in business results [7]. Also, a direct relationship between employee performance and actual results was never established, and in our country privileges for good outcomes are reserved mainly for managers. Moreover, there are numerous examples where companies had losses over the years, and material and non-material compensation were squandered away on certain managers of the companies themselves.

From the accounting point of view, the goal of the company is to reduce costs as much as possible, so it is not surprising that this type of cost is identified with other types of expenses, as in the statement the benefits of education and training of employees cannot be directly observed, while their costs and cash outflows can be directly observed and measured, so investing in employees through training and motivation for positive results achieved, both in accounting and in the regulations, is treated as intangible cost. Also, in response to the crisis that has hit our country, rationalization of costs largely comes down to rationalization-downsizing as well as lower wages. Rejection of open attitude that the human factor is equal to the development of human resources, and the position of man in the economy, in his working environment should be viewed not only in terms of its contribution to business success, but also from the standpoint of his need for recognition and their desire to confirm themselves relating to other people [8].

Employment of the population by income is the main source of purchasing power and thus represents a generator of aggregate demand and economic growth. Purchasing power of the working population is determined mostly by the earnings and price level [9]. In this way, the vicious cycle of insolvency of all subjects, due to lower cash flow and inability to settle debts, is extended [10]. The decline in employment, a significant rise in unemployment and a strong increase in the unemployment rate are all indicators of a drastic decline in economic activity. Unemployment and the exploitation of workers are done in unprecedented proportions, and according to Forrester, the only thing worse than exploitation is a situation where a man can no longer be exploited. These parameters indicate that Serbia is in deep economic crisis. Serbia had the highest rate of unemployed with higher education by 13.1% in 2010, as compared to other countries. In the 27 countries of the European Union, the average unemployment rate in higher education as 5.6%. The following countries have above average unemployment rate: Serbia (13.1%). Croatia (8.8%) and Slovakia (6.6%) [11]. The total number of unemployed university graduates, colleges or high schools, in that year, amounted to 44,911, of which 35.1% were the ones looking for a job for more than four years, 44.7% of those who have lost their jobs due to the closure of companies (ownership transformation, bankruptcy and liquidation) i.e. with previous experience [12]. Leadership and responsible positions are dominated by employees with a high school education (49%), which represents a very high percentage, especially if you take into account that this number accounts for half of employees in managerial and responsible positions, and that is higher than the number of employees with higher education. The situation is even more dramatic if we look at the

number of employees in these positions who have not completed primary school or have only elementary education [13]. In addition, it should be noted that the cumulative rate of unemployment in Serbia in the period from 2000 - VII/2012 is 33.2% [14]. The main components of the social milieu are moving in favor of financial capital at the expense of workers: "new forms of mobility, redeployment of productive resources, and a decline in real wages, where the power of money everywhere trample the dignity of man, insulting his honor and destroying his hopes [15]. Powerful staffs of financial experts direct their expertise and efforts of their activity at handling money, taking into account the excess employment [16] and wage cuts in order to improve the performance of the accounting. "Hard economic analysis leads to a logical point – in the" new "capitalism, a man is a thing, in the most literal sense of the word. As an entrepreneur frees stocks selling at bargain prices or throwing away, he will get rid of excess workers the same way – by laying off. People, who cut and arranged logs, will be treated just like those logs when a crisis occurs."[17] Bearing in mind the aforementioned, there is a question whether the employees are actually treated like human resources or as items of work, as well as whether the prices of these items and labor forces are established in the appropriate parity.

3. ASPECT OF INVESTMENT IN HUMAN RESOURCES INVESTING

Analysis of international organizations and institutions such as the World Bank and the Organisation for Economic Cooperation and Development (OECD) show that higher and better level of education contributes to higher levels of productivity, innovation and other financial performance of companies. Economically, investments in education and job training are investments in human capital. It is called "human because people cannot be separated from their knowledge, skills and values in a way they can be separated from the financial and material resources" [18].

Investment in human capital through investment in education and training represents investments with initial costs, but with the expectation that the employee will return from his education and training in the company after which he should get proper compensation as a motivator. Bearing in mind that the level of resources necessary for this type of investment is much lower compared to other investments, as well as the fact that the payback period on investments is much shorter, on one hand, and the direct connection between the effects of work on this basis, it is not difficult to conclude that investment in education and training is an investment with low risk and relatively high yield provided that invests in the education and training of the staff and knowledge which is really needed in the company [19]. According to the American Society for Training and Development (ASTD) in 2000, increasing investment in training for 680 dollars per employee, on average, results in a 6% increase in the financial results of the company. Companies that invest $ 1,500 per employee in training compared to those who spend $ 125, have on average 24% higher gross profit and 218% higher revenue per employee. Also, there is an interesting example that the Motorola calculated that every dollar spent on training contributed about 30% in productivity gains within three years. In addition, Motorola has practiced training to reduce costs by over $ 3 billion and increased its profit by 47%. [20]

Scientific and technological progress, that has given strong impetus to the process of globalization, has contributed to the changing nature of production, and the nature of the sectoral distribution of the labor force. In such circumstances, knowledge and information have become a factor of production on which depends the largest part of growth of productivity [21]. People, their knowledge and skills as well as education, research and innovation contribute significantly to increased productivity, improved competitiveness and economic growth in general. Return on investment in education and job training contributes to microeconomic and macroeconomic goals. Education of employees contributes to increased productivity and efficiency, as well as the increase in the value of business performance and absorbing these costs, so it is necessary to regard investing in employees and their treatment as human resources as an investment. However, it should be noted that one of the tendencies of neoliberalism is capital rather than labor.

4. CONCLUSION

In accounting terms, the goal of the company is to reduce costs as much as possible so it is not surprising that this type of cost is identified with other types of expenses, as in the statement one cannot directly observe the benefits of education, training and motivating of employees, while their expenses and cash outflows may be directly observed and measured, and the investment in human resources in accounting, as well as legislation is treated as intangible cost.

The general lack of liquidity of the domestic economy is reflected primarily in the number of businesses that have been blocked, went into bankruptcy and liquidation, as well as the rate of late payment of maturing obligations to creditors. [22] Lack of liquidity as well as losses in the financial statement act in behalf of rationalization thesis of work power, where we already recognize that employees are not treated as human resources in a true sense of the word, but as the labor force which must be applied to measure efficiency. On the other hand, treatment of human resources in the true sense of the word generally enjoys a privileged number of individuals and the effectiveness of measures actually implemented on the employees which mentioned individuals enjoy, by leveling adjustments, so personnel expenses in the income statement are being reduced, and the costs of provision for bonus purposes, compensation and such are being increased, and there are examples that the costs of the company are reduced to the detriment of workers' income, thus tending to increase profits. This way shows the total injustice to man, especially as a human being who has the right to work, to life and other rights that are heavily dependent on their income, as well as high unemployment and purchasing power, which has negative consequences for economic development. Of particular concern is the fact that in our economic and political reality the awareness is created that the competitiveness of our country rests exactly on cheap labor.

Economically, investments in human resources are the investments in human capital. Higher and better level of investment contributes to higher levels of productivity, innovation and financial performance of other companies, improving competitiveness and increasing economic growth in general. It is therefore essential that the financial investment in human resources, without neglecting other natural resources with which our country has a comparative advantage, are viewed as a determinant of long-term growth and development of

the company, and thus the national economy and not as a cost to be reduced in account of success by reducing salaries, wages, and taxes.

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THE ROLE OF INTERNET IN HUMAN RESOURCE MANAGEMENT

ULOGA INTERNETA U UPRAVLJANJU LJUDSKIM RESURSIMA

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Abstract: *Information and communication technologies have a dominant influence in determining the flow and transformation of human resource management. Companies and recruitment agents have moved much of their human resource management processes online so as to improve the speed of hiring applicants for vacant positions. Using database technologies, advertising and online jobboards and search engines, employers can now fill posts in a fraction of the time previously possible. Features of IT should be used to bring the best and highest quality candidates. This paper describes the role of Internet in human resource management and represents e-recruitment, e-selection, e-development as well as advantages and disadvantages of such a form of employment candidates.*
Keywords: *Internet, human resource, e-recruitment, e-selection, e-development*

Apstrakt: *Informaciono-komunikacione tehnologije imaju dominantan uticaj u određivanju toka i transformacije upravljanja ljudskim resursima. Kompanije i agencije za regrutovanje su preneli veći deo procesa upravljanja ljudskim resursima onlajn u cilju poboljšanja brzine zapošljavanja kandidata na slobodnim radnim mestima. Korišćenje tehnologije baze podataka, onlajn oglašavanja, pretraživanja, poslodavci sada mogu popuniti slobodna radna mesta u veoma kratkom vremenskom periodu. Potrebno je koristiti osobine informacionih tehnologija kako bi se dobili najbolji i najkvalitetniji kandidati. Ovaj rad opisuje ulogu Interneta u upravljanju ljudskim resursima i prikazuje e-regrutovanje, e-selekciju i e-razvoj kadrova, kao i prednosti i nedostatke takvog oblika zapošljavanja kandidata.*
Ključne reči: Internet, razvoj ljudskih resursa, e-regrutovanje, e-selekcija, e-razvoj

1. INTRODUCTION

Internet has transformed our lives and the way we communicate, how we learn, how we work and spend free time, in essence it has more or less changed every aspect of human society one can think of. The significance of the Internet and information technology in both business and private field has grown considerably in the last few years, with exponential growth of Internet users and services offered. Undoubtedly it also affected organization's employees and their workplaces in job design, conditions of work and other ways.

In today's business environment, people and their knowledge are company's key assets, it is obvious and expected of each company to be aware and prepared for such changes. Not only IT specialists are the ones that should be aware of the new trends and understand them, but also the managers.

The number of Internet users has grown over 2 billion in year 2012. There are over 555 million web sites and more than 200 million registered domains. These facts already indicate that the Internet has significant effect on how, why, where and when people work.

The Internet and information technology have the most prominent influence on more educated, skilled and ambitious people, especially those, that are regularly working with information and communication technology. Since they are also the ones that occupy

important positions in organizations hierarchy and are therefore of great significance for the overall success of the company, we shall focus our attention on the influence of the Internet on such employees.

Any potential advantage of the Internet-usage, that a company can exploit to recruit, develop and retain these types of personnel, is even more important due to the fact that there is a shortage of highly profiled people in the workforce market.

2. USE OF INTERNET IN THE REPUBLIC OF SERBIA

The Statistical Office of the Republic of Serbia has conducted two surveys on the use of information–communications technologies. The first one refers to the households and individuals, while the second covers the companies. The survey was conducted in 2012th year and the survey referring to the companies was conducted on the sample, stratified by size and activity, by phone method and covered 1200 companies. [1]

The results of the survey show that 55.2% of the households in the Republic of Serbia possess a computer and it is an increase of 3.1 %, respective to 2011, 4.8% increase relative to 2010 and 8.4% increase in relation to 2009. 47.5% of the households in the Republic of Serbia have the Internet connection, presenting an increase of 6.3% in relation to 2011, 8.5% compared to 2010 and 10.8 % increase in relation to 2009.

Business is in a state of rapid adaptation, moving from the industrial to the information age. The pervasiveness of the Internet continues to accelerate. According to results of the survey 98.7 % of the companies in the Republic of Serbia use computers for their business, meaning that there was an increase of 0.6% in relation to 2011. Proportion of computers usage is the greatest in big companies (more than 250 employees), amounting to 100%, in middle-sized companies (50-249 employees), it amounts to 99.8 %, while in small companies (10-49 employees), it amounts to 98.3 %. 97.7% of the companies in the Republic of Serbia have the Internet connection, 87.4% of the companies with the Internet connection use the electronic services of public administration and it is an increase of 7.6 % in relation to 2011, 12.6 % of the companies do not use such a possibility. 73.8% of companies with Internet connection havea website and 20.2% of them use the website for advertising open job positions or for online registration for jobs. [1]

3. HUMAN RESOURCE PLANNING

Contemporary human resource planning occurs within the organizational and business planning. It involves forecasting the organization's future human resource needs and planning for how those needs will be met. It includes establishing objectives and then developing and implementing programs (staffing, appraising, compensating, and training) to ensure that people are available with the appropriate characteristics and skills when and where the organization needs them. It may also involve developing and implementing programs to improve employee performance or to increase employee satisfaction and involvement in order to boost organizational productivity, quality, or innovation. [2]

Finally, human resource planning includes gathering data that can be used to evaluate the effectiveness of ongoing programs and inform planners when revisionstheir forecasts and programs are needed. Because a major objective of planning is facilitating an organization's effectiveness, it must be integrated with theorganization's short term and longer term business objectives and plans. Increasingly this is being done in leading organizations, although in the past business needs usually defined personnel needs and human resource planning, which meant that planning became a reactive process. In relation to human resource planning, via Internet employee updates data, personnel changes and job requisitions. This means that, since employees are given the opportunity to update their personal data, the HR record-keeping gains higher accuracy and data quality. [3]

4. HUMAN RESOURCE RECRUITING- E- RECRUITING

The main purpose of the recruitmentprocess is the generation of an applicant pooltruly interested in working in organization asa response to a job posting.The traditional recruiting methods are:

• print media advertising , such as job advertisements and recruitment brochures;
• networking;
• recruitment agencies.

In addition, there are some Internet-based methods, very effective for recruiting. These recruitment methods are driven by skills. Employers describe their free positions in the skill terms, while applicants provide an extensive detail of their skill. On most sites, jobseekers can post their resumes and browse through listings for free, applying for jobs that interest them. Recruiters will need to focus on what applicants have to offer versus their current position title. Organizations may use their own corporate web site as a recruiting tool. In this case, the recommended best practices are [4]:

- Provide information regarding corporate culture to allow applicants to assess their own fit with the company.

- Provide detailed, yet concise descriptions of career opportunities that identify upcoming projects and specify the training and development opportunities available. Modern career paths are usually more difficult to define than traditional vertical trajectories, so it will be important to discern and then communicate how employees advance through the organization. Multiple team assignments will allow employees to learn about the organization as a whole, while simultaneously developing new and valuable skills.

- Create an attractive site that is easy to navigate

One of the most important elements of recruiting individuals will be the creation of an effective recruitment message.

The main advantages for Internet supported recruiting are [5]:

- Lower costs of recruiting (savings in invitations for application, postal-costs, data-processing costs…).

- Quicker process of recruitment: period from the point when the need for a new employee is sensed until the point when he starts doing his job is, according to the research, cut for twelve days.

- Possibility to attract better and more candidates – invitation for application published on a website can also be spotted by those, who are currently not seeking new employment actively.

- Companies are no longer limited to the local geographical labor pool and this allows for spreading a broader net to catch the best talent.

- Use of Internet allows companies to receive most of their resumes in electronic format, which has numerous benefits: dealing with less paper, ease of archiving and storing resumes in databases, greater ease of sharing information with others involved in the hiring process and the rising potential of application tracking systems to analyze statistics of the company's applicant pool.

One of the most important elements of recruiting individuals will be the creation of an effective recruitment message. During the recruiting process, more information is better. Research confirms that applicants' perceive organizations as more or less attractive simply based on the amount of information they receive during the recruitment process. Existing research on recruitment indicates that the particular information applicants receive about a potential job opportunity plays an important role in determining whether they will apply for an open position. [6]

Besides the corporate websites, third-party websites are gaining importance. Not only that they act as"work- force exchange" where supply meets demand and vice versa, many of them also publish relevantbusiness news, articles on job-hunting, CV writing etc., which acts as additional pull mechanism for web users, which ensures head- hunting companies that their call for applications is seen.

5. HUMAN RESOURCE SELECTION – E- SELECTION

Usually, it is difficult to decide where recruiting ends and selection begins. The main purpose of the selection process is to distinguish individuals on the basis of important characteristics. In a changing environment,the speed of the selection process becomes important. Selection systems that process applicants in 2-3 months fall in solving organizational needs. A cycle of 2-3 days from applicant identification to employment offer will be more suitable.
E-Selection is a paperless process where electronic documents and information can be quickly disseminated nation wide or worldwide. The most important methods fore-recruitment are [4]:

- electronic resumes
- online assessments
- online interviewing
- online assessment centers

Electronic resumes - Applicants submit their resume using either email or the organization's website. With electronic submission, applicants can send their resumes to thousands of organizations. For experienced candidates, resumes represent an efficient way to stress on cognitive ability, job knowledge and capacity to work. Resumes that outline position accomplishments with quality indicators represent an individual's work portfolio. Since past performance is one of the best predictors of future performance, resume information that outlines past performance will serve as a proxy measure of job knowledge and an applicant's ability to perform similar responsibilities in a new organization.

This appears to be an area where companies are redirecting the cost savings from using the Internet to attract a broader base of applicants. The process of screening applicants' resumes is typically a collaborative process between HR personnel and some type of applicant-tracking software. Most screening applications compare some list of pre-programmed keywords with the content on the resumes and simply eliminate those resumes without the keywords. However, there are more detailed applications that are occasionally used. One of the main issues with this use of technology for screening resumes is that applicants are becoming savvy in knowing the keywords and incorporating them into their resumes

Online assessment - Previously paper-based instruments become web-viewable. Interactive forms allow applicants to access a web site, complete and summit their responses. Applicant's responses are scored automatically and applicant profile is generated immediately. Online testing allows acompany to offer applicants an immediate feedback concerning their potential fit with the organization.

Online interviewing - Most companies evaluate candidates on interviews based. Interviews can be designed to measure almost any applicant characteristic. While a structured interview measures cognitive ability, a structure interview measures interpersonal skills. The technologies used to conducts applicants interviews online are video conferencing technology and web cams, which allow for video and audio streaming between geographically remote locations.

6. HUMAN RESOURCES DEVELOPMENT – E- DEVELOPMENT

Training and development is an important expenditure for most organizations. As the need for training and development increases, companies have discovered that technology and the Internet provide a lower cost solution in the guise of online training or e-learning. Cost reduction for online training pertain to several major categories of expenditures including:

- direct costs of travel and indirect opportunity costs of time away from job work,
- production of training materials,
- maintenance costs for content updates and course refreshers.

In addition to cost reduction, online training also offers several important advantages, such as the ability to help employee learn faster and in some cases better, provide learning free of limitations of time and space and track and evaluate the effectiveness of the training more efficiently. Helping employees to learn better andf aster is a key concern for training and development professionals.

Another advantage of online learning is the ability to deliver learning material anywhere and at anytime. Online training provides the convenience of 24-hour access, feedback and interactivity with tutor and other trainees. In addition, the student's curriculum can be customized to meet his or her needs. Material can be interactive, allowing learner to answer questions and receive immediate feedback. E-learners have the ability to take more control of their learning agenda, even with something as simple as signing themselves up for courses rather than waiting for their manager to do so.

Although the number of companies utilizing online learning is increasing, experts in the training field are finding that this new medium often results in low retention and completion rates. In addition, not all employees may be comfortable with learning online and may miss the social interaction provided by a classroom environment. Perhaps the greatest concern relates to the effective transfer of learning. Some companies use a succession planning module and can track what training and development activities have been completed by individual employees. The module includes a feature to conduct analysis of gaps in employee skill development.

Using the Internet in training and development is one of the mostly discussed aspects of e-HR and probably the one with the most potential in terms of cost benefits. The internet can be used in training needs assessment, in pure e-learning activity and in career management.

7. CONCLUSION

This paper attempts to clarify the important role of the Internetin human resource management in organizations. As mentioned above, personnel are the most important resources of all organizations. Thus, in today's uncertain and competitive environment, new methods of managing these important resources should be recognized and need to be understood. Only in this way organizations reach to the competitive advantages. As discussed above, e-HR is a new method of managing human resources which will decrease organizational costs and increases organizational efficiency, effectiveness and productivity which firstly leads to organizational survival and then leads to organizational success.

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EXAMINING THE REASONS FOR "BRAIN DRAIN" AS A BASIS FOR PROMOTION OF STAYING IN SERBIA

ISTRAŽIVANJE RAZLOGA "ODLIVA MOZGOVA" KAO BAZA ZA PROMOCIJU OSTANKA U SRBIJI

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***Abstract**: This paper explores the reasons for the "brain drain" from Serbia for the sake of finding ways and measures to prevent the occurrence or at least reduce its scope. Unfavorable economic situation and high unemployment are evident facts and overriding reasons of brain drain, and the process is completely unstoppable, but the state must valorize the advantages of highly educated labor for the sake of preventing losses and take measures to mitigate this process, it is also necessary to see the importance of return migration and its effect on the country of origin, as well as strategies to achieve this.*
***Keywords**: Brain drain, emigration, leaving reasons, the reasons to remain, prevention, promotion.*

***Apstrakt:** Ovaj rad bavi se istraživanjem razloga „odliva mozgova" iz Srbije zarad pronalaženja načina i mera da se ta pojava spreči ili bar umanji njen obim. Nepovoljna ekonomska situacija kao i visoka stopa nezaposlenosti evidentne su činjenice i prevashodni razlozi odliva mozgova, i taj proces je teško zaustavljiv u potpunosti, međutim na državi je da valorizuje prednosti visokoobrazovane radne snage zarad sprečavanja gubitaka i preduzme mere kako bi taj proces ublažila, takođe je neophodno sagledati značaj povratnih migracija i njihov efekat na zemlju maticu, kao i strategije kojima bi se to postiglo.*
***Ključne reči:** Odliv mozgova, emigracija, razlozi odlaska, razlozi ostanka, mere prevencije, promocija.*

1. INTRODUCTION

Encyclopedia Britannica defines "Brain Drain" as "the departure of educated or professionals from one country, economic sector or area to another, usually for better wages and living conditions" (Pušonja, 2005., p.268).

The emigration of highly qualified personnel is often described as a loss for the country of origin and destination country for profit. In reality the situation is much more complex. From the perspective of the country of origin, the loss can be reduced by lowering the unemployment rate, but it still can not compensate for the cost of education of those who have left the country. However, if you connect migrants in the country of origin of companies with business opportunities in a new country, both countries can benefit. On the other hand, if the destination country does not use professional or other skills of immigrants in the workforce, then migration can have a negative impact on both societies. The effects of migration are wide and varied across the economic and social spheres with significant overlap and interaction between them (Stankovic, 2011.,p.515).

The OECD has defined two concepts related to brain drain. The first defines the concept of ***exchange***, and other ***waste*** of brains. The first concept defines the terms of trade between country that prepares and country recieves the gifted person. Thus, an imbalance can occur between the balance between the outflow from one (drain) and positive inflows in other countries (gain). This negative balance is then solved through concrete and dynamic balancing strategic processes (Pušonja, 2005., p.269). The third concept, which is defined by the OECD

is the ***circulation of brains (Brain Circulation),*** which includes sending staff to a developed country and then return to the home for the sake of better opportunities for further development.

Common estimates of the Ministry of Science and Technology and various non-governmental organizations say that within the last decade half a million people have left. Immediately after the democratic changes in the country, brain drain is a little lower, but a few months later continued unabated. Preliminary estimates indicate that more than half of our young are living abroad in the U.S., about 30% are located in Europe, while the rest are on the other continents. ***Institute of International Politics and Economics, as the most important reasons, for scientists and experts, leaving the country***, sculpt the low living standards and housing problems. Abroad they are mostly attracted to the high-wage, material and technical conditions. While the early nineties, from the country went PhDs, Masters, later researchers in graduate school, last year's top graduates in Science, ETF, and FON have already secured the contracts with foreign companies. Their orientation toward permanent departure from the country, as a way of resolving professional career, presents a real disaster for scientific and technical basis of the State (Dinić, 2003., p.352).

When it comes to the efficiency of the labor market in Serbia, the World Economic Forum analysis shows that it is very low. ***The biggest obstacles to increasef foreign trade of Serbia's cooperation with foreign partners are: corruption, political instability, access to finance and the inefficiency of the public administration.*** What is particularly worrying is the poor efficiency of using talents (98th place among 133 countries). That efficiency is seen through four indicators: the relationship between wages and productivity, lean on professional management; brain drain and the participation of women in the labor force. Data show that in Serbia, professional management has been neglected, since the state does not care about her talents and that she suffers from a chronic brain drain, as is the 132nd place out of 133 countries. According to the guideline of "brain drain", Serbia is behind Montenegro (57th place), Croatia (98), Albania (101), Bosnia and Herzegovina (131) and Macedonia (125), Serbia is at the 110th in the world in expenditure on research and enterprise development. Located behind Croatia (49) and Montenegro (59) and ahead of Macedonia (114), Bosnia and Herzegovina (122) and Albania (126). Otherwise, the quality of scientific research institutions, Serbia is at the 54th place***. Among the top ten motives for staying*** are the "professional reasons" only "scientific development" and "the field of scientific research." Very high place have "personal reasons" (family) that influence the decision to stay. Relationships with colleagues at all career fields of scientific activity are in the "second round of the importance of" the decision to stay. At the bottom of the scale are the high cost of travel and accommodation abroad, "love of country" is in the last place because of the subjects had when making the decision about staying (www.grupa484.org).

It is of national interest to keep the migration of intellectuals in optimal proportions, and it should be moving in both directions, in the country or in the country of origin. Establishing, maintaining and improving its cooperation with the experts who live abroad is a priority task, it is part of the national question. Experts are part of our national being, regardless of their nationality. Therefore, the national interest determines the priorities of migration policy (Grečić, 2002., p.270-271.)

In Serbia, the ministry level, even at the university level, yet there is ***no orderly system*** of monitoring our people in abroad, and it happens that some projects have been initiated, but soon suspended due to new elections and change of government, even when it comes to the database of our people abroad. In addition to official statistics, the formation of a name is one way to arrive at the exact number of people who have left the country, but especially important as a contact.

In an analysis of the possible effects of the brain drain it is necessary to consider the possible return migration and its importance to the country of origin. It is believed that the return of highly qualified personnel can be beneficial to the country of origin in the form of newly acquired knowledge and skills that can increase domestic productivity. However, this claim can be relatively easy to disprove if it is viewed through the prism of questions about how these new skills and knowledge suitable or appropriate for the local environment? When there is a big gap in technology home countries and destination countries of the former émigré, specific skills and knowledge can have a very limited application, the most obvious when it comes back out of the developed countries higher income in low-income countries and a stagnating economy. Of course, it is potentially possible to improve technology in the country based on the experiences of migrant returnees but also difficult to achieve, and if only a few highly trained return (Stankovic, 2011., p.522).

Table 1: Reduction of brain drain options

Policy	Instruments		
	Rich countries	Poor countries	International Organization
Control	Changing the balance of unskilled immigration. Restraint of hunt qualified people if there is no compensation scheme.	Curbing illegal immigration, improving the economic and political stability.	Promoting economic development.
Compensation	Division of Social Security taxes. Linking development assistance to qualified emigration. Payment of fees "bounty hunters" countries of origin of the company.	Output taxes. Taxes on the income.	Improving database relating to migration.
Creation	Avoiding shortages in sectors like health and education due to poor planning of human capital. Transparent mechanisms for the recognition of foreign credentials.	Higher education reforms. The liberalization of skilled migration.	Increasing support to higher education
Relations	Encouraging circular migration. Reinforcement of temporary migration programs.	Dual citizenship.	Development of a network infrastructure.

Source: Stanković, 2011., p. 524

2. FIELD REASEARCH

The purpose of the field research was conducted surveys in Kragujevac between 28.12.2012.do 10.01.2013. year, over 200 subjects, 50% male and 50% female.

Table 2: Percentage view of respondents age structure of the cross-gender structure

	do 18	19-30	31-40	41-50	51+	
Man	10%	10%	10%	10%	10%	
Women	10%	10%	10%	10%	10%	
In total	20%	20%	20%	20%	20%	100%

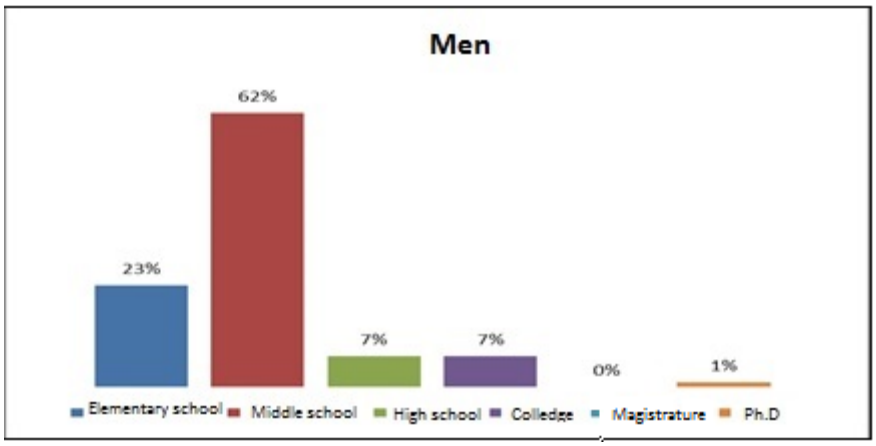

Figure 1. Display the percentage of the educational structure of men

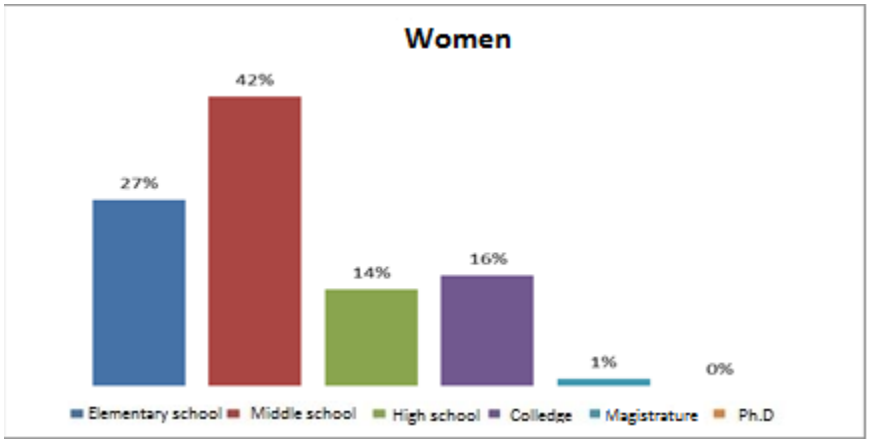

Figure 2. Display the percentage of women education structure

When asked **what should be the primary goal of education** opinions of men and women are similar, and both men and women in the highest percentage, 54%, 48%, believe that the primary goal of education practical application, then note, 38% and 43%, and a similar percentage of any of the above, 8% and 9%, however, the question of whether **education guarantees a better job** in the highest percentage answer should be but is not, 45% and 54%, then yes, 40% and 32%, even 14% men and 12% of women do not believe that education guarantees a better deal, while no opinion 1% of men and 2% of women.

The views on the **educational system of our country** surveyed men and women are the same. The highest percentage that is considered good, 48% and 41%, then that is bad, 30% and 26%, then that is very bad, 6% and 13%, that provides exceptional education, 4% and 3%, and no attitude is 12% male and 17% female. Interesting is the fact that for males with high school education, the percentage of responses that our educational system is good and that is bad nearly approximate, and 25% of men with a high school education is considered to be a good and bad to 23%. Men with higher education believe that the education system is good. In women, watching educational structure, attitudes on this issue are different than men, bearing in mind that a large percentage of women in higher education believes that our educational system is bad, even very bad.

Table 3. Percentage display quality of the education received crossed with male gender structure

	Fully poor quality	It could be better	I'm not complaining	Fairly well	High quality	I can not decide	In total
Men	8%	48%	20%	18%	3%	3%	100%

Table 4: Percentage display quality of the education received crossed with female gender structure

	Fully poor quality	It could be better	I'm not complaining	Fairly well	High quality	I can not decide	In total
Women	2%	36%	26%	29%	4%	3%	100%

Employment status of respondents. The largest percentage of men and women, 43% and 24%, works out of the profession, the profession for 26% of men and 17% women. Currently looking for work 6% of men and 16% women, which suggests that higher unemployment among women than men. He never was 10% male and 12% female. Greater ambition for advancement given women show that 19% of women want to first complete his studies while he wants to just 10% of men. Something else has completed 5% of men and 12% women.

Do you plan to stay in Serbia? There is a larger percentage of men who want to stay in Serbia than women, 70% vs. 64%, however, the greater the percentage of men who want to leave, 13% versus 9%. Women to a greater extent than men are in doubt, or hope for the better in 18%, and 1% closer to the EU, while in men the situation in 10% and 3%. 4% of men and 8% of women have no opinion. The older generation of men to a greater extent, show a desire to stay in Serbia, while the situation is reversed with the younger generations. Also the younger generation want to remain in the country if things go the better, it is interesting that men with high school, college, doctorate, they want to stay in the country, as well as men with high school education, as much as 45%, but they also show a 6% desire to leave the country, as well as men with primary school education, 6%, and the two groups would be in the 5% and 4%, remained in the country if things get better. Females, in contrast to men in every generation there is a wish to stay in a larger percentage than the other options, however, and there is noticeable that the younger generation hope things will get better at what would constitute a condition for them to stay. The situation of women by educational attainment is similar to that of men. Summarizing the above data it is interesting to note that although wasim for a country where there are no jobs for highly educated people, it is the highest percentage of those categories she wants to stay in the country.

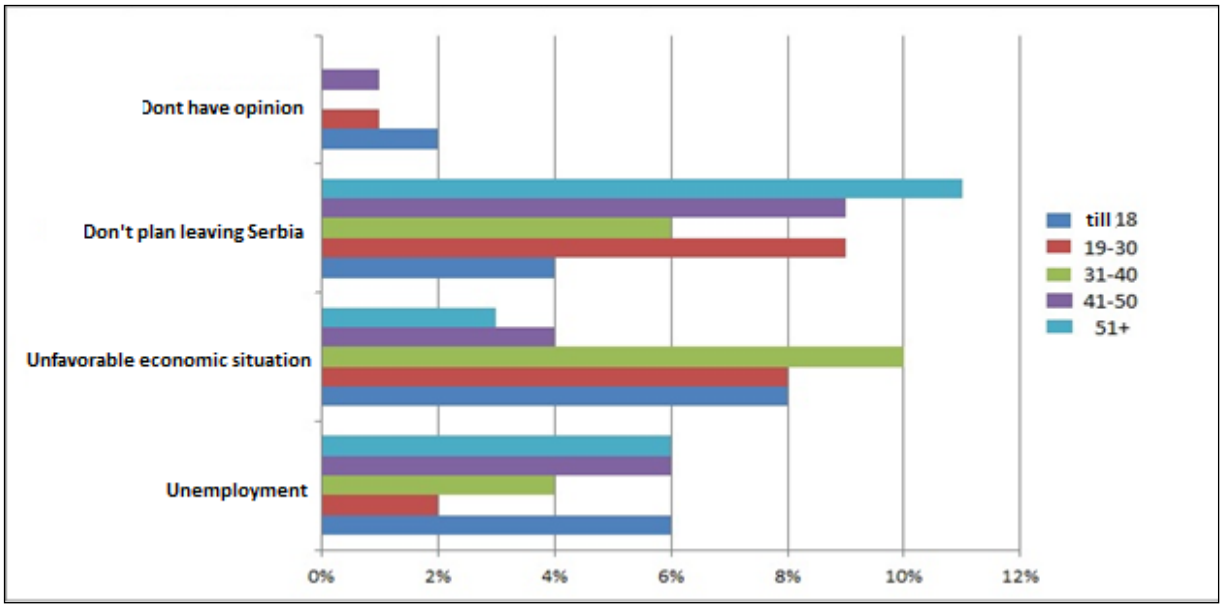

Figure 3. Display the percentage of reasons departure crossed with the age structure of men

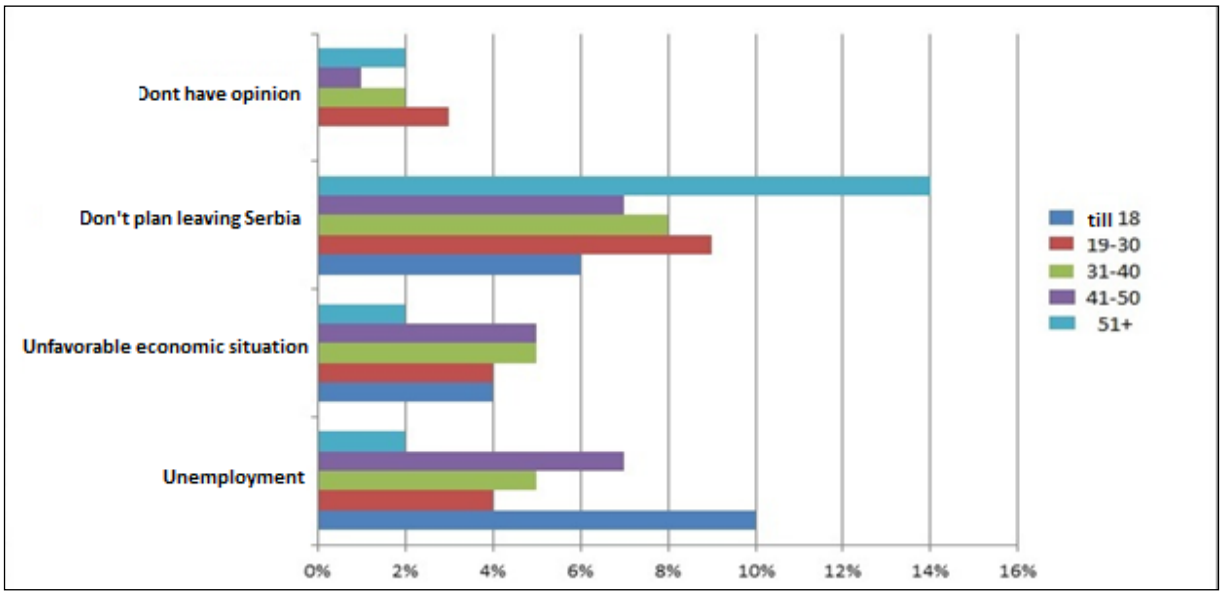

Figure 4 Display the percentage of reasons departure crossed with the age structure of women

Highly educated men are not planning to go mostly from Serbia, while men with primary education mainly as potential reason for leaving state unemployment rate, 8%, and the unfavorable economic situation, 8%, and 5% are not planning to leave. Men with high school percentage are identically distributed with the option "do not plan on leaving Serbia" and the unfavorable economic situation by 23%, while unemployment is the cause of 14% of states. The highest percentage of women with a university education, 9%, faculty, 5%, and no plans to leave from Serbia, followed to a lesser extent as a potential citing unfavorable economic situation and unemployment. The situation is similar for women with primary education and secondary education, the highest percentage of not wanting to leave the country, but among

them is the main reason for leaving the potential unemployment and then the unfavorable economic situation.

If you are planning to go abroad, do you plan to return to Serbia? The highest percentage of respondents who would go back to after retirement, 43% of men and 24% women. After 5 to 10 years, 26% male and 17% female, and if you life in Serbia improved 6% of men and 16% women. 10% of men and 12% of women would not be returned to Serbia, while 10% of men and 19% of women not planning to leave Serbia, and 5% and 12% have no opinion on the matter. 5% of men with secondary education would be returned after retirement, 9% if it is to improve life in Serbia, and 12% after 5-10 years in men with primary school education, the scores are in the ratio of 4% 5% 5 %. Men with higher education are generally consistent with the previous paragraph would not leave the country. 3% of women with a college education would be returned to Serbia after 5-10 years, 2% would not be coming back, and 9% did not want to leave, while women with a university degree with 6% prevailing attitude of staying 2% would be returned after 5-10 years, 1% after retirement and 3% if improving life in Serbia. Women with secondary and primary education, 4% would not be returned, with 2% would return after retirement, with 8% and 5% after 5-10 years, and a 4% or 2% if you live in Serbia improve.

Do you think that Serbia is having a lot of brain drain? 64% of women and 74% of men think that Serbia is having a lot of brain drain. 30% of women and 16% of men have no opinion on this issue. 10% of men and 6% of women think that Serbia has brain drain. 20% of men with primary education and 44% of the secondary school believes that Serbia lost a lot to brain drain, as well as all college-educated males. 1% of men with primary education, 8% with secondary education and 1% of the college believes that Serbia does not lose a lot to brain drain. Serbia loses too much on brain drain is considered 12% of women with primary education, 29% with secondary education, 10% with college education, 12% of the faculty, and 1% master not in accordance with that 5% of women with secondary education and 1% with the university. No opinion, 30% of women. 67% of women and 72% men feel that the state is not doing enough. 27% of women and 18% of men have no opinion on this issue. 10% of men and 6% of women believe that the state is doing enough. 20% of men with primary education and 42% with high school believe that the state is not doing enough, and 6% of college-educated man. 1% of men with primary education, 7% with secondary education, 1% of the faculty, and 1% of the college believes that the state is doing enough. That the state is not doing enough considered 14% of women with primary education, 29% with secondary education, 10% with college education, 13% of the faculty, and 1% master. not in accordance with that 5% of women with secondary education and 1% with elementary education. No opinion, 27% of women.

What do you think the state should do for the sake of preventing the brain drain? The highest percentage of male respondents believe that the State should provide employment and advancement in the profession, 30%, followed by a significant percentage of 24% believe that the state has to provide a better standard of living. 17% of respondents see as a preventive measure of the reduction in the unemployment rate, 15% of the cost of education more affordable and scholarships. None of the respondents thought that the government has done enough, 1% think it should not do anything, something else 2% and 11% of male respondents

had no opinion. 30% of female respondents believe that the state should reduce the unemployment rate, as another measure to prevent 24% of the living standards, and then employment and advancement in the field with 16%, while only 12% believe that the government should provide affordable prices education and motivation in the form of scholarships. 1% of female respondents thought that the state has done enough, just as we should not do anything. No opinion on the matter is 16% of the female respondents.

3. CONCLUSION

Analyzing the data field study leads to the conclusion that more than half of the respondents plan to remain in Serbia, but the "potential" of going to stick to this position, falling to less than half of the respondents, while other reasons are the socio-economic aspects. Interestingly enough, when asked about returning the number of respondents expressing the sense of staying in the country is still less than half of the respondents while nevertheless grouped with two profiles: those who would return if the conditions in the country improve and those who would not.

Serbia lost a lot to brain drain and that the state is not doing enough to prevent such problems, a consistent majority of respondents of both sexes, but when it comes to preventive measures are not unanimous though confined to economic aspects of life. There are also respondents who believe that the state does not lose brain drain and you do not need to take action, that is already doing enough to prevent the brain drain on the occasion.

Evident and certain groups of patients who were in many respects no opinion on whether it impacts the lack of information, lack of interest or lack of desire to participate with their opinions in the survey, the question of who can be discuss. Direct losses in human capital by about 1,300 university graduates in Serbia alone has cost the country immediately around three billion dollars in proportion to the costs of their education.

Indirect losses, based on the fact that their knowledge and skills for free "embedded" in the development of other countries, can hardly be evaluated numerical indicators. They do not refer only to the lost potential "profit" that is not insignificant, but the problem is playing, say, scientific and research personnel: who will "create" new scientists and researchers? These losses are irreversible and civilization. Loss of only 50 top experts would be painful even for a much larger, more developed and rich countries. Departure of talented professionals (roughly called brain drain) inevitably leads to technological backwardness, declining economic growth and development of destabilization, in a word, dependent economy and society and culture in stagnation. And that is the actual image of Serbia, in a hopeless race of Achilles and the tortoise for an advanced Europe and the neighboring area (Gredelj, 2006., p.83).

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THE ROLE OF HUMAN RESOURCE MANAGEMENT IN MODERN BUSINESS

ULOGA MENADŽMENTA LJUDSKIH RESURSA U SAVREMENOM POSLOVANJU

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Abstract: *Modern times are the times of transformation and change that surpass all boundaries, networking the world in a global sense. Modern business practice shows that human resource management plays a key role in motivating all the members of the organization to take an active part in decision making and operational activities. The affirmation of modern management is recognized in the processes of transformation and development of modern organizations as holistic systems where HRM is a focal area within the global management context. The role of HRM is in the creation of the vision, mission, goals and strategy for an appropriate guidance of human potentials in the process of achieving both individual and organizational goals. Broadly analysed is the HRM concept "IPAC (IPAK)"[10] which includes research, planning, execution and control, with an appropriate organization and feedback. The aim of this paper is to induce thinking about further investigation into the "IPAC" human resource management concept and contribute to a better understanding of the topic.*
Key words: *management, organization, transformation processes, human resource management, objectives, synergy effects, holistic systems.*

Apstrakt: *Savremeno doba je vreme transformacija i promena, koje prevazilazi sve granice, povezujući svet u globalnim okvirima. Savremena poslovna praksa ukazuje da menadžment ljudskih resursa ima ključnu ulogu u motivisanju svih članova organizacije da se aktivno uključe u proces odlučivanja i operativnog delovanja. Afirmacija savremenog menadžmenta ostvaruje se u procesu transformacije i razvoja savremenih organizacija kao holističkih sistema, u kojima MLJR predstavlja fokusno područje u kontekstu globalnog menadžmenta. Uloga MLJR ogleda se u kreiranju vizije, misije, ciljeva i strategije za svrsishodno usmeravanje ljudskih potencijala u procesu ostvarenja induvidualnih i organizacionih ciljeva. U širokom spektru razmatra se koncept MLJR „IPAK" koji uključuje istraživanje, planiranje, izvođenje i kontrolu, uz odgovarajuću organizaciju, sa povratnom spregom. Ovaj rad nastoji da podstakne na razmišljanje o daljem istraživanju koncepta „IPAK" menadžmenta ljudskih resursa i da doprinese našem boljem razumevanju ove teme.*
Ključne reči*: menadžment, organizacija, transformacioni procesi, menadžment ljudskih resursa, ciljevi, sinergetski efekti, holistički sistemi.*

1. INTRODUCTION

Our attention in this paper is focused upon man, namely upon human resources and their role in the management process. The knowledge that the human factor is a decisive and unique reasoning constituent of business processes affirms the human resource management (HRM) as an independent scientific discipline studied at universities and applied in modern practice.

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[10] The term used in (the Serbian version of) the doctoral dissertation is IPAK.

As a focal area of management, HRM motivates all the members of the organization[11] to take an active part in the processes of decision making and operational participation, assuming responsibility for the results achieved. It is on this basis that HRM acts as a catalyst as regards other functions and other organizational units, contributing to the synergy effects of the business system.

Acting both as the conscientiousness of the humanity and a rational category, HRM goes beyond civilization boundaries and contributes to a global level success. As a scientific discipline, HRM has built an adequate theoretical philosophy and tools for a practical implementation. Accordingly, HRM answers its strategic and operational dimensions, enhancing the achievement of individual and organizational goals in the global management context [1].

The affirmation of modern management is in the process of transformation and developement of modern organizations as holistic systems in which HRM plays a focal role in the global management context. Starting from the holistic approach, HRM is defined as a purposeful guidance of human potentials in the process of achieving individual and organizational goals. Broadly analysed is the HRM concept "IPAK" which includes research, planning, execution and control, with an appropriate organization and feedback [2].

The imperative of change lies in the paradox by which change adoption and creation results in stability, whereas resistance to change causes chaos with results that cannot be forseen [3]. This universaly recognized logic is proven in everyday life, in all the areas of human activities and behaviour. The world is changing at such a speed that one year does not even resemble the previous one. Consequently, new circumstances demand different behaviour and a continual adjustment, that is, an appropriate management in the context of change. Hence it is neccesary that we should take hold of our business ship that sails in turbulent waters and guide it to goals, so that it does not end as the Titanic in an agitated ocean[12].

In the conditions where uncertainty prevails as a certain reality, the only reliable source of permanent competitive advantage is knowledge. When markets move dynamically, when technologies network, the number of competitors grow and products and services become obsolete overnight, the only successful organizations are those that permanently attain new knowledge, spread it throughout their structure and promptly transform it into business innovation that foster the dynamics of development and improve effectiveness and efficiency in business. Radical changes in technology, in the nature of competence, the organization, in the demographic structure of work force and in culture require an adequate management, not only within companies, but also in state organizations that support the competitiveness of

[11] The term "organization"is used as a synonym for a company, entreprise, corporation, firm or institution that performs a socially-useful activity as a business entity. This term should be distinguished from organizing in the context of forming an organizational structure in the management process.

[12] "Our necks got stuck looking back. Retrospective raking the past where – blind to what does not suit us – we find only pseudo-evidence for the theses and paroles employed by daily policies is surely a significant part of a pernicious syndrome that has for years choked and killed us", Stjepan Han: What a manager will be like at the beginning of the 21st century, and Juman 94, Budva 1994, p. 145.

national economy on an international market. A dominant position in this context is held by human resource management (HRM) as an important factor in business processes.

2. BUSINESS ENVIRONMENT OF HUMAN RESOURCE MANAGEMENT

When following the dynamics of the development of civilizations we identify certain laws that are continual, although not deterministic. Thus the chattel slavery system descended from the clan system and gradually grew into the ancient civilization that has remained the basis of our civilization throughout a number of millenia. Feudalism destroyed the ancient civilization and in time, under the influence of scientific, technological and humane development, it linked the past and the present through the Humanism and the Renaissance and opened the doors for capitalism that, in turn, developed dynamically and created conditions for globalization, a new era on the path to a holistic civilization. It is in this context, and due to a great importance of globalization in the development of modern management, that technique, methods and the approach concept to be implemented become crucial steps towards survival and further development of not only companies, but also of state administration and national economies [4].

This proves the theory of a great English philosopher and sociologist H. Spencer (1820-1903) on evolution as transformation from one state into another, which should be more differentiated and individualised in the context of interrelationship and interdependence[13].

HRM in the organization serves its purpose working in a business environment. The globalization process causes turbulence in the environment while modern management finds adequate solutions to the market challenges. On this basis, HRM has established flexible and harmonious relations following the pace of change, using available resources, aiming to achieve a most favourable position and business outcomes. A continual spread of technologies and managerial know-how, the reorganization of economic, political, cultural and market boundaries in the globalization context make us realize that we will have to cope with more turbulence and an ever more complex business environment in the years to come. Successful companies today achieve competitive advantage on the basis of their knowledge, that is, superiority in human resources. Hence numerous academics and prominent businessmen agree that knowledge is the most important resource of the leading organizations in the modern world.

As a universal business system, organization is both the object and the subject of development. Hence it functions on the basis of interaction with the business environment. Consequently, the rise in the complexity of the business environment will result in the rise of the organizational complexity in the future.

The human factor has long become a term that surpassed a classic understanding of man as a workforce agent. People become more educated, they have higher-order requirements, those that are not only of material nature but involve a host of conditions referring to the quality of life and business activities. On the other hand, human factor will be ever more flexible and

[13] Enciklopedija Prosveta, Beograd, 1986, Vol.1, p. 709.

mobile, hence it will increasingly be not only a creator and recepient of new cultural and social values, but also their transmitter. In the conditions of increasing interrelations among culturally differing nations this fact gains in importance. A new era is born on this basis, one that shifts civilization boundaries, liberating man from the hierarchy of subservience. The man becomes an active agent, acting in the human resource management [5].

Modern organizations conduct continual and systemic research into the internal and the external environments, identifying their strengths and weaknesses, as well as market opportunities and threats. Making use of available information, the company strives to efficiently activate its strengths, eliminate weaknesses and use opportunities, avoiding external threats and perils. This is the context in which HRM plays a key role.

Working in a turbulent environment the modern organization faces numerous external and internal factors that directly or indirectly affect its behaviour and outcomes it achieves. While external factors form an external milieu that implies opportunities and threats to business activities, internal factors present organizational weaknesses and strengths in the context of business opportunities [6]. Overalpping of external and internal elements in the context of various organizations' business interests forms a complex environment for each individual organization, organizational unit, project or business. It is on this basis that modern organizations guide their business processes following their vision, mission, goals, policy, strategies, plans and projects.

Information on the characteristics and trends in the business environment is a starting point in decision-making and in achieving goals. The most important factors of HRM internal environment are business competence, organizational culture, structure, resources and managerial philosophy. Elementary external components comprise market, demographic conditions, technology, economy, culture, politics, legislature and others.

Basic organizational efforts are directed towards establishing a balance between external and internal components, that is, towards forming an internal environment that will flexibly integrate into the external business environment that in turn functions on a global level. Using its strengths in the context of opportunities, eliminating weaknesses and avoiding market threats and perils, the modern organization ensures the conditions for a dynamic development and a continual improvement of business efficiency.

As a dynamic business system, modern organization makes an active impact upon the business environment. Its activities are, however, limited, not only by internal strengths and weaknesses, but also by market opportunities and prospects. In this context HRM plays a decisive role both for the organization as a business entity and for the social community and the whole mankind.

3. ACTUAL PROCESSES IN HUMAN RESOURCE MANAGEMENT

People, namely, human resources, actively affect the organization, hence it expects them to produce adequate outcomes, but also takes care of their needs and requirements. A frequently used term today is "business people" which adequately highlights the importance of human

resources and their altered role in the business processes. Human resource management has its own philosophy and tools for atrategic and operational activities. In this context, some of its essential features can be explained:

a) **Orientation to action.** An effective HRM focuses on action, rather than on recording written procedures or rules. Surely, HRM uses regulations and policies, however, it stresses action. Similarly, HRM is engaged in solving the problems of the employees in order that organizational goals should be achieved and aid be provided to employees so that they develop and work with satisfaction.

b) **Orientation towards people.** Whenever possible, HRM treats the employee as an individual and offers services and programmes that satisfy their individual needs. The McDonald's fast food chain has gone as far as to assign the incumbents the titles of vicepresidents for the problems of individuals.

c) **Orientation to the global.** HRM is not a function or activity only in America or in Japan. It is equally efficiently implemented in Mexico, Poland or Hong Kong. Numerous organizations worldwide maintain a fair relationship and approach to the employees with respect and sensibility. Similarly, practitioners in America are trying to implement certain experiences from Brasil, too.

d) **Orientation to the future.** HRM helps the organization achieve its goals in the future through the provision of competent and well motivated people. Thus human resources should be incorporated into the organization's long-term strategic plans.

Today, HRM is much more than merely evidencing and filing the employee records, which was characteristic of the traditional personnel function [7]. Since the moment it was adopted within the organization, the HRM strategy has played an important role in explaining all the human-resource-related problems in the context of rational solutions meant to contribute to achieving individual and organizational golas.

Affirmation of HRM in the organization means that human resource managers assume significant responsibility, not only for HRM but for the firm's global success as well. This increased responsibility is the result of care for the productivity and efficiency, due to the reduction of the scope and redesigning of the organization, as well as the need for a rational engagement of HRM in order that it should become as competent in the complex world of competition and globalization as possible.

To prove its appropriateness, HRM has to establish an efficient collaboration with the management of marketing, research and development, production, finance and quality in order that an adequate integration should be realized in the global management context. It is on this level that the interrelation of business functions and organizational units is achieved in all the aspects of business activities of the organization as a business system. Contrary to this, in case there is no adequate interfunctional and interdisciplinary collaboration and understanding, serious consequences may arise, both for the employees and for their organization.

4. CONCEPTUAL BASES OF HUMAN RESOURCE MANAGEMENT

Starting from the holistic approach, HRM can be defined as an appropriate guiding of human potentials in the process of achieving individual and organizational goals. By motivating all the members of the organization to take an active part in the business processes and take responsibility for the results achieved, human resource management acts as a catalyst as regards other functions, thus contributing to synergetic effects of the organization as a global system.

Viewed in the context of the global management of the organization, HRM functions as a continual process of research, planning, executing business actions and control, with an adequate organization with feedback [2]. Here the HRM theory is transformed into practice, acting on a global basis of a business system, which is illustrated by a system model of HRM in Figure 1.

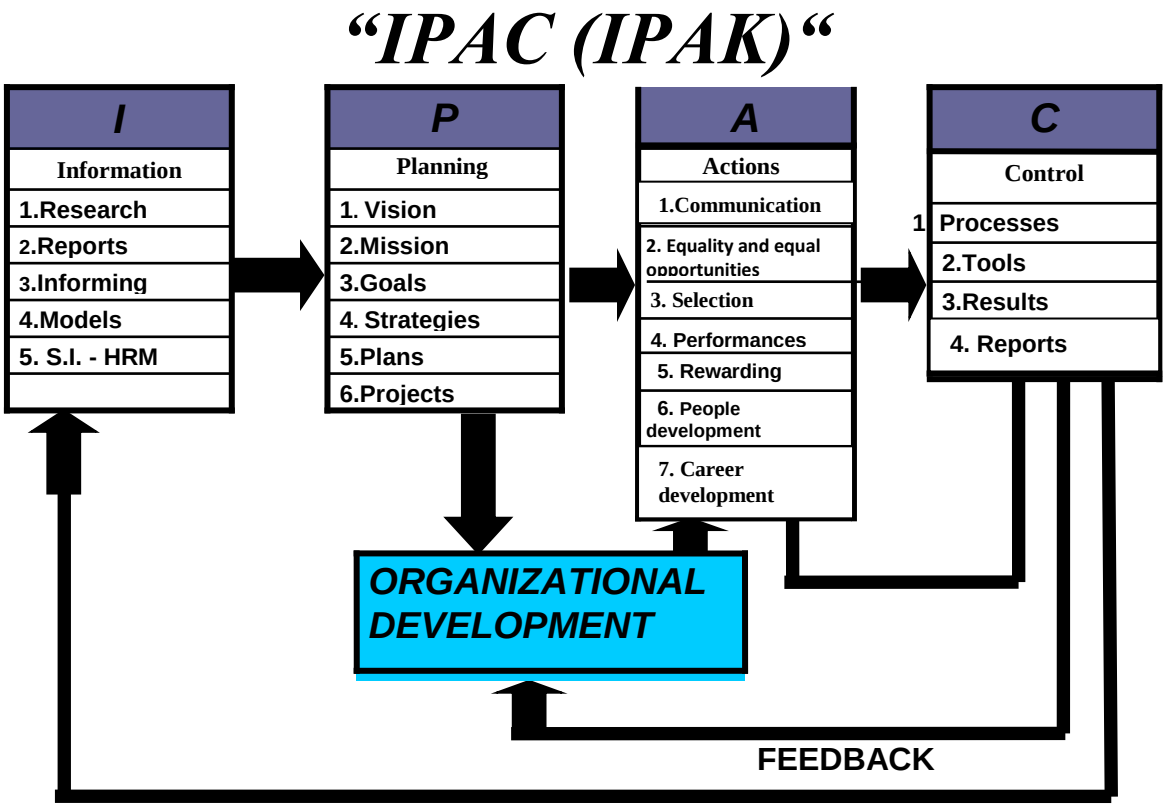

Figure 1. System model of HRM process

Information basis of the HRM process is recognized in its developed information system for strategic an operational activity. An afficient functioning of the HRM process requires adequate information, both in the domain of decision-making and conducting business activities and in the control of processes and achieved affects. The role and importance of the information system stems from the fact that business processes begin and end with appropriate information. In this context information becomes a critical factor and the measure of success of each individual phase as well as of the entire human resource management process.

The modern information system functions as a continual system of collecting, processing, storage and presentation of information for an appropriate guidance of business processes. The HRM information system does not function as an independent discipline, but rather as an integral system of a global information system of the organization. Depending on the user of the information, HRM includes the data bank and analytical models created through varied techniques and playing an important role in business processes.

Planning in the HRM process is a continual decision-making process that includes vision, mission, policy goals, strategies, projects and plans. The results of the planning process are optimum plan projections that serve as a starting point for conducting business activities and achieving individual and organizational goals and strategies of a global organization [8]. The holistic model is based on the assumption that human resources are the key factor of organizational competitiveness and business success. In this context, all functions, organizational entities and all the members of the organization participate in the process of strategy formulating, simultaneously taking responsibility for the achieved outcomes.

Conducting activities in the HRM process is an appropriate action in the context of managementof the organization as a business system. Business activities are conducted via business functions, business units, teams and individuals that perform certain activities. The basic presumption for a successful performance is that human resources have certain performance, that they are motivated, and that optimum conditions are provided for their activities in the context of HRM.

An important role in the process of performing these activities belongs to team work that encourages resources to achieve more favourable results. Depending on the characteristics of the activities, that is, on the culture and structure of the organization, each of the forms and types of team work has its specific features that are recognized in the business environment context [9]. The key role in the team work, however, is played by the human factor, namely, HRM, that ensures optimum conditions for an efficient performance of business activities. Hence HRM transforms its philosophy from theory to practice, and business results will show how good it has been in that job.

Control in the HRM process is a natural phase in the context of organizational management. The control management identifies problems and deviations in the business processes, outcomes and instruments and undertakes appropriate corrective actions in aaccordance with changes. Control supplies feedback information through feedback that informs whether and how the goal has been achieved and the work has been accomplished. Without feedback HRM cannot control business processes in an efficient manner.

5. CONCLUSION

Human resources are a corner stone of a long-term success of the organization and a permanent source of its competitive advantage. The system model of human resource management process, “IPAK“ defines to a large extent the competence and readiness of companies and other organizations to do business in an economic manner as regards all stakeholders in the management process on a global level. The development and a successful

realization of the HRM concept results into organizational success from the point of view of increasing value and profits, however, also of a long-term positive reputation of the company among stakeholders.

Human resource management in a leadership role goes beyond the departmental boundaries in the company and integrates HRM at all the company levels, horizontally and vertically, assuming responsibility for the achieved business outcomes. The role of the human resource management and of the human resource experts in the system model is manyfold and is reflected in the instruments and philosophy of practical interpretation: creation of vision, mission, goals, strategy, plans and projects for practical action.

In holistic circumstances companies are expected to go through a substantial transformation in the future in which the "IPAK" model of HRM will no longer be a separate part of business activities, but will become part of experience every employee will acquire during their life and work in the company. In this framework, human resource management realizes its mission of an appropriate guidance of human potentials in the process of achieving individual and organizational goals.

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I **Information**	P **Planning**	A **Actions**	K/C **Control**
1. Research 2. Reports 3. Informing/Intelligence 4. Models 5. S.I. - HRM	1. Vision 2. Mission 3. Goals 4. Strategies 5. Plans 6. Projects	1. Communication 2. Equality and equal opportunities 3. Selection 4. Performances 5. Rewarding 6. People development 7. Career development	1. Processes 2. Tools 3. Results/Outcomes 4. Reports 5. Feedback

ORGANIZATIONAL DEVELOPMENT
FEEDBACK

NON-VERBAL COMMUNICATION IN NEGOTIATION

NEVERBALNE KOMUNIKACIJE U PREGOVARANJU

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Abstract: *This paper discusses the basic psychological and communicational factors, as well as negotiating skills that are necessary for successful business negotiations. The aim is to explain the importance of non-verbal communication, in particular the acquisition of communicational skills which are needed for successful negotiations.*
Keywords: *Communication, gesture, improvisation, mime expressions, space, listening*

Apsrtakt: *U ovom radu se govori o osnovnim psihološkim i komunikološkim faktorima, kao i o veštinama pregovarača koje su potrebne za uspešno vođenje poslovnih pregovora. Cilj je da se objasni važnost neverbalne komunikacije, a posebno sticanje komunikoloških veština za uspešno vođenje pregovora*
Ključne reči: *Komunikacija, pokret, improvizacija, mimička ekspresija, prostor, slušanje*

1. INTRODUCTION

Successful business negotiation depends on many factors and requires knowledge of the multiple disciplines that a negotiator should master so that their negotiation activities lead to positive results. In order to master the art of negotiation, it is necessary to know the basic principles of communication studies - an interdisciplinary science that has its roots in the arts such as rhetoric, grammar, philosophy, psychology, linguistics etc. Today communication studies link with psychoanalysis, neurology, computer science and sociology.

When communicating with other people, consciously or unconsciously, controlled or spontaneously, along with words we use facial expressions, posture, gestures, spatial and temporal situation in which we communicate, modulation of voice, style of dress, etc., all of which fall within the scope of non-verbal communication. Non-verbal communication is often referred to as body language.

2. SIGNIFICANCE OF NON-VERBAL COMMUNICATION

Non-verbal signals show thoughts and emotions, attitudes and traits. They also support verbal communication or they are a substitute for it. Gestures reveal moods and states, enabling us to express agreement or disagreement, acceptance or rejection.

Any gesture can be seen as a specific act that indicates an action, starting someone or something. Most modern research in the field of Communication Studies shows that non-verbal communication is crucial in the first contact. As much as 60% of a complete impression when meeting (first impression) is formed on the basis of non-verbal communication. This moment is settled in the domain of intuitive, unconscious.

Words are often the backbone of human communication, but words can often deceive, mislead or hurt if the evidence is not properly and clearly formed, or is wrongly decoded. If the meaning and content are not transmitted and perceived in a desired way, it means that an error has occurred in the process of communication. Body language, then, is the solution, i.e., the communication bridge. In many cases, non-verbal signals are at an advantage compared to the verbal ones, as they are prejudice free.

Every speaker's aspiration is to harmonize the basic means of expression - voice, gesture, speech, statement and posture. The gesture is sometimes used to supplement, explain or illustrate the text. On the other hand, the movement can be in contradiction with the text – as a sign that expresses a deliberate, targeted contradiction. The relationship between a gesture and a text can be seen in mutual conjunction of several ways:

- When the text is dominant, content and voice constants show all the speaker's intentions. The gesture is reduced, minimal, expressed through the motions of seeing and mime;
- The gesture complements, highlights the text, that is, the purpose is to supplement and interpret;
- The gesture only follows the emphasized parts of speech, the focus of the argument. The attention of a listener is drawn to the most important place in the speech. The movement acts as a figure of gradation and the voice constant loudness may be accompanied by energetic gestures;
- The movement is emphasized, especially manual gestures. Thefunction of gesture is explanation, not a personal crutch, but a deliberate gesture.
- Sudden, unexpected, spontaneous movement acts as a moment of deceived expectations, as an improvisation in a place of speech in which it is least expected. The movement can be quick, abrupt. The essential argument is usually emphasizes by movements such as standing up, walking, moving from one place to another, etc.;
- Disciplined action is actually part of preparation and strategy for a show. These are the movements of the whole body, that is, the body language.

The choice of means of non-verbal communication depends on the area, of the environment, time available, as well as the number of participants, or listeners. Addressing a wide audience in the larger space requires larger, wider gestures, whereas the dialogue with one participant in a smaller space and political speeches require careful choice movement, gestures and poses, as well as their alignment with speech act.

This essay will explain the three types (levels) of non-verbal communication. These are:

a) conscious
b) unconscious
c) manipulative non-verbal communication.

Conscious non-verbal communication represents a conscious and controlled movement, aimed at the listener, a verbal flow and specific space. This type of communication does not mean practicing movements to perfection although sometimes there is some practice to be used in

complex negotiations. The conscious control of one's body movements and, taking a particular position in space and free, spontaneous movement in space means that there is a controlled selection of potential non-verbal signals.

Business people need to know the specific standards, and the personal creativity and imagination will dictate how individuals use them and transform. Standard, for example, covers how to sit (upright, not too reclined, or on the edge of the chair). It is understood that there should be the movements of getting up, greeting, welcoming clients, etc.

Unconscious non-verbal communication is a series of movements, often involuntary. The breathing muscles move–there is breathing in and breathing out, then the muscles in the mouth move, which means the activation of facial musculature. Breathing is itself a movement, as well as the voice. Frown, licking, swallowing saliva, eyebrow lifting, twisting and twitching of the lips –these are the movements that are involuntary and unconscious. Extremely negative aretics - nasty, petty, repetitive, involuntary movements. Involuntary actions like moving, exaggerated gestures, "wandering" look, peeking back and forth, wildly spinning, etc., interfere with verbal communication and reveal an insecure and frightened person or else, a person unprepared for the interview or performance.

There are details of dress and behaviour that give away a person. Overstressed makeup, for example, gives away a heightened desire to be liked. Promotion and wearing jewelryis often referred to as splurge, while colourful socks with classic men's suits reveal negligence. These are the details that either point to a certain insecurity that is covered by the exterior decoration or negligence. A negligent behaviour, dress and movement point to under-concentration.

Many complex situations can block the nervous system and movement, which then become forced, agitated, tight, excessive, nervous, etc.For this reason there should always be a self-control and conscious management of behaviour and body movements.

Manipulative non-verbal communication is used with the intention of practicing non-verbal communication to perfection in order to present a certain pattern of behaviour that needs to seem natural and relaxed. With this kind of behaviour we give the listener a wrong picture, deliberate misinformation and the desired, intended impression in order to achieve a certain goal. The aim of this calculated conduct is to confuse the caller. These kinds of behaviour can be noticed in polemical discussions, debates in court, in meetings, in meetings of statesmen or leaders of large companies. During the latter meeting the seating arrangements, division of the space and postureare taken into account. The territory is usually "defended" by one team in the negotiations sitting at one side and the other team on the other side of the table. As for the negotiations that are taking place in the office, the negotiators can sit facing each other, side by side, on the diagonal, very far from or opposite each other.

Arranging the position of the parties in the area expresses a "good tone" when guests are welcomed in a friendly, hospitable, warm manner. Spatial distribution is often used with a quite opposite intention, when it comes to important negotiations, for example, buying large companies. Then, the negotiators are deliberately put at a disadvantage by giving them specific seats, or specific places to stand. A variety of forms of behaviour that aren't usually part of the established patterns of business etiquette is used. If respondents or clients use other

forms of behaviour in negotiations, some additional psycho-social elements, especially guidance and persuasion are included. In these cases non-verbal communication is necessary.

Non-verbal communication includes all forms of non-speech human behaviour and expression of thoughts and feelings such as: a handshake, a position, i.e., body posture, a shoulder position, facial expression, breathing, expression and eye movements, view focus, leg and arm movements, gestures, tics, touching parts of the body, the distance of the interlocutors, the overall appearance-a salesman's look (dressing, body hygiene, etc.), as well as non-verbal signs in speech behaviour.

A good relationship between verbal and non-verbal communication leads to active participation in communication at the level of the conscious and the unconscious. The elegance and attractiveness of the movement or of dress provokes our unconscious desire to be with that person in contact and to maintain and extend the communication with him/her.
The system of non-verbal communication consists of a sequence of movements such as:

- Directing the view;
- Mime expression –facial expression;
- Listening;
- The hand movements;
- Movement in space;
- The position of the body in space;
- Group arrangement in space.

3. VIEW FOCUSING

Watching as the permanent movement that fully reveals a personality isn't thought of enough. Watching presents an orientation to the other party, and signifies that both parties in the dialogue care about communication. Fixing the gaze, however, is not free, it is frantic behaviour, while a wandering glance presents unfocused viewing.

When you meet, recognize, re-meet a person, etc., eye contact is a signal by which we give a partner the sign that we want to make contact, and that there is recognition. Also, if you avoid making an eye contact - the caller is given the sign that there is a disconnection. Distractions are used in order to avoid an unpleasant partner in communication. Unconscious blinking, winking, a wandering glance, give away a deconcentrated or frightened person.
Pupilary signals, according to psychologists, are indicators of mood changes, i.e. the expansion and contraction of the pupils are signs that can indicate an argument, a conflict, sympathy and so on. We look at each other when:

1) we meet for the first time;
2) we greet one another;
3) we exchange information;
4) we listen actively;
5) we show interest and attention;
6) we observe our partner's reaction.

It is especially important to synchronise watching and listening.

4. MIME - FACIAL EXPRESSION

Statistics show that facial muscles make thousands of movements while we watch, laugh, cry, talk, etc. The facial expression is a hallmark of personality. A person may seem as light, dark, ice, shameful, friendly, etc. Mime is a direct gesture such as movement of the eyes, cheeks, lips, cheek muscles, etc. Some faces reveal everything: emotions and thoughts, mood, state of mind. Others are motionless, like masks.

Expressive gestures, like laughter or a smile, make communication casual, pleasant and natural, only if really honest, cheerful tones and mood prevail. In the case when personal insecurity is covered by constant smiling, or a desire to be liked, a number of these movements can be converted into a spasm, a mask of smiles, and give the overall impression that the person is inclined to "communication flirting". A smile does not have to mean a movement of stretching and spreading lips. A smile includes eyes, as well as the entire face.

Open, friendly, smiling faces are more attractive than sombre, closed and immobile face. However, if the smile is not sincere, it is worthless and counterproductive to make movements that create a mask of smiles.

Movements of the head, above all, express approval or disapproval. Much more common movement is nodding – moving the head up and down while listening to someone. But we sometimes even unconsciously move our head slightly to the right or to the left, or wave the head in terms of disapproval and so we show the speaker that we disagree with him/ her.

American psychological research has led to the conclusion that the likes at the first meeting are due to a friendly expression (55%), to a friendly tone of voice (38%) and to the content of the message (7%).

5. LISTENING AS PART OF COMMUNICATION

Listening facilitates receiving and understanding of the message, and thus determining its meaning. Listening can be internal and external. In internal listening we listen to our own voice and words (i.e., thoughts), and external listening involves the world around us.

To listen actively means to take the role of the customer, whichis not easy. It requires concentration and some effort. In active listening the “shop assistant” listens to what the “customer” says, looking at what the customer does, assesses the content of the information received, and separates the important from the unimportant.

The act of listening provides that:

a) The participant in communication fully understands;
b) the information is properly received and decoded;
c) the manner in which respondent sends the message is revealed ;
d) the key issue is developed and set;
e) the participant or speaker is supported.

Speech without listening is a one-way street. To hear someone does not mean to listen to them. The very listening does not mean that the words have reached the listener. Sometimes the rhythm of listening is faster than the rhythm of speech, and" the listener" is left some time for his/ her own thoughts. Sometimes" the listener" estimates that there is no benefit from listening, and is rather amused by his/ her own thoughts.

Basically, active listening is a need to understand and march towards a common goal. When you listen carefully, you show understanding for people, care and compassion. When the partners listen actively in any kind of communication, they gain mutual trust, it is easier to communicate and solve a problem. Non-verbal signals, facial expressions, body position, motions of approval, show our partner in communication that we listen carefully.

Listening can be compromised by the manifest aggression coming from any side. Aggression is always a consequence of placing one, two or more parties, in the first place in communication, emphasizing the individual who considers him/herself the centre of attention and who tries to impose their own topics and ideas.

6. THE ARM MOVEMENTS

Arm movements, hand or finger movements that are expressed unconsciously or consciously do the talking, informing and explaining. Arms and hands are used for “painting”, “drawing “what is explained, almost pantomimic gesture underlines a statement. Manual gesture is significant, but exaggerated gestures interrupt the flow of communication. Movement can divert attention from the words-a topic and verbal part of the process, the information flow, so that the focus is finally lost in the constant motion.

Some people have exaggerated gestures during a speech, which gives the communication a too theatrical feature. On the other hand, some people are quite relaxed, their arms crossed on their chest, and the third party, however, are those who are still and immobile during the act of speaking or listening.

Banging with a hand on the table, crossed arms, turning thumbs are so- called "signs of barriers”. These distracting gesture raise an invisible wall between the participants, and they can mean a kind of tension. The movements of finger-pointing, slamming with a hand, getting too close, face to face with a person, act as aggressive behaviour that cannot attract and convince the partner in communication, as it could by force of will and positive energy.

Gesturing movement should be consistent with the verbal act, it should emphasize a word or be a replacement for it. Abrupt movement of the arm (hand) can interrupted a monologue, a dialogue, etc. Psychologists emphasise manual gestures in particular and explain the importance of different movements: arm, hand, fingers in both hands, part of arm from the elbow, shoulder, etc. Thus, they state the following:

a) the palms facing up indicate that the partner in communication is ready and open for discussion –and getting closer;
b) the palms facing down mean closing, the refusal of dialogue –and getting further;

c) tapping with one or both hands means emphasizing and highlighting certain words or phrases;
d) hand palms facing each other are a signal of reflection - hesitation;
e) a half-folded hand, palm facing the chest of the speaker means of referring to themselves;
f) the palm open towards the other party with half-stretched arm at the elbow means stopping participant.

The finger language is also very interesting and may show certain conditions (for example, restless fingers express uncertainty, nervousness; intertwined fingers - contemplation; widespread - confidence, self-esteem). Clenched fist means anger, and fear. Arms and hands should be peacefully resting on a table or in your lap, against an armchair or chair. This emphasizes the relaxed and comfortable position of a person who is sure of him/ herself and takes a natural stance and posture.

It is very important that the hand movements are not inconsistent with the spoken text.

7. MOVEMENTS IN SPACE

Movement in space should be thoughtful, organized and controlled. Depending on the size of the area and the reason for gathering,the range of motions change, as well as posture and movement in space. Movement in the space of the office is kept to a minimum, unlike the sequence of movements when, for example, giving presentations or lectures in large halls, auditoriums and so on.

Eye contact should be taken in account, regardless of the number of listeners. It is important to take into account the distance in the space that we occupy in relationswith others, since the distance reflects the type of connection and relationships. This rule does not apply equally for every situation. There are some differences in encounters with Asians, Americans or Europeans. When meeting strangers, introducing or meeting in the open space, the distance between people should be about 120 cm. This distance is what the Europeans considered decent distance, and points out that the people do not know each other well, or that they have just met. When people meet in a smaller space, the distance is 80 cm. At this distance, closer ties establish. The third type is a distance of 50 cm and indicates that partners know each other well and that they are in good business contacts.

8. BODY POSITION IN SPACE

Active movement consists of a series of movements that lead to poses and change of position, location and direction of movement. Motion control involves perceptual moment, i.e. spotting the distance at which people or objects are, and also the speed of performing certain movements. Motion control means repetition, i.e. repetition of certain movements. Movementcontrol can be tracked by the phases of motion:

a) initiating movement;
b) the duration of the movement - the determination of the speed of movement;

c) emphasizing of the movement or maintaining it;
d) the completion of the movement;
e) transfer to another movement or rest.

Movements give away nervousness and do well in many situations. The accuracy with which the movements, postures and changing positions are performed, reveals not only the harmony and security, but it also assures the partner of the credibility of the person with whom he/she gets involved in different types of relationships. Disorientation in space, i.e., a wrong place, position or a way of sitting, puts the individual in a subordinate position from which he/she cannot respond, nor participate actively in the communication process.

There are predictable movements - forms, e.g. of greeting, meeting some old friends and acquaintances (hugging, kissing, etc.). It is offensive if you refuse these predictable movements, but, nevertheless, you should avoid too intrusive and heartfelt gestures in adiscreet way, and even reject such movements, as well as the inarticulate gestures. In this sense we should concentrate on following the movements of people who we communicate with.

9. GROUP ARRANGEMENT IN SPACE

Group arrangement can be spontaneous, which is not very common in business communication. In business communication group arrangement in space is specified by certain rules. Spontaneous gathering and grouping can be observed when traveling, seminars, tours, etc. And in these situations grouping is predictable in a way and it can, if organized by a skillful organizer, look spontaneous.

In other cases, the movement and arrangement in space are determined by profession, tasks and goals. In organizing the conference presentations and negotiations, the biggest concern of the organizer is how to design the space, how to fill it and ennoble it. Otherwise there is chaos, disorientation and dissatisfaction of participants and guests. Etiquette in the allocation of space should be observed, not only during the negotiations, but also at the luncheon.

When arranging groups in space, you should take into account the status of the participants, hierarchical relationships, and you should use any information about the eventual interpersonal relationships of the participants in the event.

10. CONCLUSION

Any experienced negotiator must know his/her goals and abilities in order to be able to determine their expectations. Negotiation is not to impose your will, neither is the aim of communication to serve your goals exclusively. Negotiation tactics must not be negative neither should it be reduced to persuasion.

The goal of negotiations should be a mutual agreement. Only cooperation and compromise will lead to a conclusion acceptable to all participants in the negotiation. Negotiation is the art

of adaptation and as such is in fact the art of communication. The above facts clearly demonstrate the importance of developing communication skills for successful negotiations.

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HUMAN RESOURCE MANAGEMENT AND ITS FUTURE

MENADŽMENT LJUDSKIH RESURSA U BUDUĆNOSTI

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Abstract: *The importance of personnel, leaders, for a successful mnagement of a company, in the organization, that is in organizational structure, successful management of human resources, an arrangement of machines and a complete control over the capital of a company with the purpose of capital increase in a ruthless competitive race is a target question, how to be a step ahead of the competition. Having in mind the importance of leaders for life and survival, as well as for a prosperity of a company, it is questionable how much and if companies are ready to invest in education and creation of such personnel.Managers are usually too busy putting fire out and solving crisis situations that they don't even know what their real task is, not to mention its fulfillment.*
Key words: *Management, education, strategic, lidership*

Apstrakt: *Značaj kadrova,lidera za uspešno poslovanje kompanije, u organizaciji tj. organizacionoj strukturi, uspešnom upravljanju ljudskim resursima, rasporedu mašina, I potpuna kontrola na čitavim kapitalom kompanija, a sa ciljem oplodnje tog kapitala u bespoštednoj konkurentskoj utakmici, ciljno je pitanje, kako biti korak ispred konkurecije. Imajući u vidu značaj lidera za život i opstanak, kao i prosperitet citave kompanije postavlja se pitanje koliko i, da li su kompanije spremne da ulažu u obrazovanje i stvaranje tih kadrova. Menadžeri se često žale da su previse zauzeti gašenjem požara i razrešavanjem kriznih situacija da bi mogli doći do saznanja kakav je u stvari njihov zadatak, a kamoli da ga izvrsavaju.*
Ključne reči: *Menadžment, obrazovanje. Strategija, liderstvo*

1. INTRODUCTION

Managers in 21st century should react to changes and manage them, lead multidisciplinary working teams, take the initiative, stick to the goals of the organization or the coorperation, take the business process of whole organization, give authorizations to the personnel and others to develop their skills, improve their own professional skills as managers, keep their stuff motivated, keep their own motivation. [3]

All those challenges of the 21st century, fast changes, short advances, disruptive technologies, revolutionary competitors, disordered markets, allmighty clients, rebellious shareholders put projected limits of the organizations all over the world to the test taking out all the shortcomings of management system which is not capable of keeping pace with time. Just to remind ourselves of all the changes in our surroundings which made our lives easier, what a big breakthrough it is, personal computers, mobile phones, and what about breaktrough in management practise, anything that has changed the way of managing big companies, not an easy task at all, isn't it? Therefore management got old-fashioned.

2. THE FUTURE OF HUMAN RESOURCE MANAGEMENT

In order to give such authorization to the associates or members of the team it is necessary that the management has confidence that they do the best for the company. On the other side

all the members of the team will stay motivated only if they believe that the highest leadership will let them take part in creating their own productivity in the long run.

Therefore we come to a very important principle that a company lies on love and confidence, not on uncertainty and fear. If a company works a lot on creating a deep feeling of mutual destiny, then in the reward system it makes a clear difference between those who give more and those who give less value, and thus a feeling of satisfaction arises with all the employees, that their role in the process of helping the company development is huge. As companies grow from ten or fifty employees in Taylor's time up to today's multinational companies with thousands and thousands employees, a manager with a traditional approach of thinking is by all means disturbed. He is faced with the reality of the organization where power and authority are not connected with the position in it, where you cannot simply impose bringing any decision due to your higher position in the scale of hierarchy, where there are no direct subordinates who you give orders and where your power looses any value very easily if nobody follows you. However redistribution of power is one of the primary ways how an organization can become more engaged, more adaptable and by all means more innovative. Even when innovation doesn't mean distribution of power it is accepted with difficulty since it seems that expenses are more evident and more material than advantages, that is profit in due or even far away time. In the world of transition and fast changes how a company is compared to the others at any given time is not the most important thing, but its evolutionary advantage in the long run. The very ability of a company to adapt can be compared to basketball. A baskeball match is played in a constant motion through a series of weel-thought-out maneuvers with only a few opportunities to stop and plan on the court, a strategy is very dynamic and it must be reacted instinctively to the changes of tactics of a rival team, players must have strength and persistance to endure pace of the game, just like a match on the court.

3. FUTURE OF MANAGEMENT AND INNOVATION

Incompanies, there should be a clear pattern of protecting innovation from underestimation, and such pattern should make the company more innovative than others. If you hire an average, or ignorant person, soon there will be more of them, and so you should employ the smartest of the smartest ones, as they are always the best in their class and generation. These excellent students love to work with the excellent ones because they inspire them to think and learn as well as to compete. To the innovation usually comes by breaking down the existing paradigms and by doubting about the existing assumptions. The imperative for innovation should be: don't do something just because someone told you to do so, but provoke the authority, do it because it is worthwhile, profitable. If you lead the company through a series of conversations most of your employees will agree with you, because you're a CEO who implements the strategy from the top to the bottom of the ladder, and that unity leads to complete tasks. If we assume that the employees in your company are the brightest ones then to have control and to command them is not an option. When motivated and skilled people share a common goal, they do not need micromanager, and the motto would be: sell early, sell before others, sell often and sell quickly. The strength of the company, its ambitions and scope of its investment in innovation is an insurance policy against this kind of conservatism and the slow development of the company which often lag it behind. The unwritten rule is: give consumers exactly what they want at the right time and the right place.

If you create a model of management in which people feel encouraged to share their views and opinions, free to do what they really like, where criticism comes straight from their equals and who, to a large extent will not be quelled by the bureaucracy, then they will be very grateful to you. So there is no law that forbids companies to organize and engage their employees in building strategies that are flexible and inventive and without any red tape. Even more it is possible to completely liberate the human spirit in the workplace; it is time to embark on a journey to discover the future of management; and in 1900 the statement that people could not fly was true but wrong that they would never be able to. So not only the law of gravity kept the human race where it is today, but the lack of imagination, and this is also true for management. So why should employees with great ideas sit aside and wait for the senior management to undertake something. If an individual employee feels that there is something he could do even if it is not required of him, he should be able to follow his passion and he it should be supported and rewarded and not punished, he should be given a chance. If we gave them more freedom, it would mean less control and less control means less authority, or fewer managers, that's the danger.

The deeper we penetrate the hard shell of beliefs in this issue, the more opportunities for radical innovation we get, the reasons are as follows:First, we bring out to the surface of beliefs that have not been discussed or analyzed for decades and it stimulates us as a management innovators. Second, in order to renovate the conventional management practice it is necessary going into depth. It boils down to the question, why it is always considered managers to be indispensable, and if we continue to dig deeper and build a close relationship with customers, a relationship of mutual trust and respect, we see that their fundamental task is to organize and manage the employees. We can see that strong and successful managers are equally unaware of their leadership DNA as well as of their biological DNA.

4. MODERN MANAGEMENT PROCESS AND PRINCIPLES

Practices and modern management processes are built around a core of key principles of standardization, specialization, hierarchy, harmonization, planning and control and the use of external stimuli to shape human behavior. These principles were light spotted in the early 20th century by a small group of pioneering minded theorists of management - individuals such as Henry Fayol, LyndallUrwick, Luther Gullick and Max Weber.[1]

Almost, all of them focused on the same problem: how to maximize business efficiency and reliability in large companies. More than a hundred years after them it is still the central problem of modern management. However, excessive emphasizes of compliance and matching goals may distract managers from seeking opportunities, solutions, opportunities outside the area of their work and prevent the search for new strategic options. And the elaborate ritual of planning and control can lull managers into believing that the environment is more predictable than it is, and to make them impervious to disruption in continuity. Finally, a naive belief in the effectiveness of financial rewards can make managers blind to the power of purpose and passion as mechanisms to encourage individual effort. The development of modern management could pretty well be described as a constant striving to regulate the unregulated, starting with the outdated and rebellious employees. All that is accomplished, the regularity of standards, control of plans and procedures facilitates

managers' job and thereby helps to identify and correct discrepancies that arise. All this allows business leaders to make predictions, and then to stick to them, thereby reducing the chances of mid-level managers being caught in error by their superiors. In other words, thus the bureaucratic class is helped to keep the reassuring illusion of control.[3]

Therefore it is necessary to search for and create new management principles that will help any company to respond to the new challenges of the 21st century. Let's start with what we want to create in our company, whether it is something extremely compelling, inventive, or adjustable. Or should we start making diversity, despite meteor strikes, volcanic eruptions, tectonic movements, extreme climate, living not only survived but also developed and became more complex and more capable. During this process, despite the fact that there is no CEO of life, so there is no external force, which manage the evolutionary course. Life cannot be foreseen cannot be anticipated and cannot be saved for the future, but it can be adapted, and is still being adapted. And all this is what actually determines the manager, directes him and makes him successful.

Authors often draw a parallel between biology and business, by the conventional view the company is seen as a living organism within a larger eco-system. However, if the big companies behave as organisms that cannot be adapted into individual ones, it is only because the managers are not able to cultivate and take advantage of huge potential of diversity, which exists within every large organization. Therefore, the lessons that life has to offer to the future management innovator are the implications of diversity and selection in the organization of the 21 century. It is natural for human beings to want to maintain control, and each of us is expected to take place in the future according to our plans. However, the present itself is becoming unreliable indicator of the future, and that competitive success depends less on planning what is to come, and more on a continuous experimentation with what might follow. In the end this surprise for the company can be good or bad, depending largely on the level to which it proactively invests, experiments with destructive technology, explores new ways of publishing on the market and predicts new types of customers. In order to survive, the company needs a lot of pre-designed easy adaptation. The diversity of any system determines its capacity to adapt, and that the greater the diversity - of thought, skills, attitudes, and abilities, the greater range of adaptive responses you get. The risk in the world which is rapidly changing is that the company will pre-adapted. The company can disturb its ability to adjust, in search of focus, narrowing the scope of its attempts to innovate, relying on a business model ... or ... how the change accelerates investment in diversity ceases to be a luxury, it is a strategy of survival and innovative Management Act of successful business-investment. And their final goal is to help the company to penetrate into the evolutionary cycle of its competitors. Reinnovating management process in a way that expands the scope of experimentation, depoliticizes strategic decision-making and increases the gene pool are the key features of the design model of marketing.

Evolution is really good sorting mechanism, it promotes good mutations, and thereby suppresses bad ones.

On the other hand, the market is highly integrated routing mechanism that diverts resources away from low-value targets to the high-value ones. There is a long standing thesis of

economists that loosely regulated markets are the most efficient means of achieving an efficient allocation, which is confirmed by the Ten Commandments in the work of Philip Kotler " Ten deadly sins in marketing" [5]. 1. The company does the segmentation of the market, chooses the best segments and develops a strong position in each of them. 2. The company makes the need, perceptions, preferences and behaviors of customers maps and motivates all stakeholders to be busy giving services and customer satisfaction. 3. Company knows its most important competitors and their strengths and weaknesses, ... 10. company constantly introduces technology that gives it a competitive advantage in the marketplace. Every company needs to know, it is too expensive to dominate all five dimensions-product, price, ease of access, a service that adds value, customer experience. The company will be the most profitable if it dominates one of these attributes, achieves results above average in the second (differentiated) and the remaining three keeps at the level of the industry average [5]f Kotler And as the future unfolds, competitive environment will only choose to do business companies that have learned how to quickly develop their core strategies, and how to reject companies that are less adaptive, they fall out of the circle of struggle for survival, disappear.

We need a manager who doesn't obediently refuses the idea as eccentric, or which is big enough so to gain the attention of top management executives who are willing to shift funds from existing programs in favor of half-baked ideas, and finally, an innovator who has the necessary wit, personal charisma and political cunnings to make this happen. And those are basic functions of a manager. A good manager should possess the ability of interpersonal organizing, the ability of clear and precise presentation, cognitive/perceptual ability and he should also know how to motivate.

A modern manager must observe the surroundings, analyze different situations, think abstractly, foresee the events before they happen. They also should show the ability to make complex things simple and to adapt them to the intellectual abilities of others [4]. A manager must know that his personal success depends directly on his personnel surroundings either those are his subordinate members of the company or his executives. By all means for the motivation of a manager a feeling of power is very important, which his function itself creates, actually a feeling that they can influence many events in the company or outside [4].

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CONCLUSION

The company can disturb its ability to adjust, in search of focus, narrowing the scope of its attempts to innovate, relying on a business model ... or ... how the change accelerates investment in diversity ceases to be a luxury, it is a strategy of survival and innovative Management Act of successful business-investment. And their final goal is to help the company to penetrate into the evolutionary cycle of its competitors. Reinnovating management process in a way that expands the scope of experimentation, depoliticizes strategic decision-making and increases the gene pool are the key features of the design model of marketing.

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RELATIONSHIP BETWEEN ORGANIZATIONAL AND NATIONAL CULTURE - EXAMPLE OF SERBIA HOLCIM LTD

ODNOS ORGANIZACIONE I NACIONALNE KULTURE NA PRIMERU KOMPANIJE HOLCIM SRBIJA D.O.O

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Abstract: *Organizational culture is a system of assumptions, beliefs, values and norms of behavior that members of an organization have developed and adopted through common experience and behavior. Holcim Serbia is one of the best example of matching the organizational culture with national culture of the country in which they operate. Management of Holcim Serbia is synergy of organizational and national culture. The employees of this company bring with them their customs and principles, but they fit into the organizational culture and rules that apply for the company in other business units.*
Key words: *Organizational culture, national culture*

Abstrakt:*Organizaciona kultura predstavlja sistem pretpostavki, verovanja, vrednost i normi ponašanja koje su članovi jedne organizacije razvili i usvojili kroz zajedničko iskustvo i ponašanje. Holcim Srbija je jedan od najboljih primera uklapanja organizacione kulture sa nacionalnom kulturom zemlje u kojoj posluju. Menadžment kompanije Holcim Srbija predstavlja sinergiju organizacione i nacionalne kulture. Zaposleni u ovoj kompaniji donose sa sobom svoje običaje i principe, ali se oni uklapaju u organizacionu kulturu i pravila koja važe za ovu kompaniju u ostalim poslovnim jedinicama.*
Ključne reči*: Organizaciona kultura, nacionalna kultura*

1.INTRODUCTION

Culture is a social category that exists anymore only within social groups, such as nations, social classes and professions etc. The concept of culture encompasses a number of elements that stand out: the traditions, customs, norms, behaviors, beliefs, habits and so on. With these elements we can talk about different peoples, societies, civilizations and etc. And organizations, as well as smaller groups of people have their own culture, by which they are recognized and are differentiated. Organizational culture is created in the process of social interaction among members of the organization. The result of interaction and communication of the organization's shared values, beliefs, and norms of behavior.Today,there is more and more evidence of organizational culture, and more theorists suggest that the only thing that is common to all successful organizations is organizational culture.

Successful management of the organizational culture of an organization is a competitive advantage that arise as a result of lower costs, greater savings, greater motivation which affects their productivity, increases the reputation of the organization in the region (1). Organizational culture goes deeper than the words used in the company mission statement.The enterprise culture means tacit understanding, borders, common language and common expectations established by the members of the organization. Organizational culture shapes the leadership, top management of the organization.

In the analysis of a large number of cultural factors impact on the organization, it can be seen that the relationship of national and organizational culture less succumbed to the study,

despite the fact that the organizational culture itself is undoubtedly one of the issues that is most studied in this area. The main objective of this paper is therefore to shed light on the relationship between national and organizational culture, to point out the most important theoretical and empirical evidence in this regard and to answer the question of how national culture influences the formation of the organization's culture.

2. THE CONCEPT AND IMPORTANCE OF ORGANIZACIONAL CULTURE

There are a number of different definitions of organizational culture. To avoid broad, citing all of them, we will give only one, synthetic definition, which includes those most frequently used elements of other definitions. Thus, organizational culture can be defined as: "The system of assumptions, beliefs, values and norms of behavior that are members of an organization have developed and adopted through shared experience, which are manifested through symbols and directing their thinking and behavior" .

Regarding the importance of organizational culture, it is certainly great for the functioning of the organization as a whole. The importance of organizational culture stems from its impact on business and business performance of the company. There is a strong belief that the successful operation of the company and the necessary organizational culture of certain features and content. This belief spread by the management and the researchers who have studied the practice of "excellent" companies (engl. excellent practices). They found that all the companies have been successfully strong culture with certain values and beliefs. According to this view, the existence of such an organization's culture (as reported in a well-integrated set of social values, beliefs and behaviors) leads to higher productivity and a more complete realization of the objectives. This view is sometimes called the hypothesis of a strong culture (2).

It is logical that this attitude has led to the fact that they are much more studied positive than negative effects on the functioning of the company culture. However, one should bear in mind that organizational culture can affect the company's operations both positively and negatively. It can actually be a "secret formula for success" and "silent killer." It all depends on whether the culture corresponds to a situation in which the business is or not. The impact of culture on business operations is far from being fully explored. In recent years, moreover, there is growing awareness among researchers that often just a strong organizational culture can lead to problems and failures of organizations. Saffold, for example, warns that despite the seductiveness simplicity of the model and the strong culture must be developed more complex understanding of the relationship between culture and organizational performance which acknowledge awareness of the potential negative impacts of culture.

By far the most explored ways in which culture influences the functioning of the company are as follows:

- Organizational culture is an important factor in strategic decision making;
- It is important for the company's operations as a determinant of its ability to adapt to changing environments;
- It is a mechanism of coordination in the enterprise;
- It can be a very effective mechanism to control employees' behavior;

- Organizational culture significantly reduces conflict in the organization;
- Organizational culture is a good motivator (3).

3. CHARACTERISTICS OF NATIONAL CULTURE

Under the national culture we mean a set of assumptions, beliefs and values shared by members of a national community, and which determine their understanding of the world and behavior within it. National culture is a "mental programming: patterns of thought, feeling and action that any person acquires in childhood and then applied throughout the life." There are many artists who are engaged in the study of national culture, but we can say that until today the best known and most analyzed national survey culture linked to Geert Hofstede's, which is defined by four primary dimensions to differentiate national, and therefore the organizational culture:

1.) Individualism versus collectivism - Identifies whether the dominant culture maintains an individual or group. Individualism implies weak social ties and social structure in which the individual cares only for himself, early becoming independent of their primary family and is considered responsible for their own fate. In collectivist cultures people are very much tied to the collective, often to such an extent, that their identities are perceived solely through the social community.

2.) Power of distance - Describes the degree to which society accepts the fact that power in institutions and organizations is not equally distrbuted. In cultures with higher power distance, dominating the view that the uneven distribution of power is natural and desirable, or necessary for the functioning of a society. In such societies dominated by authoritarian consciousness, the greater the degree of centralization is, and the organization is characterized by pronounced hierarchy, formalized structure and dutifully complying with people in positions of power. In contrast, in cultures with low power distance dominate the pursuit of greater equalization of power among members of society.

3.) Uncertainty avoidance - Identifies the willingness of members of a culture to accept uncertainty, risk and change. National cultures with high uncertainty avoidance is characterized by extremely low tendency of people for changes in the private and professional spheres, the fear of all the new and unknown, and the low tolerance of differences of any kind. In these cultures there is a pronounced distrust of individuals and groups in any way deviate from standard behavior patterns, as well as to those who belong to different national cultures. As a result of such attitudes, cultural organizations with a high degree of uncertainty avoidance are based on a number of formal rules to regulate the conduct of employees, standardization and formalization, in an attempt to provide with much stability and predictability.

4.) Masculine versus feminine values - The literature is often defined as the quantity vs. quality of life. In cultures with a dominant male valuesdominate the need for achievement, success and acquisition of material goods, which are the basic criteria for the assessment of one's abilities and values. In contrast, in cultures with predominantly feminine values is

dominated by the need for social contact, providing support and aid the development of harmonious interpersonal relationships, respect and dignity (4).

4. RELATION BETWEEN NATIONAL AND ORGANIZATIONAL CULTURE

Regarding the sources of organizational culture, according to the literature, there is considerable agreement on three main factors, namely:

1. National culture
2. Characteristics of the sector (industry)
3. Specific history (including the personality of the founder, and the most important leaders in the history of the organization).

National culture is therefore an important factor in the creation of organizational culture that is realized by the assumptions, beliefs, values and norms of employees (as a member of the national culture). All of these aforementioned elements of culture, embedded in the subconscious process of socialization from an early age and a basic framework in which to develop specific organizational culture. These broader cultural orientation changing (or reinforce) under the influence of the other two factors (sources) of organizational culture, which allows the same national culture, there are companies with very different organizational cultures. However, regardless of such consent of the majority of researchers of national culture the same as one of the important sources of organizational culture, the strength of this influence is different estimated. An organization cannot convert new employees in the specific culture of the company that deviates from the society around him. Instead, it adopts an organizational culture with central values identical to those of the society that surrounds it. Johns author points out that national culture is a key component of a wider contextual imperatives imposed constraints (engl. constrains) that is developing a national culture. Analyzing the impact of national culture on the success of the strategic partnership, Petkovic and Aleksic talk about organizational culture as a reflection of national culture (3).

Analyzing the impact of national culture on the functioning of the organization (and the organizational culture) is actually part of a broader understanding of organizations as open systems and involves a significant environmental impact on the internal organizational processes. In fact, when organizations adapt their structures and practices requirements of the environment, they are in fact adapting aspects of the surrounding culture. And thus the cultural elements of the environment entries in the organization and may affect their culture. This relationship is usually already recognized by some researchers in some classic studies. However, what cannot be forgotten is extensive empirical support for the view that the management of the organization can encourage development of a recognizable organization. Such a culture can be a powerful tool for leadership and support for organizational members. Authors Adler and Jelinek assume that it is especially true in situations where the organizational culture meets the deep needs that are not met in the matrix dominant national culture. This perspective makes it possible to explore the benefits of positive interactions between different national cultures within a single organizational environment. This synergy suggests some alternative approaches. Dual model of free will-determinism allows management to review the national culture in which the organization is rooted and its impact on the organization. By carefully analyzing the dimension of managers can more effectively

encourage the creation of an organizational culture that is aligned with the key assumptions of the wider national culture (5).

As for the direct relationship between national and organizational cultures, the most points to the connection dimensions of national culture Hofstede-and-Handy types of organizational culture. Each of the dimensions of national culture promotes (or hinders) the occurrence of a certain type of organizational culture. Naturally, expressed power distance culture favors the development of power in organizations, and as mentioned cultural dimensions and the specified type of organizational culture means accepting the fact that the power of the company, organization unevenly distributed. The fact is that power is concentrated in the hands of the leader or ruling group as legitimate and they are expected to comply with this fact and act-decisions and the factors influencing the operation of the company or organization. Of course the opposite is also true-it is unlikely that in cultures with low power distance organizational culture can develop or that, even if it is influenced by the personalities of the founders, to survive in the long term.

Table 1. National and organizational culture

Power of distance	**Uncertainty avoidance**	
	Highly	*Low*
Highly	Role of culture	Culture Power
Low	Culture Support	Culture Task

5. CHARACTERISTICS OF CULTURE ORGANIZATION HOLCIM SERBIA LTD

Holcim was founded in Switzerland in 1912. It is one of the world leaders in the production of cement and related aggregates. The company operates on all continents, and has a factory in Serbia. Holcim cement plant is located in central Serbia, in the village of Popovac near Paracin, located 160 km south of Belgrade. Holcim operates under the vision of "lay the foundation for future generations," while the mission itself is expressed in the words: "We want to be respected and attractive company in the cement industry, constantly creating optimal value for all stakeholders."

The synergy of organizational and national culture is a high-quality management, which is composed of both managers with international experience, and the managers who have experience in the home country. Holcim combines proven international staff primarily in the top management, with local middle-level managers. In this way Holcim achieves harmonization of domestic and global management, or a combination of the organizational culture of the company on a global level, and national culture in the local market. The Board of Directors of Holcim consists of a General Director and Technical Director (who Holcim and staff who have extensive international experience and Holcim are more than 10 years) and the director of finance, human resources and commercial directors (who are domestic managers, experienced in the local market). The organizational culture of the company has a tradition of hundreds of years. Thus,in terms of the cultural approach these companies have a long tradition and has evolved in line with the trends in the business. In particular, we point

out that the orientation of the company as a company that has an important role in sustainable development. Activities ofHolcimSerbia, can be divided into:

- Social Responsibility;
- Labour of health and safety policy;
- Environmental Policy;
- Micro-loans for small businesses and entrepreneurs;
- Partnership for the Future;
- Holcim Foundation.

One of the major competitive advantages of Holcim is a combination of knowledge, creativity and innovation of their employees. Strong social responsibility is reflected in caring for the welfare and safety of their staff and people from the wider community. All contribute to the operations of the company. In collaboration with employees, their families, local communities and society as a whole, Holcim is committed to sustainable economic development in order to improve the quality of life. Commitment to sustainable development and socially responsible behavior is reflected in the policy of social responsibility of Holcim Serbia. The company is committed to working with all their strategic partners in building and maintaining relationships of mutual trust and respect. Holcim aim is to improve the quality of life of their employees, their families and communities nearby Holcim plant. Social responsibility is one of the most important elements of the business of the company and serves as a guide in making good business decisions and take appropriate actions. Holcim Serbia incorporate the principles of sustainable development into their business activities and taking into account the social aspects related to environmental as well as commercial aspects, and takes the interests of the environment into account in all its activities and decisions.

Holcim, one of the first major multi-national company that has spread its business in Serbia, brought with it an organizational culture that regards social responsibility. That could explain a company's desire to strike a society that allows it to operate successfully. In this way, the company that stimulated their actions helps the company in business. Vision sponsorships and donations is essential for inclusion in the local community, with a dialogue with key audiences and assessing their needs, and that makes it one of the six basic pillars of CSR Holcim. Holcim Serbia is sponzoring organization and a registered institution in Serbia, whose projects directly and positively impact local communities and use sustainable community development, and does not sponsor people as individuals, not sponsored by any organization or institution that supports any type of discriminatory purpose or operates in areas where it could be or where there could be potential discrimination. These include ethnicity, gender, race, marital, political, professional or religious discrimination.

Employees are treated with great respect. They provide a lot of their employees, and in return they expect professionalism and dedication to work and the company. Holcim aims to motivate employees in long-term. They think if they are happy and motivated employees, it will be easier to achieve higher returns. That's why I strive. Holcim offers an attractive and challenging jobs with growing potential. Openness, respect and understanding of different cultures have always been a feature of Holcim. Organizational culture Holcim has built the company's positive attitude toward people, and that includes the relationship of employer and relationship with the local community in general. Relating to employees and their families in

the company Holcim also can be viewed through three types of events: "core curriculum," "Family Day" and "informal working days." Core Curriculum is an internal seminar for staff training and management, along with case studies that deal with our employees through teams that are divided, and in the end, the best teams win awards in the form of internal certificates. Holcim Serbia annually invests an average of 400,000 euros for a variety of training and education of its employees. As a part of these seminars sports competitions are organized among employees. Thus strengthening the ties among employees and creating a team atmosphere. Family Day is organized annually and it is an event that brings together employees and their families during a weekend. That's when the doors of the company open to families of employees from all three sectors of cement, concrete and aggregates, this weekend could be felt indirectly, part of the company. Nearly a thousand people enjoyed the variety of table and rich musical program, and organized special activities for children. Informal working days are the days when business activities are carried out in a more relaxed manner, such as, for example, BBQ Facilities commercial buildings in the yard instead of the classic lunch (catering) for employees. Relations with customers Holcim products areof high quality. The Holcim Serbia organizes for its customers a weekend trip once a year, in which create closer relationships and establish long-term positive relationship. In the same way, Holcim Serbia maintains contacts with journalists who organize study tours. As examples of relationships with the wider community we can extract organized visits of students in factories, donations Holcim given along with their customers, participation in fairs, organizing concerts and other cultural and artistic creations in the local environment (6).

6. CONCLUSION

When you relate those national and organizational culture, surely first of all we need to know that national culture is an important factor in the creation of organizational culture that is realized by the assumptions, beliefs, values and norms of employees (as a member of the national culture). All of these aforementioned elements of culture, embedded in the subconscious process of socialization from an early age and a basic framework in which to develop specific organizational culture. Broader cultural orientation changing (or reinforce) under the influence of the other two sources of organizational culture-characteristic industries and specific history of the company, which allows the same national culture, there are companies with very different organizational cultures. Accordingly, it should not overstate the importance of national culture in creating organizational culture.

Each of the dimensions of national culture promotes (or hinders) the occurrence of a certain type of organizational culture. So, for example, expressed by power distance culture favors the development of power in organizations, strong uncertainty avoidance as a cultural dimension favors the development of the role of culture in organizations, the cultural value of individualism corresponding development of the organizational culture of the task, and the predominance of women in the national culture values corresponding to the development of organizational culture support. Of course, these connections dimension of national cultures and types of organizational culture is necessary to accept with some caution, and note have to be constantly called. holistic approach to understanding the national culture as a system of assumptions, beliefs and values that are often little more than a set of individual cultural dimensions.

Companies such as Holcim Serbia perhaps is the best example of fitting the organizational culture with national culture of the country in which they operate. Management of Holcim's good management, which has led to a multinational company operating successfully in the domestic environment. Management of Holcim Serbia synergy is just organizational and national culture. The employees of this company bring with them their customs and principles, but they fit into the organizational culture and rules that apply for the company in other business units, and therefore the combination of organizational and national culture established synergies, which should properly be utilized.

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INNOVATIVE ORGANIZATION UNDER THE INFLUENCE OF LEADERSHIP

INOVATIVNA ORGANIZACIJA POD UTICAJEM LIDERSTVA

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Abstract: *Today in modern and innovative conditions of business dealings, the innovative-intelligent organisation is a must; this is the organisation which initiates changes and takes chances, the organisation which accepts the changes which it itself creates, which anticipates strategies and changes the business environment. This organisation is the one which creates business opportunities and accepts them as existing novelties which are always necessary as something given. In other words, the intelligent organisation will have to answer the new changes in its surrounding and thus, through its own development, reach the status of an innovative-intelligent organisation which possesses its own know-how, that is, leadership skills in different markets and rich experience from doing business in different countries. Or to put it more precisely, these are multinational networks dealing with distribution and sales outlets located in relevant countries and which have an access to scarce resources, have a strong brand, a well-known trademark and innovative technologies. The innovative-intelligent organisation is the one which has a relevant distinctive competitive advantage that is verified as an international position in the global, open and modern economy. The development of the innovative-intelligent organisation, or the so-called learning organisation, is an unfinished concept and therefore still problematic. The concept of the intelligent organisation is given as the answer to many problems that are occuring in both theory and practice regarding the learning organisation. Here the emphasis is on the final result – the competence of the leadership. The main presumptions on which the innovative-intelligent organisation relies are the following: there are no boundaries regarding the future, there are no boundaries regarding human imagination and freedom of creativity; there are no boundaries when people's abilities to change or improve are in question; no boundaries regarding the desire to advance, to commit ourselves to serving others; there are no other boundaries except for those we set ourselves; there are no boundaries (NOKIA's report from 1999).*
Key words: *learning organisation, initiated changes, efficiency and effectiveness, competence of the management, knowledge managment, intelligent organisation, leadership.*

Apstrakt: *U današnjim savremenim i inovativnim uslovima poslovanja, inovativna i inteligentna organizacija predstavlja neophodnost; to je kompanija koja inicira promene i rizikuje, kompanija koja prihvata promene koje sama stvara, koja predviđa strategije i menja poslovno okruženje. Ovakva kompanija je ona koja stvara poslovne mogućnosti i prihvata ih kao postojeće novine koje su uvek neophodne. Drugim rečima, inteligentna organizacija će morati da odgovori novim promenama iz svog okruženja i na taj način, kroz sopstveni razvoj, dostigne status inovativne i inteligentne organizacije koja poseduje sopstveni know-how, odnosno, liderske sposobnosti na različitim tržištima i bogato iskustvo stečeno poslovanjem u različitim zemljama. Ili preciznije, ovo su multinacionalne mreže koje se bave distribucijom i prodajnim objektima u relevantnim zemljama i koje imaju pristup oskudnim resursima, imaju jak brend, poznati zaštitni znak i inovativne tehnologije. Inovativna i inteligentna organizacija je ona koja koja ima relativno prepoznatljivu konkurentsku prednost koja je potvrđena kao međunarodna pozicija u globalnoj, otvorenoj i savremenoj ekonomiji. Razvoj inovativne i inteligentne organizacije, ili takozvane organizacije koja uči, je nezavršeni koncept i stoga još uvek problematičan. Pojam inteligentne organizacije je dat kao odgovor na mnoge probleme koji proizilaze iz teorije i prakse organizacije koja uči. Ovde je naglasak na finalnom rezultatu – kompetentnosti menadžmenta. Glavne pretpostavke na kojima počiva inovativna i inteligentna organizacija su sledeće: ne postoje granice budućnosti, ne postoje granice ljudske mašte i kreativne slobode; ne postoje granice kada su u pitanju sposobnosti ljudi da se menjaju i napreduju; ne postoje granice u želji da se napreduje, da se posvetimo služenju drugima; nema drugih granica osim onih koje sami postavimo; ne postoje granice (izveštaj Nokije iz 1999.god.).*
Ključne reči: *organizacija koja uči, inicirane promene, efikasnost i efektivnost, kompetentnost menadžmenta, menadžment znanja, inteligentna organizacija, liderstvo.*

1. THE INNOVATIVE – INTELLIGENT ORGANISATION AS COLLECTIVE COMPETENCE

Intelligent organisations have to build their future on efficiency and effectiveness, that is, on top performances of all units as that requires greater collective intelligence based on knowledge, competence and understanding. The innovative organisation which learns faster than its competitors can be called or desribed as a modern competent organisation. Peter Drucker has compared an intelligent organisation to a jazz orchestra – meaning that music is being created during its playing with no scores given in advance. In a similar way, the intelligent organisation improvises and changes all the time.There are different ways to come to the common solution, but the means of reaching the goal is something that can be changed incessantly.

The structure of the intelligent organisation is based on the concept of continual improvements, while quality management is incorporated into all the processes and methods of work, t.i. the modern virtual team and the process organisation. The intelligent organisation will invest a lot in performance management which is rooted in other processes at different levels of the organisation. Competence management and knowledge management are important parts of performance management. Performance management guarantees that goals are reached, competence is being developed systematically and knowledge is available to all the people within an organisation. The management of the innovative-intelligent organisation is considered a service function and its task is to ensure the successful work of the organisation. The most important feature of the intelligent organisation is its readiness to change and regenerate, even when there are no direct conditions to ensure this. Every employee is ready for a new approach and does not tend to do only the things he / she has done so far.

The following types of management have to exist in the intelligent organisation:

1) visionary management - gives point to our activities and answers the question – why;

2) strategic management – gives direction to our activities and answers the question – what; strategic management initiates alternative strategic plans of high quality, contributes to the creation of strategic alternatives and helps choosing the optimal strategy, t.i. it helps to think strategically, to make decision and take steps strategically, which ultimately leads to the creation of a distinctive and relevant competitive advantage. The strategic way of thinking ought to be developed in the organisational structure. What also needs to be developed in the learning- intelligent organisation are the new rules which affirm innovativeness, openness, flexibility, efficiency and effectiveness. A changed organisational structure and an information-communication infrastructure are required if strategic management is to function well. Strategic management is based on the proper functioning of the intellectual capital because companies (organisations) operate in a new knowledge economy in which the new rules have to be obeyed: the innovative-intelligent learning organisation (company) is changing all the time; competitors are beaten by innovations; the organisation is as satisfactory as it is efficient and effective; the quality of its organisation depends on how much it is organised and on the efficiency of applied technologies and on its openness to new

technologies, t.i. new knowledge, new ideas and information. The quality of the learning organisation is possible to increase only if top management becomes more organised and if it is of high quality; production is just one segment which creates value. In other words, regardless of business results and the market share, it is necessary to produce new programs permanently and to encourage a business way of thinking. The biggest problem is how to sell; a somewhat smaller problem is how to produce quickly, qualitatively and with as lower costs as possible. Cost-cutting is a dominant and necessary part of every organisation's business vitality, flexibility and survival on the market.

3) performance management – guides our everyday activities and answers the question – how;

4) leadership (self – leadership) – initiates the integrity of collective goals through the process of motivation, individual creativity with coordinated collective creativity, t.i. process development, or the development of innovative ideas through the process of collective creative freedom, ideas and imagination.

The emphasis here is on the individuals' activities that are coordinated with process collective activities, which is characterised by enormous creative energy.

Of all the types of management mentioned so far, we will pay the greatest attention to performance management as it is one of the most important in modern business conditions where group members are free and intelligent individuals, educated and aware of the importance of the jobs they do, and they are all well aware of the common goals and visions. A successful leader should try and integrate people and their attempts as much as possible in order to increase performance and he / she should also take care of people in the innovative 'learning' organisation. Directing the management towards the employees means an emphasised care for inter-human relationships, t.i. for the organisational climate of positivism, creativity and trust, for the employees' feeling of satisfaction at work, their loyalty and a feeling of belongingness within a company. A modern leader helps the group's greater cohesion, which further contributes to the freedom of creativity and reaching all boundaries and ideas, information and future business relationships of high quality; in other words, this contributes to the definiton of relevant differentiated competitive strategic advantages at the time of recession and stagnation, t.i. global economic crisis. The necessary precondition for a successful evolution of any company is a good top management. The good management is created under the influence of leadership as a managerial skill. A leader guides and leads his employees so that they follow him in the implementation of the defined, collective goal. Being a leader means knowing how to lead, how to coordinate and direct; it means having the authority and knowledge as to how to apply diferent styles of leadership. A good leader is someone who is able to adapt his style of management to an innovative-intelligent 'learning' organisation.

CHANGES IN THE ORGANISATION ~ CHANGES IN ORGANISATIONAL LEARNING ~ CHANGES IN THE ENVIRONMENT ~ PROGRESSIVE AND LEADERSHIP CHANGES AT THE CORE OF DISTINCTIVE RELEVANT COMPETITIVENESS IN THE ORGANISATION

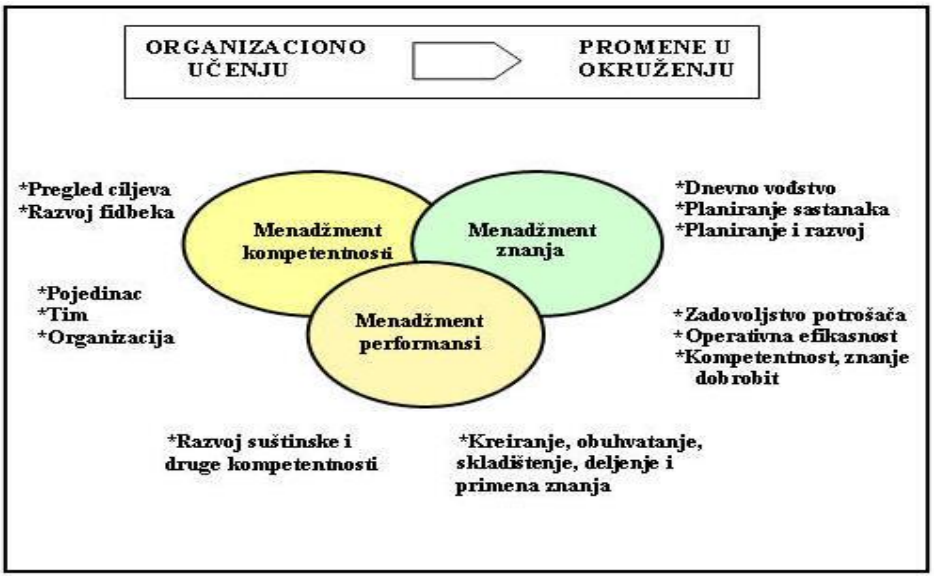

Figure 1. (Authors) The knowledge path in a modern organisation

ORGANIZACIONO UCENJE – organisational learnig

PROMENE U OKRUZENJU- environmental changes

PREGLED CILJEVA – review of goals

RAZVOJ FIDBEKA – feedback development

POJEDINAC - individual

TIM - team

ORGANIZACIJA - organisation

RAZVOJ SUSTINSKE I DRUGE KOMPETENTNOSTI – development of crucial and other types of competence

KREIRANJE, OBUHVATANJE, SKLADISTENJE, DELJENJE I PRIMENA ZNANJA – creating, encompassing, storing, dividing and applying knowledge

ZADOVOLJSTVO POTROSACA – consumers' satisfaction

OPERATIVNA EFIKASNOST – operative efficiency

KOMPETENTNOST, ZNANJE, DOBROBIT – competence, knowledge, benefits

DNEVNO VODJSTVO – daily leadership

PLANIRANJE SASTANAKA –planning the meetings

PLANIRANJE I RAZVOJ – planning and development

MENADZMENT KOMPETENTNOSTI – competence management

MENADZMENT ZNANJA – knowledge management

MENADZMENT PERFORMANSI – performance management

Shows the most important factors of the new performance management system, t.i. the development of essential leadership competence through the development of leadership feedback through process-horizontal innovative organisation (knowledge ~ competence ~ innovated knowledge ~ effective and efficient performances of innovative learning organisation in modern times).

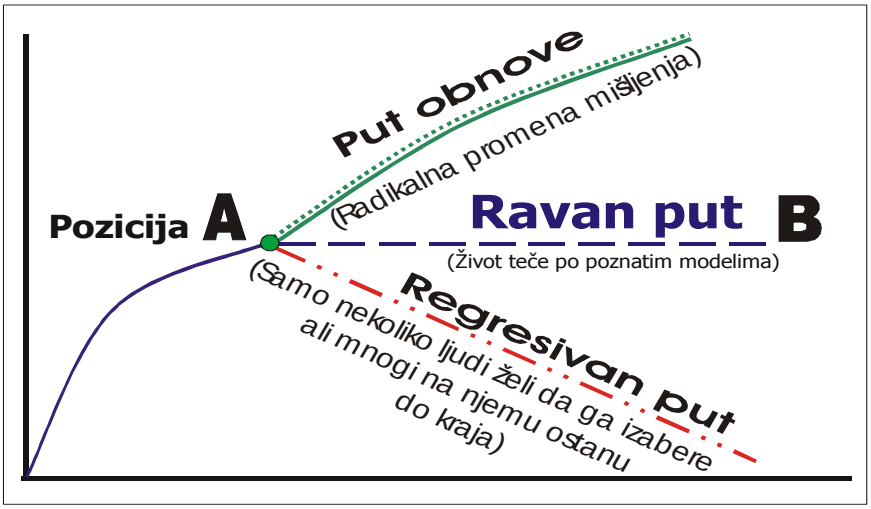

Figure 1. (Authors)

POZICIJA - position

PUT OBNOVE – path of renewal

RADIKALNA PROMENA MISLJENJA – radical shift in thinking

RAVAN PUT – flat path

ZIVOT TECE PO POZNATIM MODELIMA – life is lead accoding to the known models

REGRESIVAN PUT – regressive path

SAMO NEKOLIKO LJUDI ... - only a few people want to choose this one, but many remain here forever

2. COLLECTIVE COMPETENCE THROUGH THE PROCESS OF LEARNING

In a number of concepts regarding organisational learning, this process is said to comprise acquiring, spreading and using knowledge in the organisation (Nevis, DiBella, Gould, 1995). According to one of these concepts, the process of organisational learning consists of five main phases (Pawlowsky, Forslin, Reinhardt, 2003) and these are the following:

1. Identifying the existing knowledge is the first phase in organisational learning. In it, the knowledge which is important for the organisation is being recognised and identified. Estimating how relevant certian knowledge is for a particular organisation, actually means improving the key, relevant, dominant competences of the innovative-intelligent, open and dynamic organisation. Identification refers to internal (the knowledge which exists inside the organisation) and external knowledge (the one which exists outside the organisation). The former consists of formulating, systematising and formalising the knowledge by help of which that knowledge is recognised as a valid and key resourse of the company; the latter refers to gathering all sorts of knowledge that can be useful to the company and which is found outside the company such as the data concerning the relevant market.

2. The second phase of organisational learning is creating and generating new knowledge within an organisation. This phase consists of producing innovative ideas, creating innovations in processes or products which improve the competence of the company. In this process, the knowledge which was previously identified as the existing one, now serves as the basis.

3. The dominant steps of the organisational learning are realised through the process of diffusing the existing and new knowledge in the organisation. If knowledge is not removed from the place where it has been created, it becomes useless; it will also be useless if it does not move about the organisation or is not available to those who need it.

4. Integration and modification make the fourth phase. In it, organisational knowledge is memorised, kept, organised and made available to all those members in the organisation who may use it. In this process, knowledge can be modified and improved.

5. The last phase is using knowledge in order to change the behaviour of organisation's members, t.i. to make them more active. It is in this phase that the very purpose of organisational learning is actually seen because with no concrete actions or steps, t.i. change of behaviour, new knowledge would have no sense at all. The behavioural aspects of the process of organisational learning can be seen precisely in this phase. One of the most interesting and most original concepts of organisational learning which offers both the classification of organisational knowledge and the processs of its creation was written by Japanese author, Ikujiro Nonaka (2003, p. 491-518).

ORGANISATIONAL LEARNING – INTERNAL PROCESS OF INTERACTIVE SPIRAL FEEDBECK WITH ORGANISATIONAL KNOWLEDGE

3. ORGANISATIONAL CHANGES AND ORGANISATIONAL LEARNING IN INNOVATIVE ORGANISATIONS

Both organisational learning and organsational changes have a cognitive and behavioural component. Organisational changes and organisational learning mean that cognitive structures are changed as well as employees' behaviour in the innovative organisation. The changes in the cognitive structure are not clearly visible but can be seen in the changes that have taken place in individual's behaviour or in the changes of behaviour of a group of individuals; these changes in behaviour are caused by changes in the cognitive structure. On the other hand, changes in individual's or group's behaviour are clearly seen in changed decisions, changed activities or routines in the organisation. The connection between changes in cognitive

structures and the behaviour on the part of organisation's members is not always easy to detect. The changes can take place in cognitive structures and people's awareness and even without the relevant changes in the behaviour of people induced by the changes in the awareness of people. Also, some behavioural changes appear later, that is, a long time after the changes in cognitive structures have occured, although it would be quite natural for the changes in the people's awareness to lead to the changes in their behaviour. Sometimes, the opposite occurs: changes in behaviour cause changes of mental pictures and people's awareness. This process is the result of cognitive dissonance. What organisational changes require is a change of a behavioural component, not of the cognitive one.What is changed is an organisational activity, a decision, a routine or an organsitional structure. Changes of individual cognitive structures or collective awareness or collective cognitive structures of the organisation's members are not necessary. When a company changes its organisational structure due to a new law or the activities practiced by a successful competitor, the company actually changes its behaviour and individual cognitive structures of its employees.

The relevant theory of organisational changes

organisation's develoment~~~~~ continuous changes discontinuous changes ~~~~~~~~~perspective of organisatinal develoment – organisation continuous development theories;
perspective of organisational transformation ~~~-~~~~~ organisation discontinuous development theories;

organisation's adjustment;~~~~~~ – perspective of organisational adjustment – organisation continuous adjustment theories~~~ organisation discontinuous adjustment theories;

process change~~~~~ process perspective~~~~continuous process change theories~~~~ discontinuous process change theories.

Within the organisational change theory, organisational learning is directed at the criterion of changing the objective, whereby the changes can be developmental and adaptive. Organisational learning encompasses both developmental and adaptive organisational changes. The changes which are a substantial part of organisational learning are aimed at adjusting to the environmental changes and at developing and encouraging the competences of the relevant distinctive innovative organisation. And the dichotomy of organisational learning is seen in its twofold function: learning whose goal is development and learning whose goal is adjustment of the organisation. According to this classification, organisational learning can be structuralist and constructivist (Merkens, Geppert, Antal, 2003). The former refers to the type of learning that helps the innovative-intelligent organisation imitate the changes which take place in the institutional surrounding in order to ensure its own legitimacy within the system; the latter type of learning is the one which is employed by the organisation with the aim of using its own experience and improving its skills. It is obvious that structuralist learning is characteristic of adaptive changes, while constructivist learning has developmental changes as one of its characteristics. In other words, gaining knowledge as an initial step in process organisational learning can be done in two ways: generating the

knowledge in the organisation itself or acquiring knowledge from the environment. In the first case organisational learning will lead to the developmental changes, while in the other it will lead to adaptive changes. Therefore, we can conclude that the concept of organisational learning encompasses elements from both the theory of developmental changes and the theory of adaptive changes, and can be said to belong to both groups of organisational change theories. All organisational changes can be grouped as changes of structure and changes of process. Organisational learning refers to the changes related to the organisational steructure and to those related to organisational processes. Organisational learning itself is a process, and this process introduces certain changes into the organisational structure, systems and even into statistical elements of organisational behaviour.

The organisation's structure, its systems and style of leadership as well as its manner of solving conflicts and power structure are changed under the influence of knowledge, or more precisely, under the influence of the process of acquiring knowledge, its generation, duffusion and spreading within the organisation. The conclusion is that organisational learning has elements of the organisation design change theory. On the other hand, organisational learning encompasses certain process changes. This is especially evident in a branch of organisational learning which deals with learning as a way of improving organisational routines. Routines are a specific type of organisational process and their changeability is part of process perspective in the organisational change theory. Therefore, we can conclude that organisational learning has elements of two theories – the organisational design change theory and the organisational process change theory.

Organisational learning in the organisational change theories

organisation's development~~~~~~perspective of organisational development
organisation's adjustment~~~~~~~perspective of organisational adjustment
process change
&
perspective of organisational transformation
&&&
organisational learning theories
&
process change~~~process perspective

4. CONCLUSION

In the era of knowledge and knowledge economy, a competitive advantage of innovative-intelligent organisations is based on knowledge and the use of potential opportunities and chances which are also to be taken on the basis of knowledge. In other words, innovative knowledge is to be developed in continuity. Human knowledge is a dynamic category which is acquired and improved, and managing knowledge is a complex and time-consuming process and this is the reason why the permanent learning concept is becoming one of the dominant business objectives.

If intelligent organisations want to preserve their competitive distinctive advantages, t.i. their target advantages, it is necessary for them to develop knowledge, creativity, innovativeness

with all employees and to do that incessantly. If gaining and improving a competitive advantage is seen as a presumption of development, then this makes it easier for modern organisations to use knowledge more efficiently and effectively, and this can be seen in innovations that require less and less time to be practically used. Therefore, the successful companies today are those which have realised that learning and new knowledge are a key to success, while education is crucial for their future wealth.

The modern business environment is determined by scientific and technological achievements and continuous changes in the environment whose nature is technical, economic, social and political. Scientific and technological achievements and developments have led to a significant change in how organisations behave and act, emphasising the importance of intellectual capital as a precondition of successful doing business today.

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THE ROLE OF INTELLECTUAL CAPITAL IN SERBIA

ULOGA INTELEKTUALNE SVOJINE U SRBIJI

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Abstract**:** *Despite the fact that we, as a country, are still in transition, a significant number of companies recognize the business imperatives and potential that can lead to the creation of modern and competitive organizations. The importance of intellectual capital and the value of know-how to create profit and increase market share have been recognized. The authors of this paper will attempt to identify the causes why the management, that heads the Serbian companies, does not invest enough effort to focus its business strategy towards creating the businesses subjects oriented towards the creation and use of their own knowledge base, as well as towards the roots of problems of management and use of intellectual capital.*
Key words**:** *Bussines, know-how, strategy, intellectual capital, knowledge base*

Apstrakt: *Bez obzira na činjenicu da se kao zemlja nalazimo i dalje u procesu tranzicije, značajan broj privrednih subjekata prepoznaje imperative poslovanja koji dovode do stvaranja modernih i konkurentnih organizacija. Prepoznat je značaj intelektualnog kapitala i vrednosti know how-a za stvaranje profita i povećanje udela na tržištu. Autori ovog rada će pokušati da utvrde uzroke zašto menadžment, koji rukovodi srpskim firmama, ulaže nedovoljno napora da svoju poslovnu strategiju usmeri prema stvaranju poslovnih subjekata koji su orijentisani prema formiranju i korišćenju sopstvene baze znanja, odnosno gde su koreni problema na relaciji menadžment i primena intelektualnog kapitala.*
Ključne reči*: Poslovanje, know-how, strategija, intelektualni kapital, baza znanja*

1. INTRODUCTION

Intellectual Property is defined as any technical innovation, invention, discovery, or Know how. Modern economy is being more oriented towards knowledge and the corresponding technological support, while the management theory introduces new orientations and new concepts with the aim to pinpoint the organizational transformation maximally oriented to the information technology (1).

In recent years, intellectual capital in the literature, occupies a notable place as a basic resource that companies should provide a competitive advantage. Knowledge is more valuable and more powerful than natural resources, huge factories and numerous bank accounts, although the intangible intellectual capital. It is a knowledge workforce: skills, intuition and skills of the team, or know-how team of employees who devised ways to improve the efficiency of their factories. Intellectual capital is intellectual material (knowledge, information, intellectual property, experience) that can be used to create new value and lasting wealth.

Peter Robertson, the executive vice president of the Chevron USA Production Co., who recently described the benefits of knowledge management: "The fact is (knowledge management and best practice sharing) is good for business. The faster and more effectively we can share ideas, the better we can make our product, the better we can serve our

customers, the better we can build a committed team of employees, and — bottom line — the better we can earn profits for our shareholders." (2).

Successful management is reflected in the ability for creating knowledge management systems to harness intellectual capital and create value. A common problem for those undertaking a knowledge management project is placing technology ahead of the ability or the desire of people to use it. "If you're spending more than one-third of your time on technologies for knowledge management, you're neglecting the content, organizational culture and motivational approaches that will make a knowledge management system actually useful" (3).

The organization must know first how to get an answer if knowledge currently exists and what kind of knowledge is missing. Knowledge management systems must be structured to capture tacit knowledge. "Tacit knowledge cannot be bought on the market in the form adequate for direct usage." (4). Tacit knowledge cannot be easily channeled because it requires deliberate cooperation of the individual in possession of such knowledge. This kind of knowledge is t often the key to the effective solution of many business problems. The value of capturing tacit knowledge should not be underestimated. Davenport and Prusak have stated that "having access to knowledge only when its 'owner' has time to share it or losing it entirely if she leaves the company are significant problems that threaten the value of the organization's knowledge capital." (5).

If the Serbian government fails to create a more better environment for the development of this sector, then it will be very difficult to enjoy the benefits of the foregoing opportunities. The long economical slump allows no easy approach to the international market. Acting competitively on the market, means funding and investing in technology and know-how, which is quite hard at the moment due to the difficult access to credit lines. At the same time everyone in this sector agrees that at the moment there is a clear need for development strategies and for this reason a large part of Serbian production units is still seeking a solution on their own (6).

2. INTELLECTUAL CAPITAL

Knowledge management is a strategic use of collective knowledge of the company and know-how to create profits and increase market share. Knowledge assets created computerized collection, storage, distribution and direction of corporate knowledge. Advanced technologies enable research to create corporate awareness of new products based on knowledge. Knowledge management covers three main knowledge activities: generation, codification and transfer. Generating knowledge includes all activities that convey new knowledge to individuals, group or organization, such as the creation, acquisition, synthesis, fusion and adaptation. Codification of knowledge is that kind of knowledge representation that allows individuals and organizations to use it again. Knowledge transfer involves transfer of knowledge from one place to another and its absorption. Knowledge is power that enables organizations to improve the productivity of all activities and provide their value to the group and individuals (7).

The result of an inventor's rights may also be determined by knowledge and experience that are applied in the industrial and handicraft production and economic life in general. The set of knowledge and experience is called Know-how. The holder of the rights enjoyed de facto monopoly in the market, which is the basis of the confidentiality of the contents. Know how is a category of intellectual property that does not require a materialization of that knowledge. Parallel with the process of globalization, set up the new field of economics, which in Western literature referred to as knowledge-based economy or knowledge economy and information-based economy or information economy. Economics of knowledge can be seen as part of a system that is associated with the processes of creation, dissemination and use of knowledge, as a characteristic of a particular state of the economy, where knowledge is emerging as a key determinant of development of its growth and development, or as a knowledge-based economy. Knowledge, information, skills, innovation and revolutionary new ideas pushing the boundaries of social and economic growth and development, wealth and become a key production resource (8).

Managers are increasingly challenged by an abundance of uncertainties and demands in their operating environments that have transformed the fundamental nature of competition Many manufacturers recognize the importance of being able to quickly respond to these changes in competition, technology, regulation, etc. at the organizational level through enhanced process flexibility (PF) and product innovation (PI) capabilities (9). To build capabilities such as these, some suggest that managers must manage more efficiently and effectively the knowledge based resources of the firm (10).

3. FACING THE CHALLENGE

What is Serbian reality? Round 78% of the population completes elementary schooling while 11% achieves higher education. The current Company Law was enacted and came into force in November 2004. This Law regulates the setting up and operation of businesses in a much more market orientated manner that the previous Law on Enterprises did.

The main characteristics of the market of Serbia in 2010. year, according to the Institute for Market research is the unpredictability of inflation trends, the uncertainty developments related to foreign currency exchange rate, business insolvency, lack of foreign investment. Uncertain business environment is accented by a lack of clear strategy economic development, and ineffective regulatory bodies.

In December 2010. the total external debt of the Republic of Serbia amounted to 23,786.4 billion euros. Compared to December 2009. year, the amount of external debt increased by 5.78%. World economic crisis led to a decline in economic activity and to an outflow of capital, so that the state increased their borrowing, and thus the external debt. The main problems in the employment field, facing the Republic of Serbia are: lack of jobs as a result of insufficient economic activity, low employment.

The number of employees fell by 8.03% or 207,881 persons in October 2010. compared to the same period 2009. year. The employment rate decreased from 40.8% in October 2009. to 37.7% in October 2010.

The total registered unemployment at the end of 2010. year, professional unemployed (III-VIII level of education) accounted for 66.52%, and unskilled (I and II level of education) with 33.48%

Discrepancies between supply and demand of labor is reflected in the fact that a number of reported staffing needs remain unfilled because there are no persons with the appropriate knowledge and skills, while on the other hand there are many people with occupations that do not there is a need in the labor market (11).

A significant proportion of the population works in the grey economy, so Serbia has a problem with macroeconomic stability. Privatization gives to society numerous owners who do not recognize their roles, rights and responsibilities. Most of them simply wait for the paying out of dividends, which are often worthless in their value. Also, managers do not understand their roles of agents when they are compared to owners, but they run companies as if they were their property, satisfying own interest to the detriment of owners and the company as a whole (12).

As world is in the process of transition from industrial era into an information and communication era, successful society is defined as a learning society. This new society demands employment and personal development of every individual. New demands are: to be more efficiency, higher quality and much more innovation in both services and production. Workers have to be with large scale of skills, capability for individual work, to be more adaptive in the production processes. Main demands are: Intellectual abilities; Social and interpersonal skills and knowledge (communication, teamwork, decision making, taking responsibility); Business and entrepreneurial skills and knowledge (entrepreneurial capacities, creativity, ability for innovations, self-employability); Multiply technical skills and knowledge. These requirements can be fulfilled only if the people achieved social inclusion, active citizenship and employment. Key competences represent transferable, multifunctional package of knowledge and abilities necessary for the individual to achieve personal development, professional mobility and employment. An individual acquire key competences at the end of vocational education and training and they represent the basis for individual's lifelong learning (13).

We are now living in a time of global business activity and the knowledge economy. Intellectual property rights have been identified in our country but protection of these rights is not consistently applied. But, this is not only problem which we are faced. Serbia is faced with many other unresolved issues which affects the companies and we can't expect that their main goals would be knowledge. Dealing with the crisis at every level of society causes businesses to focus on the fight for survival rather than long-term strategic plans and investment in knowledge.

4. CONCLUSION

Knowledge-based resources include both tacit and organizational Know-how stored in personnel, organizational manufacturing processes, and relationships. Accumulation, delivery and management of knowledge (and innovation based on them) has long become an

imperative for economic growth and development. The interest in knowledge management is increasing, as has long been clear that his influence is crucial for creating competitive advantage, economic growth and development.

First of all companies have to Creating Successful Knowledge Strategies to generating greater value through the knowledge in products, people and processes.The knowledge dimension have to be used as a strategic lever, either to add value to products and services or to improve organizational performance. Most important is to establish base of knowledge of their needs, their relationship, and opportunities. People will determine organizational success. Knowledge must be systematic processes (14).

Knowledge is understanding of customers' needs and the business environment or the skills and experience of staff. Employment policies play a central role in this and it means that they need a knowledge bank containing useful information and instructions on how to carry out key tasks. Technology alone isn't the answer to sharing knowledge – it have to be done only with people. Every company is unique – with its own story of achievement, company culture, reputation, products and people, but all of them must develope close relationships with both colleagues at work and the client base of the business. Open systems ensure that employees can obtain the information they need from any location at any time. Economic situation in Serbia, unfortunately does not show a trend towards the development of companies that can lead to more adequate employment.

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MANAGEMENT ROLE IN THE MANAGEMENT OF HEALTH AND SAFETY AT WORK AND THE RISK

ULOGA MENADŽMENTA U UPRAVLJANJU BEZBEDNOSTI I ZDRAVLJU NA RADU I SMANJENJU RIZIKA

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Apstract: *The modern style of governance and management in companies, institutions and other entities-organizations in addition to all the functions performed by managers is posed as an important task of risk management and safety and health at work. The paper discusses the role of management in the management of health and safety at work, as a modern risk management.In order to achieve this, the following topics were discussed: terminology of risk management, the main elements of the management of health and safety at work, safety policy and health and safety, legislation on safety and health at work, documentation management of safety and health at work the role of leadership in management-system approach to risk management and monitoring of security systems.*
The aim of the work is to educate students about the role of managers to manage risk health and safety at work.
Key words**:** *management, risk, safety and health management system*

Izvod: *U savremenom načinu upravljanja i rukovođenja preduzećem ustanovom i drugim subjektima-organizacijama pored svih funkcija koje obavljaju menadžeri postavlja se kao važan zadatak upravljanje rizicima, odnosno bezbednošću i zdravlju na radu. U radu se razmatra uloga menadžmenta u upravljanju bezbednosti i zdravlju na radu, kao savremeno upravljanje rizicima. Da bi se to postiglo razmatrane su sledeće teme: terminologija u upravljanju rizikom, osnovni elementi sistema upravljanja bezbednosti i zdravlja na radu, politika bezbednosti i zdravlja na radu, zakonska regulativa o bezbednosti i zdravlju na radu, upravljanje dokumentacijom iz oblasti bezbednosti i zdravlja na radu, uloga menadžmenta-rukovodstava u sistemskom pristup u upravljanju rizikom i praćenju sistema bezbednosti.*
Cilj rada je obrazovanje studenata o ulozi menadžera u upravljanju rizicima odnosno, bezbednosti i zdravlju na radu.
Ključne reči: *menadžment , rizik, bezbednost i zdravlje, sistem upravljanja*

1. INTRODUCTION

By definition, management means managing and leading a certain job, a certain balance, a certain organization, process and collective (team). Management can be differentiated by different conceptual bases. If treated as a scientific field, or as directing business activity, management may choose a more management disciplines from which we emphasize the most importantb[1]. The modern style of management and leadership-affiliated companies, institutions and other entities-organizations (hereinafter organizations) to managers at all levels in addition to a large number of highly commercial activities, there is a compulsory task:

Risk Management in the context of the management of health and safety at work. Management of health and safety at work is regulated by the Law on Safety and Health at Work "Figure Gazette "no. 101 / 05th [2].

Though in every country there are systemic laws and regulations governing the obligations of the organization in terms of health and safety, it is very important international standards, OCHSS ("Occupational Health and Safety Assessment Systems"). Standard is a practical, flexible and applicable to all areas of the business and related primarily to safety and health at work. The main objective of the standard is to eliminate or at least reduce them to an acceptable level of risk to the safety and health of employees who are exposed to and is primarily intended to: minimize the risk to the safety and health of employees and others; to improve the profitability of the organization; help organization to present to the market to take care of the health and safety of its employees and other stakeholders starna which improves its image. So there is a strong connection between the Act and OHS standards OCHSS. every element management system safety and health, depends primarily on the size of the organization, the nature of its activities, the risks incurred and the conditions in which it operates [1].

2. ROLE OF MANAGERS BY OBJECTIVES RISKS

Management is linked to the achievement of the objectives of the system and it should be a continuous process. New approaches to the management of the organization talk about strategic management. It is a continuous process of constant adaptation of the environment variable on both sides of interaction.

According to the cybernetic uprauvljanje business systems have the following characteristics:

1. management is a complex social process which carries the characteristics of social system in which it exists,
2. management is the process of immanent system-every business organization, business management system,
3. organization is a dynamic and complex process.

Consideration of management activities and processes of an organization is based into three general sub-processes:

- planning, implementation, control, and at the same time each sub-process is also three phases: planning, implementation, control.

Planning implementation and control activities of the organization is based on a strategy of development. Development strategy of the organization is straight-way movement of the future in order to achieve the set ciljeva.Strategijom development organization determines the answer to the question-how to reach the desired development goals. Objectives are extreme limits that the company wants to achieve a strategy means to achieve these developments.
When set goals and develop strategies throughout the organization leads to hierarchical structures. Elements of the strategy at a higher management level as goals at a lower management level.Modern theories of observe-enterprise organization as a set of strategic business units that offer different development opportunities. One strategy may be the knowledge management and quality, and in this context the management of people. Human resource management in modern organizations has become a strategic function. Regarding quality of life is very important is the quality of working life, which includes health and safety

at work, respect, equal opportunities for development and advancement of critical thinking and freedom of creativity and so on.

The quality of life of an employee raises his training and education which is also reflected on the obligations imposed by the Act and OHS standards OCHSS. Training is the acquisition of practical knowledge and skills needed for work, leadership, management and organizational behavior according to the adopted rules, regulations and standards.
Evidence of training and education are provided in the delegation of tasks, scheduling the job, increase or retention of earnings etc. According to the aforesaid imposed as an important obligation of implementing management measures organized education and training of employees on the need for risk management and safety and health at work.

3. GENERAL TERMS OF RISK MENAGEMENT

1. **Accident** - an undesired event that results in death, ill health, injury, damage, or otherlosses.
2. **Hazard identification** - The process of recognition of danger, and defining its characteristics.
3. **Incident** - an event that is the cause of the accident, or that could lead to an accident. The incident in which there was no damage to health, injury, damage or other loss is also considered an event "just what did not happen." The term "incident" includes "is about to happen."
4. **Stakeholders**- individuals or groups on the formation prihvatlljivog risk.
5. **Non-compliance**- any deviation from work standards, practices, procedures, regulations, performance management systems, and so on. which may directly or indirectly lead to injury or illness, property damage, disruption of the working environment or a combination of the above.
6. **Goals-**tasks related to the performance by the organization wants to achieve.
7. **Occupational Safety and Health labor** - conditions and factors affecting the health of the employees, staff under contract, visitors and other persons at the workplace.
8. **Organization**- a company, agency, company, enterprise, institution, or association, or part thereof, whether incorporated or not, public or private, that has its own functions and administration. If your organization has multiple business units, one unit of work can be defined as an organization.
9. **Performance**- measurable results management system in relation to the management of safety and health risks in the organization, based on its policies and objectives.
10. **Risk**- the combination of the probability and consequences of a hazardous event taking place.
11. **Fried risk** - sveobihvatan level risk assessment process and determine whether the risk can be accepted or not.
12. **Security**–Avoiding unacceptable risk.
13. **Acceptable risk**–the risk is reduced to the extent that it may be presented to the organization with regard to its legal obligations and its policies.

4. BASIC ELEMENTS OF SAFETY MANAGEMENT AND OCCUPATIONAL HEALTH

As the basic elements of risk management are carried over:
1. Policy health and safety at work,
2. Legislation and
3. Objectives of risk management.

4.1. Policy of health and safety at work

From the organization or management is required to review the implementation of initial examination of the situation regarding the management of safety and health of employees. The aim of the initial examination is to provide the information necessary to make informed decisions about the scope of the current system of safety and health, its adequacy, as well as to provide background information and to define the politics of health and safety at work.
Initial review should compare the current situation with: the requirements of existing laws and regulations– relating to safety and health at work, existing instructions and guidelines relating to safety and health, situation in organizations with well-developed systems of safety management and occupational health and standard– requirements.

Management as the top management of the organization is responsible for defining, documenting and implementing the policy of safety and health at work. Privacy of health and safety, must contains the strategic choices of organizations ¬ tion in this field. Policy Health and Safety at Work, adopted by the top management (management) and that clearly express the objectives related to safety and health at work and obligation to improve health and safety outcomes, must exist in every organization.

According to the security and health and safety responsibility for the tasks required by the employer, but in practice it is delegated to management.

4.2. Requirements of existing laws and regulations relating to safety and health at work

The system of health and safety at work in the Republic of Serbia is based on Council Directive EEC 89/391/EES, on the introduction of measures to encourage improvements in the safety and health at work. The directive defines responsibilities ¬ ¬ salesperson agreed to develop and promote a culture of prevention. According to the Directive, the Law on Safety and Health at Work ("RS Official Gazette", No. 101/05). The law promotes the principle of prevention of occupational hazards in the workplace and regulates the obligation of the employer to make a comprehensive risk assessment report, in writing, with the aim of reducing injuries, occupational diseases and work-related.

Employer's obligations are given in Chapter III of the Act. These obligations will continue to be displayed and interpreted as an obligation of management in the management of health and

safety at work. In fact, the management (at all levels) is required to give effect to the same in the name of the employer, although the law clearly does not relieve the employer of responsibility of these obligations.

Regulations on the procedure for the assessment of risks in the workplace and work environment.
This regulation is the most important by-law and it is the obligation of both the right and the management and employees. Regulation is based on a system of prevention and law promoted him in detail the manner and procedure for evaluating the risk of occupational injury or illness of an employee in the workplace and work environment, as well as the methods and measures for their elimination. detection and identification of hazards and hazards in the workplace and work environment, according to the Regulations, the fourth element of comprehensive risk assessment report must include, as a second step (five) risk assessment procedure. Hazard identification is considered to be the most important step, because the risks and hazards not identified will not be assessed and control. It is therefore extremely important to identify risks and hazards conduct comprehensive.

After a detailed analysis of work processes and working conditions in the workplace it is necessary to draw up a list of risks and hazards. According to Art. 8 and 9 Ordinance 39 risks and hazards, depending on the type and nature, grouped into seven groups.

4.3. Objectives of risk management

Is necessary to ensure that the whole organization, set measurable goals, and those relating to: reducing levels rizka, the introduction of additional measures in Shechem– management, step to improve the current– situation, or the compliance of its application, elimination or reduction in the frequency of occurrence of certain adverse incidents.

When you establish and review objectives, organization, or its management must consider its legal and other obligations set forth hazards and risks, adopted or proposed technological options, financial, labor and business needs and attitudes zaintere with vanih page. The goals must be consistent, including the obligation to improve. The planning and implementation of activities to improve the management safety and health of employees is shown in table 1 Ranking of objectives relating to safety and health at work, according to perioritetima, should result from the analysis of the information received: initial examination, internal audits, management review, risk assessment, analysis of complints and views of interested parties, analisis of the regulation, standars, codes of conduct, analisis of the results of the exchanged experiences (benchmarking), analyzes of the avioidable or actual incidents and accidents, etc.
Parameters to be monitored must be selected so that a unambiguous information on the degree of realization sets term goal.

Table 1. The planning and implementation of activities of the risk assessment

Definition of goals (based on the initial review of policies, laws and regulations, risk assessment, the views of interested parties, etc.).	Development of the program objectives (defined, activities, timelines, responsibilities, planned results, financial).
The choice of priority targets (based on the results of initial testing, laws and regulations. risk assessments, opinions and stakeholders, etc.).	Implementation and monitoring of program implementation (monitoring parameters and response to the question whether the goal potignut).
Defining the intended results (planned quantify the values of parameters to be monitored in order to monitor the results of the implementation of the goals.	Review of the results of the implementation of the program and the need for modifications.

5. THE ROLE OF MANAGEMENT – LEADERSHIP IN MONITORING OF SAFETY AND RISK REDUCTION

5.1. Document management of safety and health at work

Management of the organization is required to maintain all records which are necessary to demonstrate compliance with the statutory and other regulations. Records should be kept to demonstrate the effectiveness of the management of security conditions under which the process is conducted. The records must be accessible and must ensure traceability of activities in which they are incurred. They must be disposed of in such a way that they can be easily found again and must be protected from damage, destruction or loss. The time of storage should be provided.

Role of management-leadership in the monitoring of safety and risk reduction.

Management and senior management should review the functioning of the management, in order to assess whether fully implemented and is always appropriate to the purposes, for continuous improvement, it is appropriate for the coming period and to consider whether changes are needed to any of the elements management system. Place to review by the management-leadership in the management of health and safety at work is the same as in the system of quality management and environmental protection. Reconsideration of the management-leadership should include:

1. overall performance of the safety management system and occupational health,
2. performance of individual system elements and
3. findings of internal audits.

6. SYSTEMATIC APPROACH TO RISK MANAGMENT

The concept of risk management is based on the basic premise that risk management planning, forward-looking, structured, informative and always applicable techniques. The key

to successful risk management is early planning and aggressive implementation. Good planning enables an organized, comprehensive, and integrative process of identifying and assessing risk, and adequate response.
Any risk management strategy depends on the nature of the system under consideration. Studies have shown that a good strategy menadžmen that is based on certain processes. risk planning phase of risk management and a set of actions that are carried out within the overall risk management process and defines the risk management plan. The main elements of the risk management plan are: summary of the system: the objectives and purpose of the system, required standards, development strategy; method considering risk: determining the risk of a rating scale of risk; organization risk management process through the stages; responsibility for risk management. Risk management plan is the basis and guidance for the team of risk managers and document control its implementation by top management (strategic management).

CONCLUSION

Theoretical basis of risk management is a prerequisite for successful assessment, monitoring, mitigation and maintaining risk at an acceptable level. Therefore it is necessary that the knowledge must have managers at all levels of a company or organization. The knowledge and activities include: Mastering the basic terminology of risk management; The basic elements of their systems; Basic knowledge of security policy and health; Legislation safety and health at work; Document management of safety and health at work; The role leadership in the monitoring system and a systematic approach to risk management.

This paper analyzes all the indicated actions that management has to deal with all levels of planning, implementation, evaluation and continuous control and improvement. Such outlined the basics of risk management in general, as well as the safety and health at work in particular, allow for efficient access solve practical problems in business and organizations.

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CHARACTERISTICS OF CROSS-CULTURAL COMMUNICATION

KARAKTERISTIKE INTERKULTURNE KOMUNIKACIJE

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Abstract: *The process of globalization has led to a new form of business where the main role is played by internationally oriented managers. Considering that international business is much more complex than working within the boundaries of the state, any internationally oriented manager must keep in mind the complexity, specificity and sensitivity of the issues of international business communication. Understanding, tolerance and acceptance of cultural differences are the key to success in intercultural management and international business. Successful cross-cultural management depends on the ability to develop the organization in which diversity and pluralism are very important, and successful international communication is the essential tool to achieve that.*
Key words: *cross-cultural management, international communication*

Abstrakt*: Proces globalizacije doveo je do novog oblika poslovanja gde glavnu ulogu imaju međunarodno orjentisani menadžeri. S obzirom da je međunarodno poslovanje znatno kompleksije od poslovanja u okviru granica matične države, svaki međunarodno orjentisani menadžer mora imati u vidu kompleksnost, specifičnost i osetljivost međunarodne poslovne komunikacije. Razumevanje, uvažavanje i prihvatanje kulturnih razlika predstavlja ključ uspeha u interkulturnom menadžmentu i međunarodnom poslovanju. Efikasan interkulturni menadžment zavisi od mogućnosti razvijanja organizacije u kojoj su različitosti i pluralizam veoma važni, a uspešna međunarodna komunikacija je osnovno oruđe da se to i ostvari.*
Ključne reči: *interkulturni menadžment, međunarodna komunikacija*

1. INTRODUCTION

Communication is a permanent process of exchange of messages, which may relate to announcements, tips, providing or receiving information, convincing, expressing emotions, attitudes, and so on. Therefore, we can say that communication is not a one-way process and that always involves more than one message. Business communication is a specific model of interpersonal communication. It includes the intentional exchange of ideas, opinions and information through symbols, signals or images in order to achieve the goals of the organization. On international business, where people with a different cultural background meet, three factors affect: perception, verbal and nonverbal communication. The basic elements that directly influence the perception and communication are cultural values, religion and society. Culture teaches us the symbols and what they stand for, so different cultures have different symbols and their interpretation. Communication skills for communicating between members of different cultures are extremely important since inattentive communication can create many misunderstandings and conflicts.

Language and symbolic communication are extremely important elements of culture that are the product of communal life between people.Communication and culture are two sides of the same coin called human life and that is why some theorists such as E. Cassirer the whole culture understood as communication. Symbolic communication is the transfer of the content of awareness among different people, and unites them and makes it possible to operate.

Language is the basic foundation of every culture that significantly affects all its other elements, and is the most sophisticated mean of communication between people. It is built on the social rules that express the community attitudes towards the objective world. Mutual understanding by language is the use of various signs and symbols, which through their systems of connecting achieves the most accurate and the truest expression of thoughts. Business relations with other countries, emphasize the relevance of knowledge of the language of the country concerned, because it reflects the nature and the value system of a culture. It should be noted that the individual is tolerated in mistakes in an attempt of communication in a language that is not his native, but the lack of culture of one country is unacceptable, especially if we take into consideration the business and diplomatic contacts [1].

In the modern, highly dynamic business environment it is necessary to avoid mistakes related to ignorance of communication from the deeper layers of the language itself. Especially, if we know that the language is not the only mean of communication among people, since beyond language there are many other forms and channels of communication. They may be conscious or unconscious in nature and are present especially when expressing emotions, or other irrational situations. These are often more intense and more precise systems of signs that together are usually referred to as non-verbal communication, or "silent language" as it is called by Hall [2].

2. COMMUNICATION IN INTERNATIONAL ENVIRONMENT

Communication is a permanent process in which people continually sendout and receive information, verbally or non-verbally or in writing, with the aim of exchanging ideas. Communication is the most important moment of the transfer of information, in which they must be reliable, accurate, proven and dynamic.The flow of information is a two-way flow, which means that peopleare not only receiving information, but also sending. However, the theory did not initially recognized the two-way process of communication, since the transmitter was perceived as active side and the recipient was passive. Over time, studies have shown that this is a two-way process and that it is influenced by all the participants, ie. that there is not a passive observer.

By communication and control people coordinate their activities with others. People with different education, experience and personal needs, which affect their ability to understand the messages they receive from others. The success of management depends on a clear transmission and interpretation of messages so that people can work together. We communicate whenever we send a message to someone and when we think about what he said in return [3].

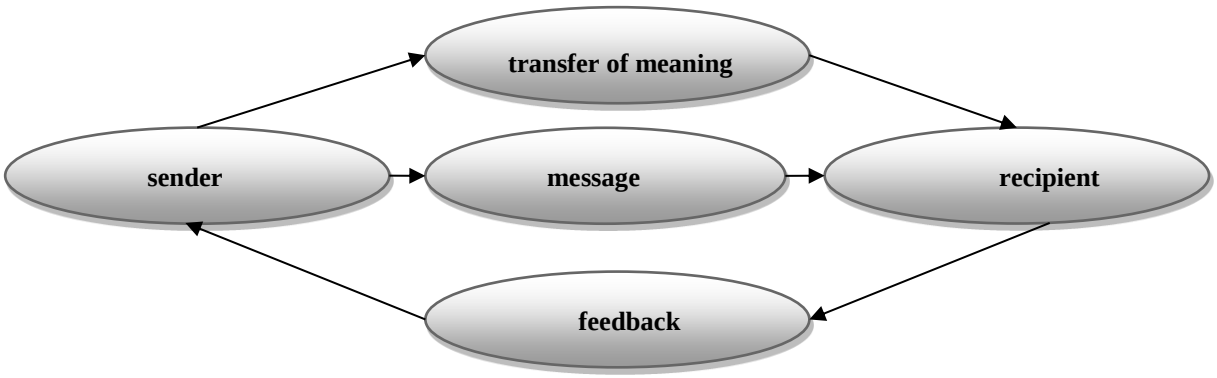

Figure 1. Model of the communication process

Considering all the facts, international business is much more complex than working within the boundaries of the state, and any internationally oriented manager must keep in mind the complexity, specificity and sensitivity of the issues of international business communication. One of the reasons for this is the individuality and complexity of the situation in which it comes to dealing with different cultural environment. Based on the amount of core and additional more detailed information needed to fully understand a particular communicative situation, there are two types of communication culture:

1. narrow context of culture (communicative simple culture)
2. wide cultural context (complex communicative culture)

Between the above two extreme types of communication culture in some countries, there may be a culture that is a combination of wide and narrow context.Data distribution can provide important guidance to each manager who manages international operations for planning behaviors in business communication.

2.1. CHARACTERISTICS OF A NARROW CONTEXT CULTURE FROM THE COMMUNICATION ASPECT

Cultures of narrow context type practice direct and easy communication with emphasis on direct answers YES / NO. According to its relation to the time they are monochrome cultures. Key characteristics of the business culture in the narrow communicative context are:

- high tendency to plan,
- behavior in line with the planned and agreed,
- a tendency towards accumulation of knowledge, capital, material goods,
- rational and individualistic orientation,
- control of emotions,
- orientation to achieve business results.

What should be emphasized in business contacts with partners from countries belonging to these cultures (UK, USA, Australia, Germany, Netherlands, Switzerland, the Scandinavian countries) are following characteristics:

- short-term, superficial, rational and fade relationships with individuals,
- directness of message, precise and specific communication
- the importance of a written agreement,
- finite contract
- failure to recognize the great attention to non-verbal communication.

2.2. CHARACTERISTICS OF WIDE CONTEXT CULTURE FROM THE COMMUNICATION ASPECT

The practice of indirect and imprecise communication is characteristics of the culture of the wide context type. In order to understand the specific business situation, it is necessary to provide a considerable amount of additional information with respect of context and ambient conditions. Members of the given culture are characterized by:
• orientation towards reflection, interaction and group communication,
• attachment to traditional values, family and obligations,
• mystery, insincerity, reservations.

It is important to add the following features of wide cultural context:
• importance placed on the oral agreement and forms
• long-term relationships between people followed the successful communication (relationships of trust and loyalty)
• deep roots of cultural models,
• the existence of many indirect and unwritten manner rules whose violation is not tolerated.

Typical country with a wide context cultures include: Japan, China, Korea, Vietnam, the countries of the Mediterranean and the Middle East [4].

3. CULTURALY RECOGNIZABLE STYLES OF COMMUNICATION IN DIFFERENT CULTURES

Culturally distinctive styles of communication can be divided into several groups: direct and indirect style; comprehensive, accurate and concise style; courtesy like and informal style of communication.

In the wide context cultures indirect communication is a preferred communication style. Actors communicate for business or private, in an attempt to achieve closeness and a wide attentiveness. Because there is a tendency for preventive information from multiple sources, each actor is acquainted with the other participants in the communicative network. More importance is given to the personal and professional characteristics other than the topic and subject of communication. Consequently, thereis extensive practice of various forms of non-verbal communicationin these cultures. In a preparation and organization of a meeting in a wide context cultures, the usual question is "Who will attend the meeting?". People are interested to know interlocutors and the environment in which the interview is conducted.
In the narrow context cultures direct style of communication is cultivated. Since the actors do not know each other closely, they tend to be more direct in communication. They focus on the subject and topic of conversation more than the personal and professional characteristics of the other actor. More importance is given to verbal communication. When preparing and calling a meeting, in the narrow context cultures the usual question is: "What will be discussed at the meeting?". People are interested in the topic and the questions that will be asked during the meeting.

Considering the volume of information, we can distinguish comprehensive, accurate and concise communication style at the international level. For example, in the Arab countries or cultures as representative of comprehensive communication, the importance is based on a number of words spoken on both sides. Descriptions of problems and topics include lots of details. Participants in communication often repeat what has already been spoken, so the statements and opinions become more convincing and memorable.Precise communication style is widely present in Anglo-Saxon and European countries and cultures, such as the U.S., England, Germany and Sweden. In these and other similar countries and cultures, respondents cultivate rationality and precision of expression. Concise communication style is present in some countries and cultures of Asia where people communicate the essence of the problem with only a few words. They use relational pause and various forms of non-verbal communication to convey the true meaning of the message. In the new and unfamiliar situations, communication is further reduced and summarized in order to save face of participant and speak only relevant words. In the wide context cultures both extensive or concise communication style are found. Both styles of communication are used to achieve indirection, remoteness and reservation in mutual contacts and relations. In Arab cultures, this is achieved by redundant words, and in Asian cultures, this is achieved by frequent practice of non-verbal form of communication and techniques. Precise communication style is mainly present in the narrow context cultures. This style has achieved immediacy, sincerity and honesty in mutual contacts and relationships, which are important characteristics of simple and direct communicative culture.

Courtesy communication style is based on carefully chosen words that imply biographical and status characteristics of each participant. Hierarchical position and status of individual participants in the conversation is taken into account. Participants are primarilyrespected,and the cultivation of the relationship between the parties is of major concern. Courtesy communication style is most evident in Asian cultures. It is clearly a complex communicative style of widecontext cultures. The organizationsappreciate communication based on an understanding of the business context and interrelations. Polite expression is considered to be a desired attribute of social education. According to the method and style of communication, superiors and subordinates role interlocutors are recognized , as well as the preferred form of address of the younger to the older interlocutor and reverse. The Japanese take care not only about their direct relations, but also of affiliation to certain social groups, as well as the prestige of institutions they represent. In India, taking into account of the social status is even more emphasized. Belonging to a particular caste determines the social status of the individual, that has direct implications on its communication status [5].

4. COMMUNICATION IN HETEROGENEOUS AND HOMOGENEOUS CULTURES

Cultural heterogeneity is defined as a relatively large degree of diversity among the important elements of culturein observation. The country in which several different languages, nationalities and religions simultaneously exist is culturally heterogeneous. These are: Canada, USA, India, Switzerland, Russia and many others. It can be said that in these countries a number mini cultures exists. The other countries, which are relatively compact in terms of language, nationality and religion structure are defined as a culturally homogenous: Japan, Saudi Arabia and others.

For international managers is much more demanding, difficult and challenging to operate in culturally heterogeneous than in homogeneous environments. All business decisions that are made require careful consideration of the situation and understanding of the conditions in which these decisions are implemented. If the heterogeneous cultures are wide context cultures with high communication complexity, it increases a number of business barriers and unknowns. This is the reason why it is , for example, more difficult to operate in India than in the US. Although both countries have heterogeneous cultures, additional business barriers and difficulties in doing business in India occurs because it is a wide context culture, opposite to US with narrow context culture and low communicative complexity.

Understanding cultural heterogeneity and complexity of communication in the host country should be one of the initial priorities in business internationally oriented companies. In order to achieve a successful business in a multicultural environment, it is necessary to cultivate sensitivity to the local culture, and an understanding and appreciation of manifold cultural differences. In heterogeneous national cultures, many business opportunities can be lost due to lack of knowledge of characteristics and needs of individual micro-culture and its representatives, that is, if the focus is placed only on the characteristics and needs of the dominant culture. Understandably, it is much easier to keep business negotiations in a country with relatively homogeneous cultures. [6]

5. INTERNATIONAL COMMUNICATION

At the international level we are faced with a multitude of problems when it comes to communication. The main problems are conditioned by the fact that the sender and recipient come from different cultures, and therefore, they interpret the same message and communication contents in different ways. The contradiction of communication styles is especially emphasized in the communication betweensimple and complex communication cultures. It is emerging as one of the most common sources of various misunderstandings and mistrust in business communication. For that reason, managers of international operations are forced to undergo comprehensive cultural training in the culture of a potential partner, before initiating any kind of serious business [7].

Business associates from different countries communicate in the language that both sides understand. It is necessary that business diplomats adjust to foreign cultures which belong to the people with whom they do business with. This adjustment involves learning the facts that may be relevant, for example, one should be familiar with the history, customs and practices of members of other culture with which they operate with.

Members of different cultures behave and react differently, so it is clear that practice in another country can not be conducted with the same approach as in the native country. It is well known that from country to countryperceptions and views of the work differ, and that some cultural practices have to be transformed in order to increase the efficacy and quality of the work. Even when a business associate is familiar with the foreign culture his work is not finished. Consequently he has to be prepared to accept the differences between cultures and to act according to them, when doing business with someone from a different culture. One needs to respect the norms and adjust to diversity, but without losing own identity, or fully

succumbing to the influence of culture, and must continue to execute the goals and objectives of that the company. Adapting to a foreign culture means creating a favorable work and negotiating climate, more relaxed atmosphere that will favor better business results and achievement of objectives. Ability to adapt to foreign cultures can make a positive impression on business associates who will appreciate the effort of becoming acquainted with the culture and prospect of prosperity of their people [5].

5. CONCLUSION

Understanding, tolerance and acceptance of cultural differences is the key to success in intercultural and international management of business. Until recently, managers have mainly focused on knowledge of one country and culture. Contemporary business conditions and the process of globalization have led to a new form of business where the main role is played by internationally oriented managers. They are required to work in a complex, uncertain environment with constant changes, understand and respect the cultures of their business partners. International managers need to speak several languages, be tolerant, flexible, free of ethnocentrism, etc. In addition, the global environment allows companies to do business with organizations from different parts of the world and the ability to negotiate with foreign partners has become one of the critical success factors in international business.

Managers ignorant of rules of successful intercultural communication, which is essential in the world of international business and management give very negative impression. Cultural patterns are part of our personality and behavior. They allow us to communicate with members of our own culture without difficulty. According to many scientists, culture is not founded in genes, but is based on the relationships in the group. It is of great importance to understand our own cultural practices and patterns in order to be able to understand different cultures. Ethics, moral and societal norms are the result of cultural evolution of the certain society. Since believes, norms and values are based on the culture, interpretation and evaluation of the certain messages between members of different cultures could create misunderstandings and even conflict. Lack of knowledge of other cultures may produce prejudices and incorrect assumptions about behaviors of other people.

Participants of international communication have to be tolerant and free of ethnocentrism in order to understand and appreciate the values, norms and characteristics of different culture. Business success in modern world is depending on capacity for development of the organization founded on valorization of diversity and pluralism, with communication as a major tool for this achievement.

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THE RELATIONSHIP BETWEEN ECO-EFFECTIVENESS AND ECO-EFFICIENCY: A FIRM LEVEL POINT OF VIEW

VEZA IZMEĐU EKO-EFEKTIVNOSTI I EKO-EFIKASNOSTI SA STANOVIŠTA PREDUZEĆA

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***Abstract**:Notwithstanding the important results obtained in terms of eco-efficiency, we are far from sustainability. Another important step is now needed and a new point of view. The new objective is now eco-effectiveness. Using a factor analysis approach, this paper studies the approach of private firms toward eco-effectiveness and the relationship between eco-efficiency and eco-effectiveness. The results of our analysis is that private firms tend to adopt three different approaches. Two of them are based on eco-inefficient production technologies while the third approach privileges investments in R&D and more efficient production technologies that produces less waste and less GHG emissions.*
***Key words**: Eco-efficiency, Eco-effectiveness, Sustainability*

***Apstrakt**: Uprkos značajnim rezultatima ostvarenim u pogledu eko-efikasnosti, daleko smo od održivosti. Potrebno je načiniti odlučujući korak i stvari sagledati iz novog ugla. Novi cilj je eko-efektivnost. Korišćenjem pristupa analize faktora, ovaj rad razmatra odnos privatnih firmi prema eko-efektivnosti i vezu između eko-efikasnosti i eko-efektivnosti. Rezultati analize ukazuju da privatne firme nastoje da usvoje tri različita pristupa. Dva od njih se baziraju na nedovoljno ekološkoj proizvodnoj tehnologiji dok treći pristup podržava investicije u IR i efikasnije proizvodne tehnologije koje emituju manje otpada i manje štetnih gasova uzročnika efekta staklene bašte.*
***Ključne reči**: Eko-efikasnost, eko-efektivnost, održivost*

INTRODUCTION

The importance to consider not only the business but also the "natural" and "societal" case depend by the degree of substitutability, linearity and irreversibility among these aspects [1]. The concept of Eco-effectiveness is strictly linked to the idea of sustainability, as is possible to argue by the following statement: "eco-effectiveness celebrates the abundance and fecundity of natural systems, and structures itself around goals that target 100 percent sustaining solutions"[2]. Instead the idea of eco-efficiency it is not strongly associated to the sustainability, or it is not in a clear and unequivocal way. If for example we consider the definition of eco-efficiency given by the World Business Council for Sustainable Development (WBCSD)[3] we can see that there is a reference to the absorption capacity of the world but this aspect seams merely theoretical and represent a point of arrival, perhaps far and not a starting point. Moreover even considering the wide definition of the WBCSD it is clear that are taken into account only the economic and ecological aspects without the social one, in fact is considered the satisfaction of human being but not the improving of the quality of life [4]. In the reality even the ecology side of the eco-efficiency remain dismissed as point out by the great attention to the "business case" logic [5]. In fact following this logic it is possible that a more efficiency in resources use could lower price of goods and for this pathway the overall selling could increase with a growing in total quantity of resources use and pollution inducing a rise in the absolute level of ecological footprint [6]. The concept of

the eco-efficiency is related with “creating more value with less impact or doing more with less”[7]. To visualize better the idea it is possible to represent it as a ratio between an economic value and an ecological value in other words it is the ratio between “product or services value” and “environmental influence”[8]. Using the ratio between two economic values or two ecological values could show a less reliable result in the case of change in the same direction and proportion of the figure chosen for the ratio. The eco-efficiency seams more related with the idea of the triple bottom line while the eco-effectiveness is directed towards the concept of the triple top line as suggested by McDonough and Braungart [9]. Another aspect that is linked with the idea of eco-efficiency is the factor X reduction in resources use [10], it is a quantitative approach and of course the target can vary if it is considered the long term of time or the short one.

It is interesting to consider the different role that play the innovation towards eco-efficiency and towards eco-effectiveness. In the first case the aim is to increase the output given a quantity of input or to obtain the same output with less use of input. In the other case the idea is to create a radical change and so it is necessary a “disruptive innovation”[11]. Another question to analyse is the conflict or the concordance of the two schemes regarding the eco-efficiency and the eco-effectiveness. At the firm level point of view the two tool would find a precise and concrete role to pursuit the final aim of full sustainability in the more fast way. It is worth to note that the eco-efficiency seams more oriented to the side of production rather than the consumption one, and this could cause the overall result of more resources depletion, more CO2 emissions, more pollution and waste production [12]. So the great importance of considering before the quality and then the quantity, when the harmful substances are eliminated then it is the right time for considering eco-efficiency, it would be important so to create a cradle-to-cradle system instead of a cradle-to-grave and then pay attention to have “more with less”[13]. This would be the better solution but it is to take into account that the eco-effectiveness has generally the necessity of longer period of time to be realized. It is a wide qualitative concept, it regards the all system in an holistic way, the eco-efficiency is more quantitative and tend to have a more narrow point of view, such as a single production activity [14].

It is significant to consider the link between environmental and economic performance [15]. Even if the causality direction of this relationship it is not unequivocally clear it is useful its existence to justify the interest towards eco-effectiveness [16]. In this contest it is of great importance the role of shareholders, stakeholders [17] and of management [18]. Given the nature of the firm [19] they have an essential role to achieve a full passage to an eco-effective system of business [20].

In the following paragraphs it will be examined an empirical database of corporations worldwide distributed to identify different scenarios that could face in the analysis of the relationship between eco-efficiency and eco-effectiveness.

DATA

The data base used is composed of more than 7.000 firms from 87 different states. On these firms are the following variables were collected: Net Income - Net Assets - Shares

Outstanding - Market capitalization - Free Cash Flow - Revenue - Number of employees - Energy use - GHG emissions (Scope 1 + Scope 2, CO2e) - GHG emissions (Scope 3, CO2e) - Water - Waste produced - R&D Expenses - Cash taxes - -EBITDA - Book value per share - Book value - Pension assets - Pension liabilities - Total wage bill - Total CEO Comp - Disclosed Intangibles - Total Assets - Disclosed intangibles/Total assets - Percentage women on the board - Lost time injury rate - Fatalities - Employee Turnover in percentage - Clean Cap Pay Link

The data set is therefore composed of financial variables, data on emissions and some other management related data. Due to the lack of data in some records the final sample of analysis is composed from about 430 different corporations for a range of years from 2006 to 2011 corresponding to a table with 7 columns and with 1603 rows . The data collected from Bloomberg were kindly provide by Corpotate Knight14.

Although the number of firms may seem elevate, the sample may not be fully representative of the phenomenon. The first and most important problem is self-selection. The emission data, for example, are available only for the firms that have adequate information system that monitors the emission and are interested in a process of reduction of the emission or work in an environment in which there is high attention on this subject.

Moreover, also in this restricted and self-selected sample the analysis is affected by the presence of many holes in some variables that further reduce the sample size. Therefore the main challenge is to choose an optimal set of variable that is able to capture the main features of the phenomenon without reducing too much the size of the sample. The main problem is given by the data on emissions and the management related data. Some of these variables, in fact, are not even surveyed in many firms or are not published.

The variables that best capture the link between eco-efficiency and eco-effectiveness and maintain an adequate sample size are: Net Income - Net Assets - Number of employees - Energy use - GHG emissions (Scope 1 + Scope 2, CO2e) - Waste produced - R&D Expenses.

RESULTS

We studied the link between eco-effectiveness and eco-efficiency using a factor analysis approach. We pointed out three main factors (see **Error! Reference source not found.**) that explain about 87% of the variability.

Table 1.

	Factor 1	Factor 2	Factor 3
Net Income (millions USD)	0.28	0.36	-0.04
Net Assets (millions USD)	0.23	0.25	0.01
Number of employees	0.19	0.32	-0.09
Energy use (000's MWH)	0.48	-0.12	0.48
GHG emissions (000's Scope 1 + Scope 2, CO2e)	0.50	-0.12	0.46
Waste produced (000's metric tonnes)	0.56	-0.42	-0.71
R&D Expenses (millions USD)	0.19	0.71	-0.20

14 Thanks to the kindness of Michael Yow.

Each factor can be associated to three different production approaches. The first one can be called the "more production more pollution approach". This factor has in fact higher coefficient for Net income, Net Assets, Number of employee, Energy use, GHG emission and Waste produced, all with the same sign. This can be interpreted as a production approach that, in order to make higher profits, needs to produce high quantity of wastes and of GHG emissions, and consume higher quantities of energy. The fact that this factor can explain close to 57% of the variability is a relevant index of how important changes must be made in our production way to produce if a reduction of the emission is to be made.

The second one, instead, can be called the "more profits less pollution approach". The second factor, in fact, has higher coefficient in absolute value on Net income, Net Asset, Number of employees and R&D expenses. It is worth notice that the coefficient of Energy use, GHG emission and Waste production has opposite sign with respect to the coefficient of Net income Net Assets, Number of employees and R&D expenses. This can be interpreted as a production approach based on more R&D expenses and more investment on capital. Profits are made reducing waste production, energy consumption and GHG emission. These firms human capital, eco-efficiency and eco-effectiveness are the main instrument to make profits.

Finally, the third approach, can be called the "less waste more emission approach". These firms seem to use a production technology that reduces Waste production for high Energy Consumption and more GHG emissions. This may be due to higher costs associated to waste disposal with respect to GHG emissions.

This results has relevance in the analysis of the GHG emission as suggest that in order to correctly analyze GHG emission at firm level it is necessary to distinguish between the different approach toward GHG emission,

The highest average values of the first factor are in Australia and Africa while the lowest values are in North America and South America. The Economic sectors with highest average values of the first factor are Material and Utilities while the ones with the lowest values are Software services and Household & Personal Products.

The highest average values of the second factor are in North America and Europe while the lowest values are in Africa and Australia. The Economic sectors with highest average values of the second factor are Semiconductors & Semiconductor and Pharmaceuticals, Biotechnology while the ones with the lowest values are Real Estate and Utilities.

The highest average values of the third factor are in South America and Africa while the lowest values are in Africa and Australia. The Economic sectors with highest average values of the third factor are Others and Energy while the ones with the lowest values are Real estate and Household & Personal Products.

Table 2.

	Factor 1	Factor 2	Factor 3
Africa	2.45	-1.87	-1.62
Asia	-0.24	-0.09	0.06
Australia	3.12	-1.59	-0.51
Europe	0.77	0.12	-0.14
North America	-0.43	0.55	-0.01
South America	-0.40	-0.99	1.10

Table 3.

	Factor 1	Factor 2	Factor 3
Automobiles & Components	0.64	0.62	-0.26
Capital Goods	-0.32	0.05	-0.30
Consumer Durables & Apparel	-0.12	0.35	-0.02
Energy	0.18	-0.59	0.38
Food Beverage & Tobacco	0.21	-0.40	-0.06
Health Care Equipments & Services	-0.30	0.82	-0.02
Household & Personal Products	-1.06	0.33	-0.35
Materials	0.78	-0.70	0.16
Pharmaceuticals, Biotechnology	-0.45	0.83	-0.10
Real Estate	-0.79	-1.16	-0.44
Semiconductors & Semiconductor	-0.34	0.87	0.06
Software & Services	-2.06	0.44	-0.05
Technology Hardware & Equipment	-0.40	0.64	0.04
Utilities	1.40	-1.00	0.27
others	-0.72	-0.27	0.70

CONCLUSION

From the analysis conducted emerges various scenarios with different implication for the relationship between eco-efficiency and eco-effectiveness.

The eco-efficiency can easily encounter the logic of business because more efficiency means a save in cost of production and in the yield per unit of input. The eco-effectiveness not always

could respect this assumption because the reduction of the overall footprint could be correspond to a reduction of activity in the short period of time. For this reason it is fundamental to identify the appropriate driver that can lead to eco-effectiveness. The pressure of stakeholder in this contest would be determinant both for the pressure to the government and to the corporations too.

Quoting Hyupes [21] at macro level the concept of decoupling, shows if eco-efficiency has risen enough to take into account the economic growth avoiding so environmental deteriorations. While at macro level can be relative easy to denote the sustainability it is not so easy at firm level for this it is important the implementation of eco-effectiveness at corporation level.

Eco effectiveness is the right pathway but it is important to consider if it is possible to reach it in the short period of time

Future development of this research is to elaborate a kind of sustainability indicators for corporations that can represent the eco-effectiveness and develop a regression analysis with the indicators of eco-efficiency.

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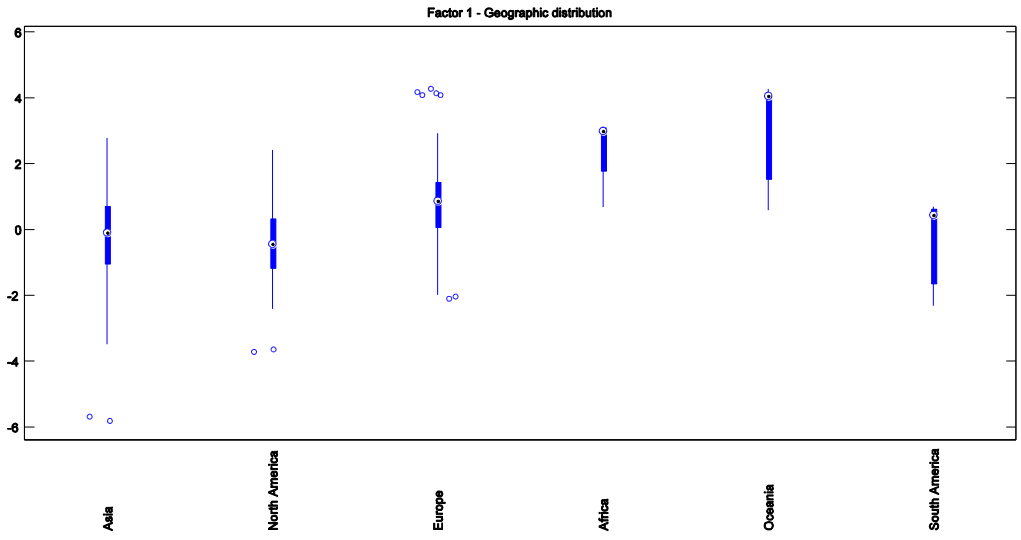
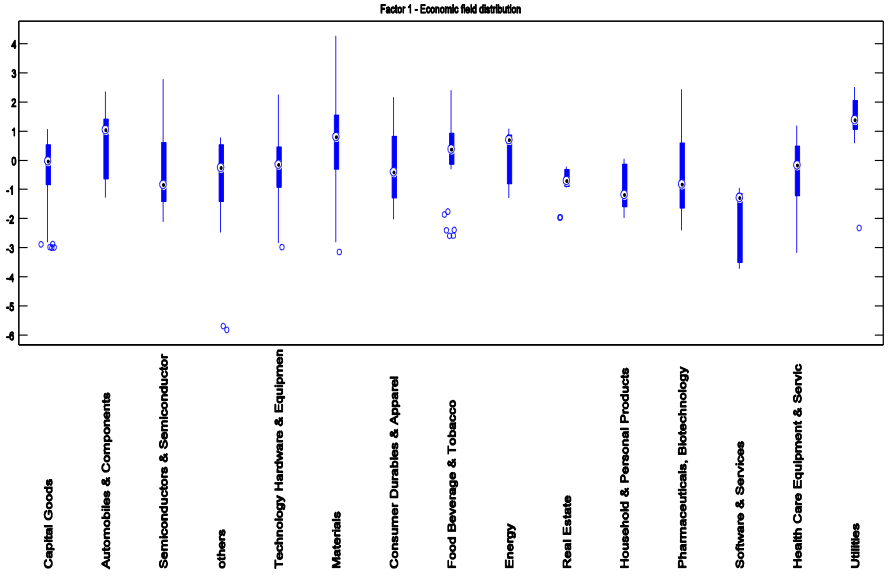
APPENDIX




Factor 1 - Economic field distribution
4
3
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Capital Goods
Automobiles & Components
Semiconductors & Semiconductor
others
Technology Hardware & Equipmen
Materials
Consumer Durables & Apparel
Food Beverage & Tobacco
Energy
Real Estate
Household & Personal Products
Pharmaceuticals, Biotechnology
Software & Services
Health Care Equipment & Servic
Utilities

INCREASING ENVIRONMENTAL AWARENESS THROUGH SOCIAL NETWORKS

PODIZANJE EKOLOŠKE SVESTI PUTEM DRUŠTVENIH MREŽA

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Abstract: *Social networks represent a significant phenomenon nowadays, because they are the largest virtual community and endless source of data and updated information on various topics. Online social networks are an integral part of modern business: marketing, PR, promotion of healthy lifestyles and environmental protection, and other business segments. This study describes the ways that social networks like Facebook and Twtter influence on increasing environmental awareness of users.*
Keywords: *social networks, ecology, environmental awareness*

Apstrakt: *Društvene mreže predstavljaju značajan fenomen današnjice, jer su najveća virtualna zajednica i neiscrpan izvor podataka i ažuriranih informacija o različitim temama. Online društvene mreže su sastavni deo savremenog poslovanja: marketing, PR, promocije zdravog života i zaštite životne sredine, i drugih poslovnih segmenataU radu su opisani načini na koje društvene mreže poput Facebooka i Twtter imaju utjecaj na podizanje ekološke svesti korisnika.*
Ključne reči: *društvene mreže, ekologija, ekološka svest*

1. INTRODUCTION - ENVIRONMENTAL PROBLEMS

Since the end of 2006 climate change has gradually become the hot topic amongst all other environment problems. A large number of events, reports, movies, etc. have generated increasing media coverage on climate change issues [1]. Conventional environmental awareness campaigns strongly rely on information to change attitudes. To make climate change communication effective, more sophisticated alternatives are suggested, such as harnessing tools and concepts used by brand advertisers, so as to make being climate-friendly desirable rather than a duty or matter of obedience [2].

Climate change affects every citizen at every level - local, regional, national, and global [3]. Some authors [4] have looked at the reporting of climate change in the mass media. Results of this analysis [4] show that scientists tend to be associated with an emphasis on environmental problems and causes while politicians and special interests tend to be associated solutions and remedies. A major European Commission survey revealed that “pollution in towns and cities and climate change” are the most frequently discussed environmental topics amongst EU Citizens and this reflects the intense public discussion on these topics [5]. Almost 57% of EU Citizens surveyed placed climate change as the number one issue that “worried them about the environment”.

2. IMPACT OF THE INTERNET ON ENVIRONMENTAL AWARENESS

In the past decade, sustainability and environmental awareness have gained increased media attention and due to increasing media coverage, our society is becoming more aware of the effect that our activities have on the health of the environment. Creating and maintaining a

more sustainable environment is imperative to the survival of future generations. Mass media refers to all media technologies which are used for mass communication including radio, television, newspapers, the Internet and films.

The promotion of environmental awareness is essential, and citizens have a responsibility to take part in improving the environment's sustainability for the future. A sustainable environment means harmony between humans and nature while not jeopardizing the lives and opportunities of future generations. A focus on environmental sustainability has been increasingly present in our media.

Methods for delivering news have multiplied and evolved, originating with print, then adding radio, broadcast television, cable, and finally the Internet. The Internet has converged traditional media with new media, which has produced an eclectic and multifaceted resource for consumers to get news. With much of traditional and new media converged online, the Internet is often the best resource for an infinite amount of content about environmentalism. In addition, it has a huge reach across the world and allows participation and discussion. These features make the use of web sites and online communication tools the most powerful approach to promoting environmental awareness and advocating change.

The Internet is an exceptional tool for communicating and distributing information, and environmentalists have taken advantage of its usefulness in reviewing literature, raising questions, and discussing the best ways to work towards social change.

"Environmental activist groups are successfully using the Internet and electronic communication technologies as mechanisms through which to access, use, create, and disseminate information. Internet-based technologies are impacting the information functions of grassroots activist movements as groups develop voices that expand their traditional social, political, and geographic boundaries." [6]

Environmental web sites usually have goal of promoting green living, sustainability, and environmental awareness. The web site contains blog posts with spotlighted articles and videos, a list of shopping web sites that carry eco-friendly products, background information about sustainability and climate change, news feeds, a large list of links to other web sites with an environmental theme, widgets including a recycling center search, green DIY projects, a Twitter feed, and a Facebook Page that gives visitors another way to participate.

When learning about a new topic, such as environmental issues, the ability to navigate from page to page via links, watch embedded videos, and view content seconds after it is published provides people with access to more information than they could ever get from using just one type of media alone. The Internet also allows discussion about a subject in a way that was never possible before. People from all over the world can participate in a conversation and exchange ideas. We can share our own thoughts and opinions with a potentially unlimited audience and encourages dialogue via comments and social media.

3. PHENOMENA OF SOCIAL NETWORKING

Online social media or social networking is one of the most intriguing phenomena of our times. Its rapid growth has been the subject of numerous discussions, literatures, and research studies. As technology advances, online communities grow in both strength and number. This period has been described as the era of social networking, collective intelligence, participation, collaborative creation, and borderless distribution [7]. Social media means many things to different people. Since 2005, the use of social networking sites has risen rapidly and the major services, particularly Facebook, continue to attract new users at an astounding rate. While it took mobile phone 14 years to gather 150 million users, it only took Facebook 5 years to gather the same number of users (telephone: 89 years; iPod: 7 years). The use of Facebook as a business tool, however, does come with a risk – it may detract from productivity. [8]

Social media such as Facebook, MySpace, Twitter, or LinkedIn provide ways for users to communicate online. Features available include chat, messaging, email, video, voice chat, file sharing, blogging, discussion groups and so forth. Because users can communicate with each other anywhere and anytime, social media tools become very useful in saving on travel costs during a down economy. Facts and figures on Facebook suggest that this social media tool is gaining popularity as one of the most preferred communication media for ussers. The better organizations align their communications to their employees' media preferences, the easier and faster they can achieve results.

Here are social media statistics and figures from 2012 that can help to better understand Facebook, and Twitter. Monthly active users now total nearly 850 million, 488 million users regularly use Facebook mobile, 23 percent of Facebook's users check their account 5 or more times daily, more than 1 million websites have integrated with Facebook in various ways, 250 million photos are uploaded to Facebook every day, 80 percent of social media users prefer to connect with brands through Facebook, 43 percent of Facebook users are male, while 57 percent of Facebook users are female, etc. [9]

Twitter Statistics – Registered users more than 500 million, there are 175 million tweets sent from Twitter every day in 2012, the average Twitter user has tweeted 307 times, top 3 countries on Twitter are the USA at 107 million, Brazil 33 million and Japan at nearly 30 million, the average user follows (or is followed by) 51 people, 32 percent of all Internet users are using Twitter, in 2012, 1 million accounts are added to Twitter everyday, 50 percent of Twitter users are using the social network via mobile, etc.[10]

66.2% of all internet users in Serbia in 2012 posted messages to chat or social networking sites, according to the State Statistical Office. The report also found that 92.1% of young internet users (aged 16 to 24 years) have an open account in social networks (Facebook, Twitter). [11]

Based on the statistics taken from Facebook interface as at April 2013 the total number of Monthly Active Facebook Users (MAU) in Serbia is approximately 3 629 660 and grew by more than 257 180 in the last 6 months. Monthly Active Users measures the number of people

who have been active on Facebook during a 30-day-period. That makes Serbia 48th in the ranking of all Facebook statistics by Country. [12]

4. BLOGS

Blogs are a great tool for many reasons that can help in promoting and discussing environmentalism. The ability for visitors to write comments on each post is key because it opens topics up for discussion and creates a forum where others can share their own insights, experiences, opinions and ideas. Hearing from readers can add a lot of good content to the site and benefit both the author of the post and everyone who reads the comments. Based on experience with blogging, reading and commenting on other blogs and being part of a blogging community is the fastest way to get readers and comments on your own blog.

The Internet is full of blogs about "being green" and sustaining a healthy environment written by both experts and concerned citizens. The concept of blogging began to take off in 1999 when free and easy platforms for blogging were made available to the public. Open Diary, LiveJournal, and Blogger.com were the first blog hosting web sites to be launched and thousands of people took advantage of these free tools to write about their thoughts, ideas and opinions. On blogs environmentalists were able to publish their findings, thoughts, and concerns instantly and develop a following of people who were also interested in the subject and could provide feedback and ask questions in the comment section of each article.

Blog is set up in reverse chronological order so visitors to the web site will always see the most recent posts first. This is a key characteristic of blogs and if they are updated often, visitors will always have access to fairly recent information. Ideally, frequent updates and current information will keep blog readers interested so that they will come back. Regularly adding new content to a web site is important for maintaining readership. In addition, if blog posts are able to generate new conversation, the web site will be a more interactive place for individuals to visit and learn about the subject matter.

5. THE INFLUENCE OF TWITTER

Environmentalists can use social media tools such as Twitter, a microblogging service, to instantly post and read short messages that can be seen by everyone who subscribes to their updates. Users can categorize each tweet by adding a hash tag followed by the topic (#topic), making it simple for others to search for tweets that are of interest to them.

The online social network Twitter.com (http://twitter.com/) and environmental issues such as climate change and pollution are both inextricably linked with today's popular culture and mass media. Twitter is used by millions of people around the world to stay connected to their friends, family members and coworkers through their computers and mobile phones. The interface allows users to post short messages (up to 140 characters) that can be read by any other Twitter user. Users declare the people they are interested in following, in which case they get notified when that person has posted a new message. A user who is being followed by another user does not necessarily have to reciprocate by following them back, which makes the links of the Twitter social network directed.

For Twitter to gain acceptance as a communication device for serious issues such as climate change the authors feels that it is necessary that the problems of the email world: spam, junk mailing, phishing, etc are tackled aggressively and effectively. Otherwise users will follow the same usage patterns as they use when managing their email - only trusting a small set of users, or friends, and deleting any material which looks dubious.

Public awareness is key to making a real difference in fighting environmental problems such as climate change [1]. However, due to ineffective communication strategies, much effort to educate the public on climate change issues has not translated into a great degree of concrete progress. As outlined in [13] the authors show that the experiences of the UK, Canada and Sweden demonstrate that climate change communication campaigns appear to influence large numbers of people in relatively short periods of time. These campaigns were based on pro-social behavioral campaigns but had little success in changing peoples habits and behaviours. Harnessing the pro-social aspects of Twitter could prove a useful tool in informing the public better about environmental problems. We believe that Twitter can assist in communicating information about climate change. Tools such as Twitter can address "the dichotomy of high awareness and low priority strongly related to ineffectiveness of some environmental communications" [1].

6. THE INFLUENCE OF FACEBOOK

Facebook originally required a valid email address with a high school or college domain name to join. This exclusiveness to students is what seemed to have originally set Facebook apart. In April 2006, Facebook opened its registration process to organizations and more than 4000 organizations joined within 2 weeks. In its factsheet posted online, Facebook describes itself as: founded in February 2004, Facebook is a social utility that helps people communicate more efficiently with their friends, family and coworkers. The company develops technologies that facilitate the sharing of information through the social graph, the digital mapping of people's real-world social connections. Anyone can sign up for Facebook and interact with the people they know in a trusted environment.

This study was conducted using the quantitative survey method. Such method remains the best known and widely used research method in the social sciences today. A set of questionnaires was used as the instrument for data collection. This study adopted a quantitative method because it provides a way to obtain a better understanding of the mix of communication tools people use as well as the tools' strengths and weaknesses. The subject of the study is students who have a Facebook account and who wanted to participate. We used a sample of 50 respondents. The focus of this study is the influence of Facebook on awareness level on climate change among students. All of the respondents have been using the Internet for more than five years. Over the last year, more than half of the respondents (60.0%) said that their Internet usage has strongly increased. Data showed that more than half of the respondents (55.0%) spent more than 9 hours a week surfing the Internet. Slightly more than a quarter (35.0%) spent between 5 and 7 hours a week while less than a quarter (10.0%) spent less than 5 hours a week surfing.

When asked how often Internet replaced watching television, more then a quarter of the respondents (35.0%) said that it rarely happened. 30.0% said that Internet replaced watching

television from time to time. Another 30.0% said that Internet often replaced watching television. However, only a small portion (5.0%) of the respondents said that Internet always replaced watching television. Nearly half of the respondents (45.0%) said that Internet always replaced doing research in the libraries. More than a quarter (35.0%) said that this was often the case while only a small portion (5.0%) felt that Internet rarely replaced doing research in the libraries. Finally, when asked whether they searched a topic which they were interested in on the Internet, majority of the respondents (80.0%) said this was always the case. The rest of the respondents said that they often used the Internet to search for a topic. Nearly all (95.0%) agreed that Facebook helped them share their opinions and explained things easily.

All of the respondents agreed that the world climate is changing and that climate change is the result of human behavior. However, when asked whether climate change is a natural occurrence, only half agreed that it is. Only half of them also felt that climate change has become more of an issue for them in the past year. Majority (85.0%) believed that they could personally help to limit the effects of climate change. All of them agreed that they understand the presence of an environmental threat and that they comprehend and assess the dangers posed by such environmental threat. More than half of the respondents (75.0%) believed that they have the ability to prevent potential environmental risks from occurring. The results showed that the participants were generally aware of climate change. This suggested that new media such as Facebook can be used as effectively as conventional face-to-face means to increase awareness about environmental concerns. The findings of this study are also consistent with the global statistics on Facebook usage, which helped explain why more and more people chose it as the preferred medium of communications.

7. CONCLUSION

Even with the rapid increase of Internet usage, television has remained one of the most widely used media technologies. However, a convergence of media is occurring and television and Internet will no longer have to compete for audiences. We are entering an era where media will be everywhere and we will use all types of media in relation to each other. The Internet doesn’t replace old technologies. Instead, it links many technologies together to use all at once.

Quality environmental information should be available to as many people as possible in order for citizens to be able to understand the problems and make smart decisions that will lead to a better and more sustainable environment. The Internet's ability to disseminate information can create greater environmental awareness, encourage a free exchange of views, and promote participation and change. Thus, using the Internet to inform and engage the public about environment problems and solutions is an effective approach to creating awareness and working towards a more sustainable environment for future generations.

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COMMODITY FUTURES INVESTMENTS STRATEGIES AND PORTFOLIO DIVERSIFICATION

STRATEGIJE INVESTIRANJA U ROBNE FJUČERSE I DIVERSIFIKACIJA PORTFOLIA

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[1,2]Faculty of Management Zaječar

Abstract: *With the ever changing economic conditions, considering new investment opportunities has never been more important. Diversification using the commodity futures markets has been a very popular avenue investors have turned to with goals of reducing portfolio risk and realizing positive gains on their overall investment portfolios. One of the most common myths about the futures markets is that participating in them is a full-time commitment. However, the truth is, there are several simple ways to become diversified using commodities without having to compromise time from life's hectic tendencies. This paper will describe the most popular means of passively investing in commodities—commodity futures indexes—and will discuss their role in a well-diversified portfolio.*
Key words: *commodity futures, investments, portfolio, risk, return, correlation, commodity indexes, diversification*

Abstract: *Razmatranje novih investicionih mogućnosti nikad nije bilo značajnije imajući u vidu promenljive ekonomske uslove. Diversifikacija putem tržišta robnih fjučersa je veoma atraktivan način kome su se investitori okrenuli sa ciljem smanjenja rizika portfolia i ostvarenja pozitivnih reultata u ukupnom investicionon portfoliu. Jedan od najuvreženijih mitova o tržištu fjučersa je da je učestvovanje na istom vremenski veoma zahtevno. Ipak, istina je da postoji nekoliko jednostavnih načina za postizanje diversifikacije primenom roba bez ulaganja previše vremena. U ovom radu su opisana najpopularnija sredstva pasivnog investiranja u robu – indekse robnih fjučersa – i razmotrena je njihova uloga u dobro diversifikovanom portfoliu.*
Ključne reči: *robni fjučersi, investicije, portfolio, rizik, povraćaj, korelacija, robni indeksi, diversifikacija*

1. INTRODUCTION

The motivation for investing in commodity futures dates back to at least the 1930s when John Maynard Keynes proposed the theory of *normal backwardation*.[15] The theory of normal backwardation posits that futures markets are essentially insurance markets. Under the assumption that hedgers were primarily producers of commodities, Keynes reasoned that long speculators should earn a risk premium for taking on the spot price risk hedgers wished to shed. This view was debated extensively throughout the next four decades but was almost always addressed in an isolated, individual market context. The advent of Harry Markowitz's mean-variance model and the development of Sharpe's capital asset pricing model (CAPM), however, prompted new thinking on the nature of speculative returns in commodity futures markets.

The literature has traditionally dichotomized commodity futures investments as either strategic or tactical. Strategic investments, which are addressed in the next section, are usually

[15] When the futures price is below the expected future price, the situation is known as *normal backwardation*; and when the futures price is above the expected future spot price, the situation is known as *contango*.

viewed in a static context where long-only investments are considered. Strategic allocations seek to exploit the long-run characteristics among different asset classes through passive investment. Tactical opportunities, which are addressed in the following section, take advantage of the possibility that futures returns may vary in response to structural factors, such as inflation, and imply that dynamic trading schemes can be formulated in response to macroeconomic conditions and short-term aberrations.

2. COMMODITY FUTURES MARKET AND PARCITIPANTS

Commodity futures market participants have traditionally fallen into one of two groups: hedgers and speculators. Hedgers produce or consume a commodity and enter the market to reduce the risk of adverse price movements. Speculators, on the other hand, seek monetary gain by anticipating when and in what direction futures prices will move. Recently, a third group has entered the marketplace. Seeking neither to hedge risk nor to speculate on prices, these individuals invest in commodity futures as a separate asset class, not unlike someone buying stocks or bonds. [1]

Just as there are popular indexes that measure the value of groups of stocks, such as the Dow Jones industrial average (DJIA), there are indexes that do the same for commodity futures. Investors in commodity futures often seek to create a portfolio that mimics one of these indexes—thus, they are known as commodity index investors.

The amount of money associated with commodity index investing has become nontrivial. For example, the net exposure to West Texas Intermediate (WTI) crude oil was recently estimated at around $34 billion. This compares with about $217 billion for all outstanding futures and options contracts on WTI crude oil. [2]

To illustrate the rationale behind some market participants' determination that commodity futures investment is beneficial, we developed an example based on oil futures. This example shows that the benefits from investing in futures have varied over time and, at least for oil futures, appear to have diminished recently as markets have increasingly moved in sync.

The last commodities boom was partly triggered by geopolitical and economic events (such as the 1973 oil crisis) and was maintained by strong speculative and trend following investment. With every boom comes bust, and declining markets attract little investment to increase production capacity. Towards the end of this commodity bear market was the *dot-com* boom. During this time, global markets saw massive allocations of funds into high-tech companies. Commodity prices at this time were approaching all time lows; 1998 saw an oil price as low as $10 bbl, and mining companies were struggling to survive with copper prices at about $2,000 per tone. Under challenge, commodity production infrastructure struggled to cope.

When prices are low producers cannot hedge their future production against current infrastructure expenditure. As commodity prices rise, the viability of increasing investment in infrastructure, and therefore production capacity, increases. With oil prices having reached more than $70 bbl in 2007, and currently sitting not much lower at about $60 bbl, it is more viable to invest in new exploration or refineries. Several base metals have reached all-time highs in the past 12 months making it worth investing in mines and smelters. Before certain price thresholds are met it is not realistic to invest in this type of infrastructure. After the *dot-com* bubble burst in 2000 investors suffered poor returns from both equity and bond markets.

These, with fears that inflation was set to rise, gave investors cause to look elsewhere, and commodities markets saw a fresh influx of funds. In part investors were searching for yield, in part they were seeking an inflation hedge, but mainly they were looking to diversify equity- and bond-heavy portfolios. [3]

Previous under investment in infrastructure and strong demand fundamentals, primarily from China and India, resulted in a supply deficit. Importantly the short term supply of commodities is generally inelastic. Without the necessary capital, producers are unable to build production infrastructure. Even once these projects become viable they need time before they result in increased production. As initial commodity investment increased, prices crept upwards, attracting momentum and trend following investors, thus increasing demand further.

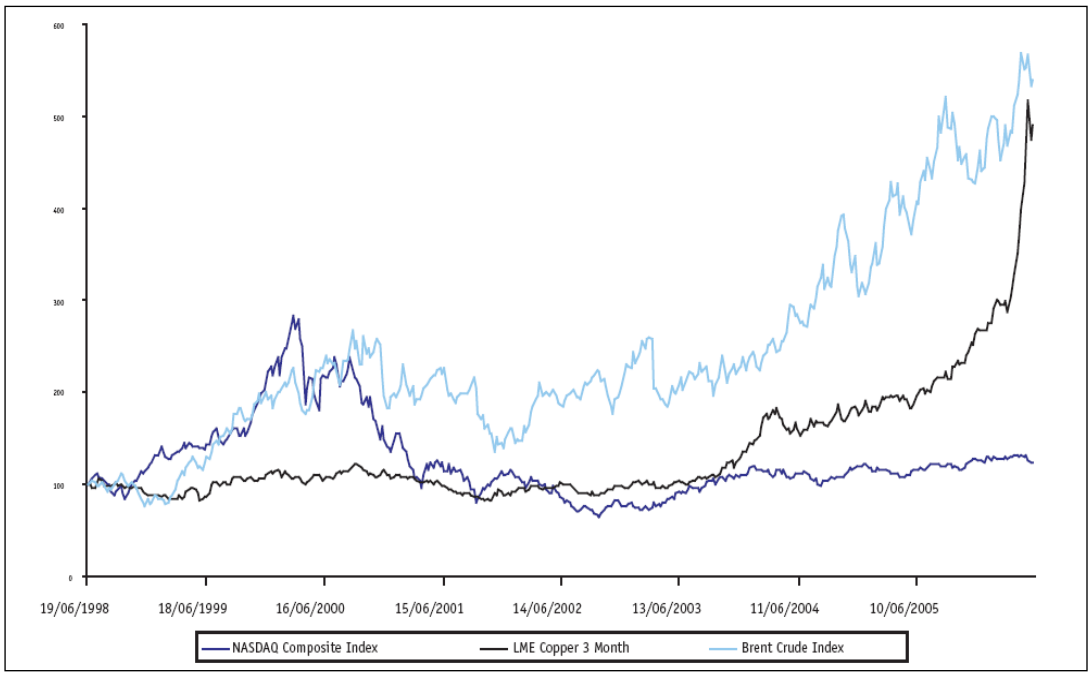

Figure 1. NASDAQ vs. LME Copper (3m) vs. Brent crude index

Figure 1. shows the price of Brent crude and copper rising following the rapid decline in the NASDAQ composite. Increased commodity prices have several effects. End consumers are adversely affected as rising costs are passed down the supply chain (recent home gas bills will attest to this). However increased prices raise the forward curve to a level where it becomes viable to hedge future production against current infrastructure projects. Current prices are running at multiples of base costs to suppliers: it costs roughly the same amount to physically extract a tone of copper now as it did two years ago, but current prices mean the producer can sell the metal for about $7.000/t now as opposed to about $3.000/t two years ago.

Figure 2 shows the forward curve available to those wishing to sell copper production into the future in December 2005 compared with that in December 2006. From Figure 2 we can see that in December 2006 a producer could sell September 2008 copper for $6,500/t, whereas just 12 months previously this forward hedge would have yielded only $3,200/t.As a result

producers are now financially strong enough to invest further in infrastructure, and in the same way that the bull run began with a supply deficit, future production should bring it to an end with a rebalancing of supply and demand. However, it is important to note that of late, and particularly in the oil industry, firms have tended to invest through buying assets of other firms, so they are not investing to increase overall global supply.

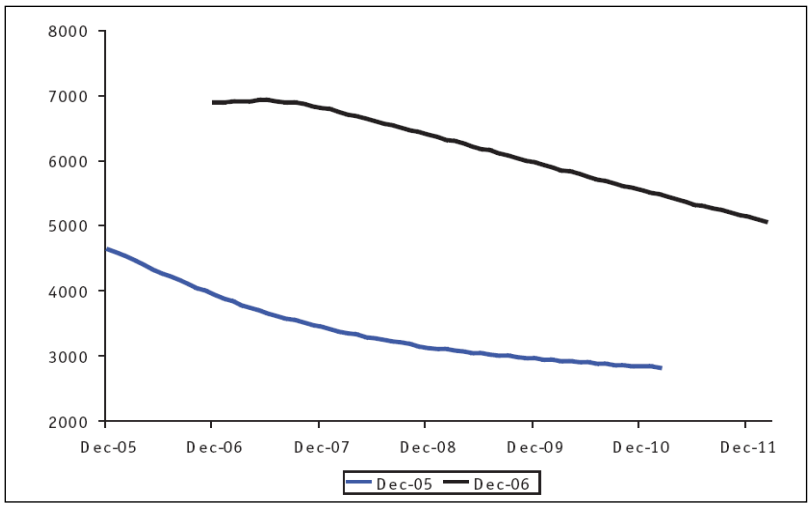

Figure 2. Sell Copper production (dec.2005 – dec.2006)

3. BENEFITS OF INVESTING IN COMMODITIES

Studies have shown that commodity price movements have traditionally been negatively correlated to price movements of other financial instruments (such as stocks or bonds), so a natural resource investment can provide important portfolio diversification. Stocks, bonds and other financial instruments have shown that they tend to follow the same trend in times of economic crisis. In addition, equities are also bound by country-specific economic pressures. In contrast, commodities such as zinc and wheat or orange juice will rarely rise and fall in parallel, regardless of economic fundamentals, and they reflect the global economy.

Figure 3. shows the negative correlation between commodities and bonds and equities over time. By being able to efficiently diversify a portfolio, a fund manager reduces the risk that the total value of their fund will decline given particular economic fundamentals. Figure 3 also shows the positive correlation between inflation and commodities. Even so, investors should be cautious. Recent price drops have led to media comment quoting commodities professionals who say that the bull run maybe over and that it would be a bad time for investors to enter this asset class. They say that with some markets now in *contango* (i.e. the spot price is lower than the futures price) in the nearby, the roll on indices has become a negative yield (see Figure 4.).

There are a number of reasons to consider investing in commodities, including low correlation to traditional asset classes, exposure to world economic growth and a potential measure of protection against unforeseen events, rising inflation and a weak U.S. dollar. Additionally,

price trends in commodities tend to last a long time. We describe each reason to consider investing in commodities in more detail below.

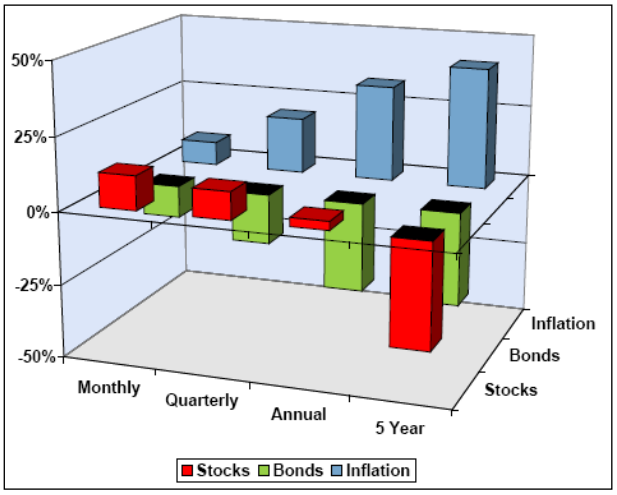

Figure 3. Correlation between commodities and a) stocks b) bonds c) inflation
Source: [1]

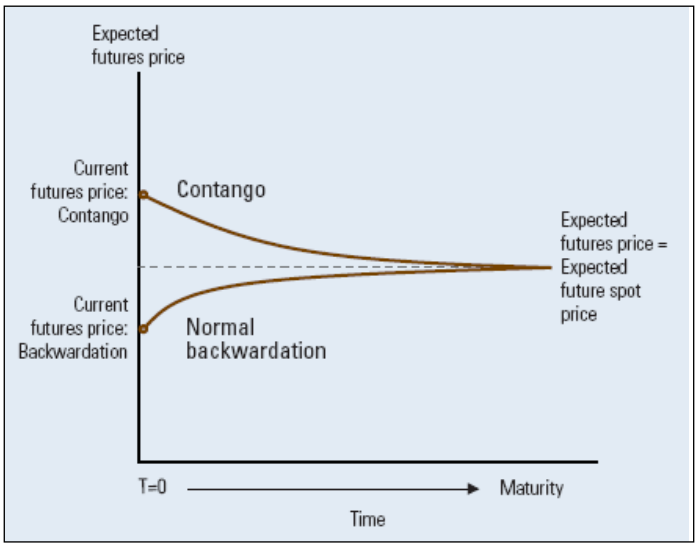

Figure 4. Normal beckwardation, contango and expected futures price
Source: [4]

In the Figure 5. commodities are represented by the Dow Jones UBS Commodity Index. *Natural resources stocks* are represented by 50% MSCI World Materials Index and 50% MSCI World Energy Index.[16] U.S. stocks are represented by the S&P 500 Index. U.S. bonds are represented by the Barclays U.S. Aggregate Index. U.S. Treasury bills are represented by the Citigroup 3-Month Treasury Bill Index. Global stocks are represented by the MSCI World Index. Global bonds are represented by the Citigroup World Government Bond Index. U.S. real estate is represented by the MSCI U.S. REIT Index. [5]

[16] Stocks of natural resources companies listed on exchanges

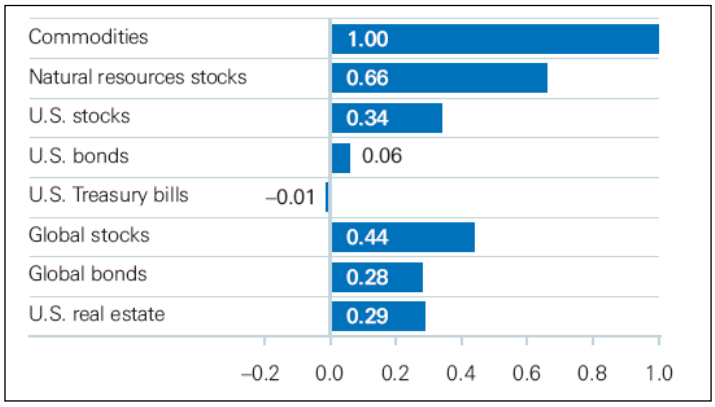

Figure 5. Correlation: commodity and other asset classes
(15-year correlation as of 9/30/12)
Source: [5]

One of the main benefits of investing in commodities is their low correlation to traditional asset classes, such as stocks and bonds. Because portfolio volatility is a function of the correlation of the combined assets in a portfolio, adding commodities to a portfolio can potentially help diversify a portfolio and thus help mitigate its overall volatility. Of course, diversification neither assures a profit nor guarantees against loss. [5] Further, and as we cite above, some commentators point to the number of leading equity indices made up by companies whose share prices are positively correlated with commodity prices, e.g. *British Petroleum* (BP) and oil prices, *Rio Tinto* and the price of copper. This means an investment manager must be very careful when seeking to have a truly diversified portfolio.

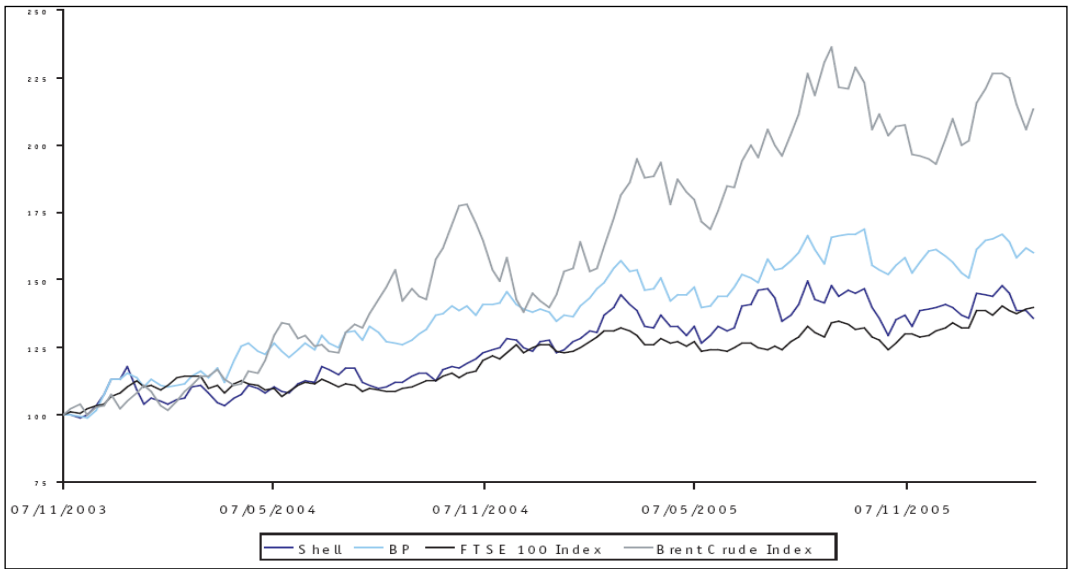

Figure 6. Correlation: Brent crude Index vs. BP stock prices vs. FTSE 100 vs. Shell stock prices

Figure 6 shows that there is a reasonably close correlation of the share prices of *Shell* and *BP* to both the FTSE100 and the price of Brent crude. Similarly Figure 7 shows the correlation between copper prices and the share prices of *X strata* and *Rio Tinto* (FTSE 100 mining companies).

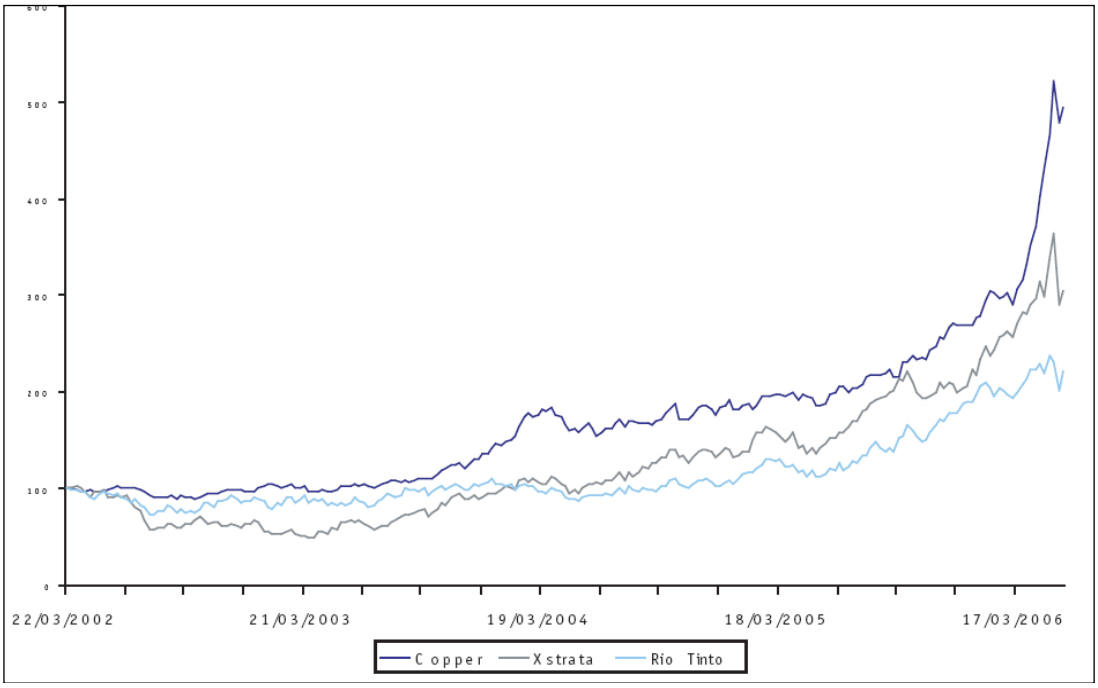

Figure 7. Correlation: Copper prices vs. X strata stock prices vs. Rio Tinto stock prices

4. COMMODITY INDEXES

An index provides a value for a variable (usually a basket of goods) on a specific date relative to the price it could command on some other date. For instance, the Standard & Poor's 500 index (S&P 500) is an index of stock prices for 500 publicly traded corporations in the U.S. Comparing the index's value on two different days provides a measure of how much the stock prices for those 500 companies have changed.

Commodity indexes are similar to stock indexes; they track the value of a group of commodity futures contracts instead of a group of stocks. The index specifies what commodities are tracked, which futures contracts are used (noting when delivery is to occur) and how the futures contracts are weighted within the index. (See *Index in Action: The S&P GSCI.*)

Most commodity indexes assume that the investor is going "long"—that is, buying a commodity that will be delivered in the future. The strategy implied by this is passive and distinguishes index investing from speculation.

When a futures contract is created, no money is exchanged between buyer and seller. The futures exchange requires both to post a deposit, although this is typically a fraction of the underlying value of the commodity involved. This means that for $1, an investor gains exposure to more than $1 worth of a commodity. To ensure that the returns from a $1 investment in commodity futures can be compared with the returns from $1 in a stock, commodity indexes often assume that an amount equal to the total dollar value of the contract is posted as a deposit. This deposit is usually in the form of a short-term government bond.

Returns on the commodity index, thus, come from two sources: the futures contract itself and the deposit.

Commodity index performance comparison

Index	# of commodities	Weighting method	Recomposition frequency
S&P GSCI	24	World production	Monthly
Rogers International Commodity Index	36	Discretion of Committee	Annual
Thomson Reuters/Jefferies CRB Index	19	Equal Weighted within broad sectors	Irregular
Dow Jones UBS Commodity Index	19	Liquidity and Production	Annual

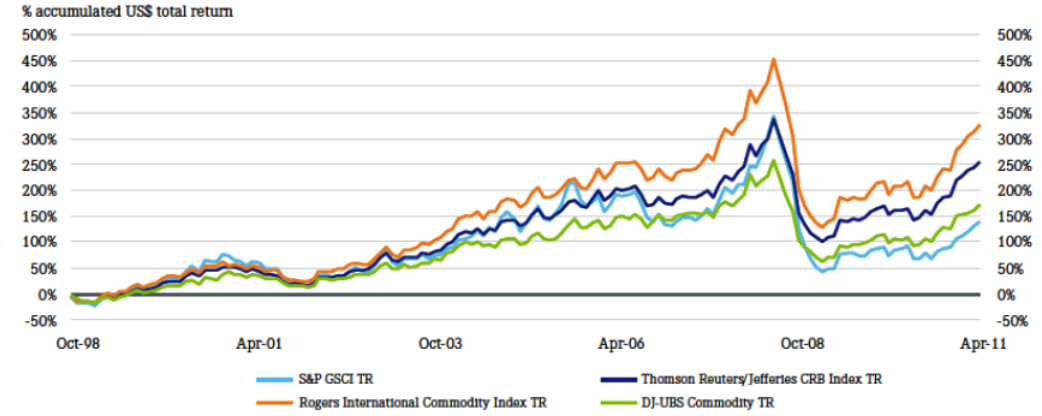

Figure 8. Commodity index performance comparison (2008-2011)
Source: [6]

Index in Action: The S&P GSCI

One real-world example of a commodity index is the S&P GSCI Index (previously known as the Goldman Sachs Commodity Index). This index tracks the value of futures contracts for 24 widely traded commodities. For each commodity, there are specific rules about which futures contracts are used. The weight of each commodity is determined by its economic significance in the global economy.

The figure below shows the weights used for broad categories of commodities in 2011. Given oil's importance, energy has the greatest weight, roughly 70.6 percent. This means that for every $1 invested, 70.6 cents goes into energy-related futures contracts. The index assumes that the collateral on the contracts is invested in Treasury bills (short-term U.S. government debt).

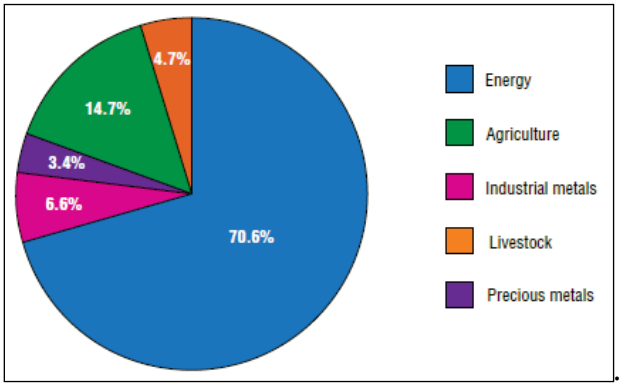

Figure 9: S&P GSCI weights (2011)

Source: [7]

5. WHY COMMODITY FUTURES?

Why might an investor want to add commodity futures to a portfolio? Diversification could be one reason. Correlation measures the degree to which two variables move together. If commodity futures returns have a low or negative correlation with returns from stocks, a portfolio that contains both may be a better choice than one composed of only stocks or commodity futures.

To show how this works, consider a simple example using the S&P 500 index and a commodity index constructed to contain only futures for crude oil—specifically, contracts for NYMEX WTI (West Texas Intermediate crude oil traded on the New York Mercantile Exchange) [8]. Figure 9 shows the inflation-adjusted values for the S&P 500 and our index of oil futures from 1984 to February 2012.

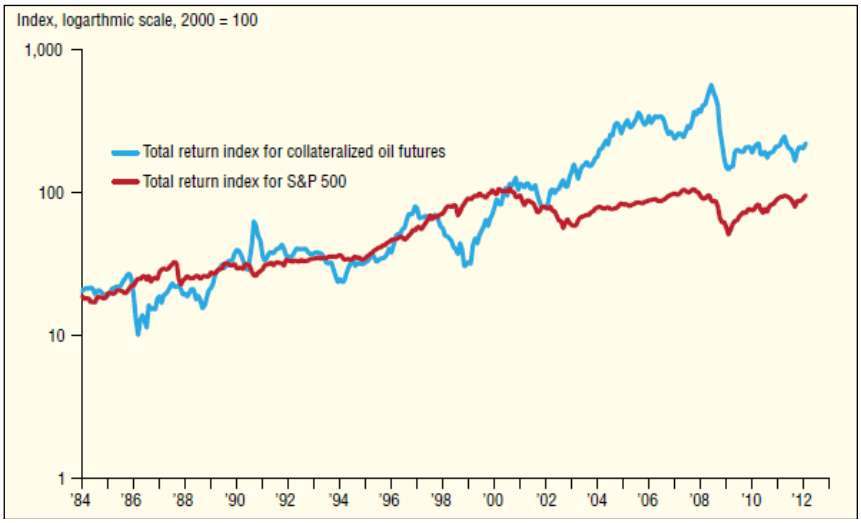

Figure10. Oil Index Shows Greater Volatility than S&P 500

Source: [9]

The S&P 500 had an average annualized return of 7.1 percent per month and the oil index an average return of 14.1 percent per month. While the average return on the oil index was

greater, the volatility associated with that index was also higher because the dispersion of individual returns from the oil index around their average was much wider. This implies that there was greater uncertainty associated with the returns in any given month when compared with stocks. The oil index is also visibly more volatile than the S&P 500 in Figure 10.

The closer to zero the correlation between the returns, the less the returns move together and the greater the diversification benefit achieved by combining assets in a portfolio. The correlation between the returns on the oil index and the S&P 500 over this period was low, approximately 5 percent. This suggests there could be a benefit to having both assets in a portfolio as opposed to just one or the other.

To examine the validity of this claim, we calculate the average returns and volatility associated with various portfolio combinations ranging from a portfolio entirely weighted toward the S&P 500 to one entirely weighted toward oil. We then plot these data to create what is called the "efficient frontier" (Figure 11).

Point A represents the all-stock portfolio; point D, the all-oil portfolio. It is clear that, at least over this time period, an investor would have been better off moving away from the all-stock portfolio (A) to a portfolio with a small weighting to an oil index, such as point C. This is because point C, for a similar amount of risk (depicted by the standard deviation), increased the average return by an additional 2 percent.

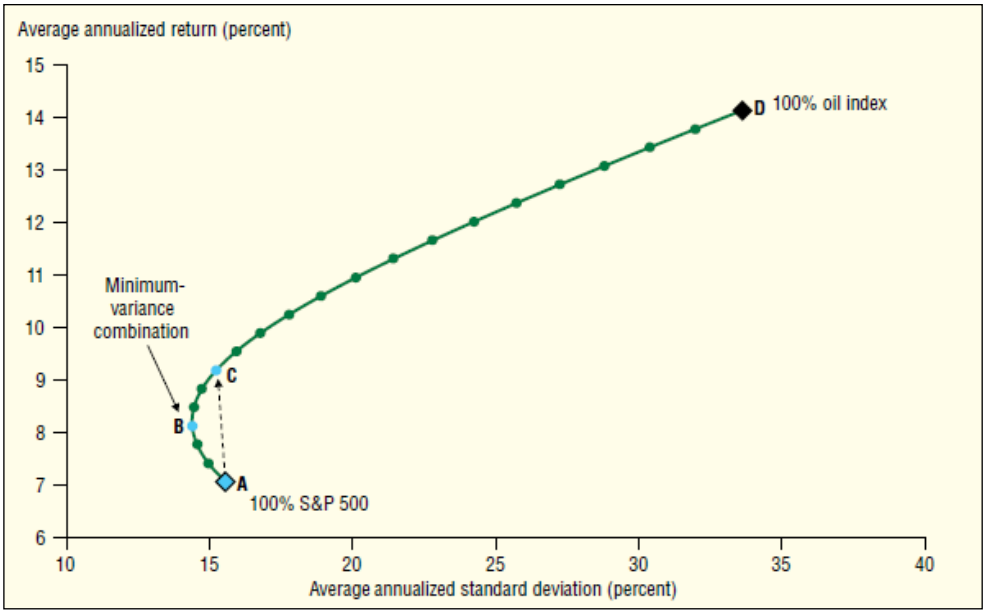

Figure11. Combining oil futures, stocks may aid returns, cut risk

Source: [9]

One might wonder if the same benefit can be derived from simply investing in the stock of commodity-producing companies. Although we do not investigate that here, several factors might cause their returns to differ. For one, commodity-producing companies may hedge the price they receive for their production, eliminating exposure to the commodity price. Additionally, commodity-producing companies are affected by factors besides the price of the

commodity they produce; company management plays a role, as does the firm's capital and debt structure.

6. DIVERSIFICATION POTENCIAL REDUCED

Given the significant changes that have occurred in the global economy and the increased interest in commodity futures markets, one might wonder whether diversification benefits have changed over time. For example, if crude oil futures respond to macroeconomic news to a greater extent now, the returns from them might be more correlated with stock returns than before.

To explore this question, we look at the efficient frontiers created using data over our entire sample, from 1984 to the present, as well as those created using data over just the past 10 and five years. The resulting efficient frontiers are displayed in Figure 12.

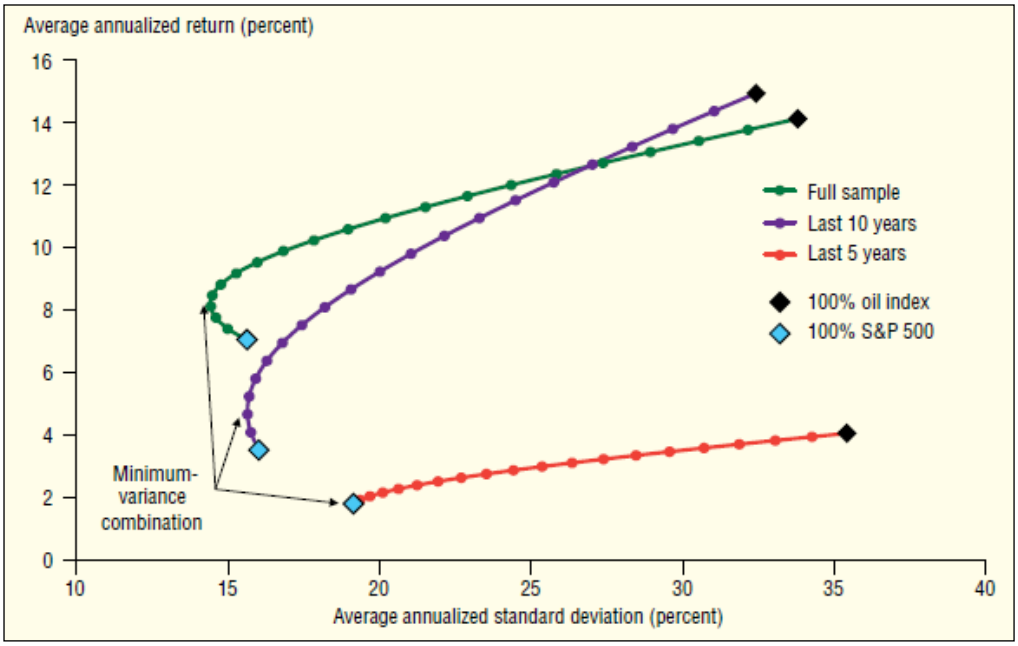

Figure 12. Efficient frontier varies over time

Source: [9]

The frontiers created using the full sample and the recent 10-year period show that, in both cases, it would have been beneficial to hold at least a small portion of the oil index in combination with stocks. However, the proportion of the minimum-variance portfolio dedicated to the oil index decreased in the more recent time frame.

An even more distinct shift comes when we examine the frontier created using data from the recent five-year period. As one might expect when looking at this bumpy time for stock and bond markets, the average return declined significantly while volatility rose. During this period, little diversification benefit was gained by holding the oil index because the minimum-variance portfolio was one composed of only stocks.

These results may not be surprising when we consider what has happened to the correlations between the returns. The correlation averaged about 28 percent over the past 10 years and 56

percent over the past five. While the diversification benefits achieved by combining the two assets in a portfolio were reduced, this may or may not hold for other commodities or commodity indexes.

Clearly, the possibility of higher returns and less volatility is an important rationale for commodity index investing. An important finding, however, is that these benefits appear to vary over time. Investors trying to diversify their portfolios by including commodity futures should bear this in mind.

CONCLUSION

In an environment of historically low interest rates, markedly reduced upward potential, and continuously decreasing risk premiums for traditional asset classes, there is growing demand from institutional and private investors for alternative investments. An allocation to commodities offers not only a hedge against inflation, but also effective portfolio diversification because of its low correlation with traditional asset classes.

In the long run, commodity investments show equity-like returns, but are accompanied by lower volatility and shortfall risk. The advantages hold for passive investment in commodity futures indexes, which are considered indicators of commodity market price movements. However, the futures indexes of individual providers differ with regard to sector weights, index construction, and calculation method—hence there are tremendous variations in risk-return characteristics.

In a total and excess return index, an important return component results from the risk premium connected with the roll yield. This results from rolling commodity futures positions with a backwardated term structure. A direct investment in commodities generates positive roll returns in certain backwardated markets. Investors in passive commodity futures indexes must take into account that, independent from the term structure curve, only long positions can be held.

In view of current global market demand, we assume that the growth of commodity consumption, particularly in the BRICS countries (Brazil, India, Russia, China and South Africa) will continue to generate high demand for commodities in all sectors. But because low commodity prices over the last two decades did not lead to sufficient investment in increased production capacity, we expect that pricing pressure on the commodity markets will intensify. In addition, we expect to see short-run scarcity in the commodity supply due to increasing inventories. In light of this tremendous development and according to the commodity super cycle theory, we predict a lasting boom in the commodity markets in the near future.

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METHODS AND PROCESSES OF ENVIRONMENTAL MANAGEMENT IN FUNCTION OF SUSTAINABLE DEVELOPMENT

METODE I PROCESI EKOLOŠKOG MENADŽMENTA U FUNKCIJI ODRŽIVOG RAZVOJA

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Abstract: *Environmental management is a modern system of management. The main objective of this system is the elimination of negative influences and trends, that are related to human health. Increasing the exploitation and processing of natural resources leads to the increasing amount of various waste materials and objects in the environment. Therefore, it is necessary to radically change the current rate of exploitation of natural resources, and on that way direct the further development strategy of scientific-technical and technological processes. From the viewpoint of environmental management, sustainable development could be defined as the management of natural resources in a way that ensures their long-term quality and sufficiency. The paper will put emphasis on the role of eco management in terms of sustainable development, as well as the principles and the basic principles that eco-management relies in environmental protection and sustainable development.*
Key words: *Environmental management, health, sustainable development, environment.*

Apstrakt: *Ekološki menadžment predstavlja savremeni sistem modernog menadžmenta. Glavni cilj takvog sistema jeste eliminisanje negativnih uticaja i tendencija, koji se odnose na zdravlje ljudi. Rastućom eksploatacijom i preradomprirodnih resursa dolazi do uvećanja količina raznih otpadnih predmeta imaterija u prirodnoj sredini.Zato je neophodno radikalno izmeniti sadašnji tempo eksploatacije prirodnihbogatstava i u tom pravcu usmeriti dalji pravacnaučno-tehničkog itehnološkog procesa. Sa stanovišta ekološkog menadžmenta, održivi razvoj bi se mogao definisati kao upravljanje prirodnim resursima na takav način koji osigurava njihov dugoročni kvalitet i dovoljnost. U radu će se akcenat staviti na ulogu ekomenadžmenta u funkciji održivog razvoja, kao i na principe i osnovne postulate na koje se eko menadžment oslanja u zaštiti životne sredine i u održivom razvoju.*
Ključne reči: *Ekološki menadžment, zdravlje ljudi, održivi razvoj, životna sredina.*

1. INTRODUCTION

The concept of sustainable development implies a balanced economic, social and cultural development without harming the environment (Figure 1) [1]. It must be considered that the modern world is faced with the challenge of global, shared responsibility for development in accordance with the needs of humans and nature and because of that, there exist moral reasons for today's generation to be strong in terms of adequate opportunities for future growth and survival of offspring.

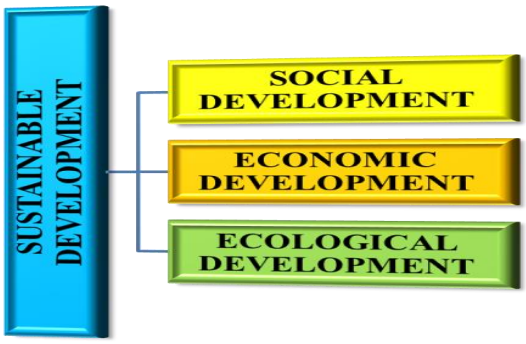

Figure 1. Concept of sustainable development
Source: [1]

In this way, future generations would be able to facilitate the development of the same or higher level. So, we can say that the essence of the concept of sustainable development is made of the correlation of economic development and environmental issuesrespecting laws of ecological systems, that is also shown in figure 2 [2] .

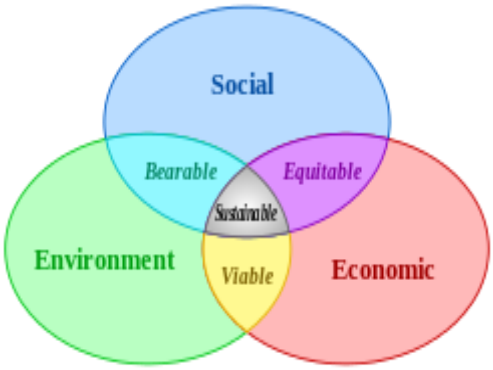

Figure 2. Essence of the concept of sustainable development
Source: [2]

This concept is aimed at the rational use of natural resources of the state and accordingly, raising the quality of environment and quality of life. In order to achieve sustainable development, it is necessary to establish new social values based on knowledge, creativity and skills of human resources, inother word, the creation of a quality management that the current society is transformed into a learning society [1]. This line of reasoning is based on the fundamental principle of moral justice, inother word that all people have equal rights in the broadest freedoms that do not contradict the freedom of others. Right of the present generation to use resources and a healthy environment may endanger the same rights of future generations [2] .

2. PRINCIPLES AND DEFINITIONS OF ENVIRONMENTAL MANAGEMENT

Eco management can be defined as the process of allocation of natural and artificial resources, but in way to achieve optimum use of the environment, to meet basic human needs to a minimum and if it is possible, on a sustainable basis. Many authors have discussed

environmental management methods in the papers and example of that are reviews include [3-6]. Eco management represents a form of control of all human activities that have a significant impact on the environment. In other words, environmental management involves decision-making process, that is regulated by the impact of human activity on the premises. The basis of the concept of sustainability a central place occupies capacity utilization of the environment for human progress and development, but in ways that the environment is not damaged and completely exhausted. Management of environmental quality is a complex multidisciplinary task based on the strategic principles of sustainable urban development and it can be successfully achieved if there is a well-conceived eco management in the environment. Conservation and environmental management are an integral part of management - management at all organizational levels and in all business functions. In that way, management should introduce a continuous process that must be coordinated with social and economic processes (employee safety, health, and others.). Principles and elements of environmental management use the following strategies [7]:

1. environmental policy,
2. planning,
3. introduction and implementation,
4. checking and corrective action,
5. review and improvement, and
6. continuous improvement

In each of the aforementioned strategies of environmental management, there are four basic stages:

1. identification phase - obtaining information on the potential effects of pollution,
2. phase monitoring - monitoring and direct measurements of pollutants, the extent and localization,
3. evaluation phase - ends in the sum of all the information related to the environment have been obtained in the earlier stages and
4. phase control - application of various instruments and measures for effective environmental management.

To direct the desired state of the environment in the future, it must be used prognostic-planning methods and models to management led to an exact level. Therefore, it is necessary to influence the development of methods of environmental management, both at the theoretical level and at the level of regulations, standards and guidelines. The management model must show a good relationship between the parties (the competent government authorities) and object management (environmental elements), asset management (laws and plans), and position management instruments (regulations, standards, offer standards, criteria, and information) [8]. Implementation of planning solutions, based on the harmonized application of instruments and measures in different areas of directing the development, construction, land use and environmental protection, must be conducted. Figure 3 shows the main aspects and levels of environmental management of these areas, such as economic, technical, institutional, legal and aspects of information system [9].

Figure 3. Aspects and levels of Environmental management
Source: [9]

3. KNOWLEDGE – BASE OF SOCIETY

Creation of the knowledge-based society and sustainable development means encouraging coordination among the key factors that include: investment in education, research and development and putting into practice of research results. Using information and communication technologies is also a way to expand and acquire knowledge. The level of education of the entire population is one of the main factors that influence the formation of social knowledge base. In this regard, at the level of society, the improvement of the higher education system should be done, and on the company level can be done adequate training and human resources training. Management has the key role in the education of human resources, that should also be well educated.

Looking at history, economic development was based primarily on the dominant share of natural factors and physical work within the concept of an agrarian society. During the expansion of industrial society, both in production and in commercial activities, the most important factor of production was the real and financial capital (money, industrial equipment, energy). Technological development has led to the fact that the share of physical labor, and the material and technology, as well as natural and financial resources gradually lost its importance. During the twentieth century, we began to speak of a "post-industrial society", "information society" and so on. "Weightless economy" was dominated by intangible factors [7]. In a society whose economy is based on knowledge, as the capital braced and comparative advantage, a key factor of production becomes a costly, complex and intangible factor. Information, skills and work culture are the factors that have a growing economic impact and are gaining a higher market value. Major changes concerning formation, collection, creation, processing and usage of information, are occurring these days, and are caused by the expansion of the service sector information. Massive supply and increased availability of services based on information, are leading to a rapid reduction of their price, and in the meanwhile open the possibility of their use by any number of users worldwide. This fact leads to the conclusion that knowledge is unlimited, and that by sharing it can be increased and enriched. Therefore it is necessary only to know how to use it, without good and quality management both at micro and macro level that is impossible to achieve [8].

4. ENVIRONMENTAL ETHICS AND PRINCIPLES OF SUSTAINABLE DEVELOPMENT

Today's civilization was developed on the paradigm of continuous material growth, thus encouraging the unscrupulous use of natural resources. To the consequences of this way of thinking and behavior we are more than familiar. Humanity is entering the third millennium with the major ecological problems at global levels. We will mention some of these concerns [10]:

1. damage to the biosphere and its ecosystems,
2. huge population expansion - in the year 2040. it is expected to be 10 billion people,
3. global climate change,
4. exhaustion of natural resources ,
5. insurmountable amounts of waste,
6. damage to human health etc.

On the one hand, there is industrialization to improve the standard of living, but on the other hand it has a negative impact on the environment and on human health. The inevitable has been finally understood that is the issue of further survival strategy, a different attitude towards the environment has been set. In fact, the environmental crisis is just part or a parcel of the great events of a civilization. First of all, it is part of a profound crisis of modes of production, consumption patterns and economic growth, while basic human values are lost**.** That way of life has unbalanced the society, and the man is out of balance with nature. Shaken balance can be restored by fundamental socio-cultural changes in the mode of production and consumption.

5. STRATEGY DEVELOPMENT AND ENVIRONMENTAL POLICY

Preservation and enhancement of environmental protection are a necessity in today's world. Reducing pollution and environmental pressure, is achieved by using naturalresources by economic and other subject, but in such a way as to ensure their availability for future generations. For this purpose, there must be a good strategy for the development of environmental protection. The company or companies, as well as the management at the social level, should rely on the following postulates:

1. The establishment of the protection and sustainable use of natural resources, i.e. resources which include: air, water, land, minerals, forests, etc.;
2. Strengthening of interplay and achieving significant effects between environmental and development policies of other sectors;
3. Investing in the reduction of environmental pollution and the development of clean technologies;
4. Reducing high energy intensity of the economy of the Republic of Serbia and the efficient use of fossil fuels;
5. Encouraging the use of renewable energy sources;
6. Planning of sustainable production and consumption and reducing waste per unit of product;
7. Protection and conservation of biodiversity.

Enumerated elements as environmental factors depend largely on social responsibility for sustainable development. Establishing a system of environmental management in enterprises, the maintenance and continuous improvement, with the improvement of service quality, is one of the priority tasks in the achieving long-term business policy. Contributions to environmental protection enterprise can be achieved by preventing or reducing the adverse impacts of its activities, processes and services. In order to make environmental policy a reality, take the following measures (e.g. company, MIVA, "Inđija) [11]:

1. Enforcement of laws and regulations on environmental protection,
2. Constant improving of the work organization aimed at the rational use of materials, energy and water, as well as reducing emissions and preventing water pollution and soil,
3. Striving to reduce and eliminate overall waste, which cannot be processed in a manner that does not endanger the environment,
4. Continuous improvement of the environmental protection performance,
5. Training in the field of environmental protection in order to acquire new knowledge and raise awareness of all employees about the importance of its preservation,
6. Establishing effective communication with all stakeholders and other relevant organizations in order to improve the exchange of information relevant to the environment,
7. Influence on subcontractors and suppliers in order to take action to protect the environment,
8. Policy of protecting the environment being available to public.

To realize these goals, it is necessary to establish a system of environmental management according to SRPS ISO 14001:2005. In businesses, top management should take responsibility for the implementation of this policy.

6. FEATURES OF CLEAN PRODUCTION

During the sixties of the 20th century Solid Waste Management (UCO) has become the subject of increased interest in the world[12]. Now days we are more concerned about taking appropriate measures to mitigate pollution process. Industrial processes that pollute the environment can be mitigated by using one of two basic approaches: the application of technical solutions based on the control of pollution, pollution treatment technologies, at the end of the production process ("end-of-pipe" technologies, EOP) and the prevention of pollution - cleaner production. In the last two decades, approaches based on pollution control are replaced by strategies based on preventing the creation of pollution. Cleaner production is a modern approach for avoiding the pollution that has made the biggest contribution in the manufacturing sector but also in other industries. It is part of the concept of sustainable development that takes into account the fact of the limited capacity of the environment to accept a certain amount of pollutants so that no irreparable damage to the environment is being done. Developed countries are gradually making changes in their environments and transforming their approach to pollution control activities; based on cleaner production.

Developing countries have much lower levels of pollution control and in front of them is far more difficult task to introduce these changes relatively quickly and efficiently. The goal of pollution prevention and cleaner production is an effective reduction of air, water and soil and waste reduction. Cleaner production has decreased levels of resource use by the means of the development of new, cleaner products and production methods. It can be described as a superior approach to the EOP technology for its applying the principles of prevention of environmental pollution and economic reasons. The development of cleaner production approach and the introduction of cleaner technologies in production processes are often limited by internal organizational weaknesses of the company. New technologies typically require a significant investment, which is also a limiting factor. Cleaner production is focused on the causes of the problems related to the environment, rather than on the consequences and not only deals with the processes of production, but can also be applied to the entire product life cycle, from the beginning of its development, by the phase of its consumption and the phase of disposal. Its use requires a change in behavior, responsible environmental management, development and implementation of appropriate policies and constant evaluation of different technology options.

7. BIODIVERSITY CONSERVATION

Gradual extinction of some and the formation of other species is an evolutionary process. The fact is that man today, by a number of its activities, is becoming a major cause of extinction and downsizing of many plant and animal species. Among the factors that have negative impact on biodiversity may be given the destruction and disruption of habitat and poor management of land (agricultural land expansion, fires, unplanned deforestation, inadequate afforestation, land reclamation works, urbanization and infrastructure construction), over-exploitation of species (picking, hunting, fishing), illegal trade, introduction of alien species, the occurrence of invasive species and pollution of water, air and soil. Any changes that lead to a reduction in biological diversity, which have so far been recorded in the world are expressed, to a greater or lesser extent, in Serbia [13]. The protection of biodiversity is a set by establishing policies and procedures, by which endangered plant and animal species are protected against the negative effects of man. They are made from a variety of methods and activities that go into the field of science, law and the biological disciplines and can be divided into three parts, namely: the scientific basis for the protection of endangered species, such as legal protection of endangered species; practical measures to protect endangered species [14]. Protection of endangered species on a scientific basis is achieved by the so-called Red List 'and' Red Book '. Red List and Red Book contain the basic information in the form of tables on endangered species and the degree of their vulnerability in a certain territory, or significant publication based the measures of protection. The threatened species is classified into categories proposed by the International Union for Conservation of Nature (IUCN).

Among such documents is 'Red Book of Serbian Flora " from 1999. Legal protection of endangered species is related to the legal documents (laws, decrees, declarations, codes, etc.) at the international or national level, upon which endangered species, depending on the level of risk, are given the level of legal protection. Practical measures to protect endangered

species can be divided into: 'In-situ' protection - maintenance of populations in their natural habitats (reserves, parks),, Ex situ "protection - the cultivation of certain populations outside their natural habitat (botanical gardens, gene banks and laboratories); reintroduction – restoring of endangered species in their natural habitats; introduction – the attempt of artificial populating species in the area that is not a natural habitat, education and presentation of results and findings.

8. CORPORATE SOCIAL RESPONSIBILITY IN SUSTAINABLE DEVELOPMENT

Corporate Social Responsibility (CSR) is, in essence, a new awareness of the importance of the position and that companies have in the modern, global society, and it is reflected in the liability resulting from such awareness. The practice of such business relates to the overall operation of a company,i.e.: What products to buy and sell, if you obey the law as it relates to employees to invest in the local community and how they contribute to the conservation of the environment [15]. Corporate social responsibility can bring the following business benefits:

1. protect and enhance existing resources (human capital, or environment) that influence the company's operations;
2. predicting, avoiding and minimizing business risks and related costs;
3. increase the effectiveness of financial companies reduce costs;
4. Opening new business opportunities and new markets;
5. protection, development and improvement of the reputation of the company, particularly in relation to consumers;
6. company becomes more attractive to investors, educated and motivated workers.

There are many arguments in favor of the fact that there is a real interest of companies for socially responsible behavior. The first thing is definitely a reputation which is directly linked to the value of the company. The second argument is related to the motivation of the employees. Productivity of the company can contribute to investment in education, working conditions and the adoption of good interpersonal relationships. Being socially responsible means not only fulfilling legal obligation, but more than that; invest in human capital, the environment and relationships with other stakeholders. The need to implement the concept of social responsibility in business management occurs due to the increasing pressure of the state, consumers employees and other stakeholders in order to protect the environment, employment, human rights and the like.

Key constraints broader implementation of the concept of corporate social responsibility in local conditions are usually: unstable political conditions, inadequate legislative framework, lack of information on the benefits and potential applications, the lack of support of the state and other institutional infrastructure management and employee resistance, insufficient support from financial institutions [16]. As a result of the increasing importance of economic activities in the social and environmental conditions in Serbia these topics are increasingly coming to the fore. Actors from all sectors are beginning to think and talk about concepts such as sustainable development, corporate social responsibility and commitment of resources in all sectors of general value to the social good [17] .

9. CONCLUSION

In recent years, the problems of urban development and environmental protection in our country are becoming very complex, in the first due to the dramatic political and social change, deepening socio-economic crisis and a very large population migration. Limitations of realistic development strategy in the long run, in terms of efficient and rational planning, utilization, organization and legal system is a major drawback, since in space nothing happens that is not interacting with the socio-economic development processes. Bearing in mind that planning is the key in the system of management of change in the environment, to determine the framework for the formulation of strategies eco management in new and changing conditions. Business in a global economy must be based on the principles of social responsibility and compliance with the requirements for the maintenance and improvement of the environment. The guidelines define sustainable development at the global level, which should strike a balance between the goals of economic development on the one hand and social development on the other hand, taking into account the need to protect the environment. All this affects the businesses to make serious commitments to meeting the objectives of a number of stakeholders in their environment. The near future points to the need to incorporate the concept of social responsibility into practice of the companies. In this regard, the proposed approach eco management in planning, providing complex environmental problem solving and greater flexibility in decision-making.

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THE STRATEGIC IMPORTANCE OF INTRODUCING THE INDUSTRIAL ECOLOGY PRINCIPLES IN INDUSTRIAL SYSTEMS

STRATEŠKI ZNAČAJ UVOĐENJA PRINCIPA INDUSTRIJSKE EKOLOGIJE U INDUSTRIJSKE SISTEME

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Abstract: *There are ecological to aspects between the industrial system and the environment and there are economic aspects between industrial systems and man.. Industrial ecology is a systemic view of the interaction between industrial and ecological systems. Taking responsibility for the consequences of professional intervention is one of the basic principles of industrial ecology. The paper defines the objectives and importance of industrial ecology and explains its role in the industry.*
Keywords: *ecology, systems, industry.*

Apstrakt: *Između industrijskog sisetma i prirode postoje ekološki aspekti a između industrijskih sistema i čoveka ekonomski aspekti. Industrijska ekologija predstavlja sistemski pogled na interakciju između industrijskih i ekoloških sistema. Preuzimanje odgovornosti za posledice profesionalnih intervencija predstavlja jedan od osnovnih principa industrijske ekologije. U radu su definisani ciljevi i značaj industrijske ekologije i objašnjena je njena uloga u industriji.*
Ključne reči: *ekologija, sistemi, industrija.*

1. INTRODUCTION

One of the prejudices is that the protection of the environment comes into conflict with the interests of economic development - GDP growth, standard of living, job creation. However, at the current level of economic and environmental sciences, the necessity to integrate environmental requirements into the national and global economic development policy is generally accepted, both at the level of individual countries, and at a global international level as well. Ecological crisis is the result of exceeding the tolerance limits of the global natural system. In fact, it is a crisis of existence of the modern society in relation to the already frustrated native environment. The standpoint that ecological crisis issocially conditioned has long been the common denominator of most theoretical approaches. Since social context is inevitable in interpreting the environmental crisis, it is understandable that this is where we may look for the possible scenarios ofprogress. The environmentally-friendly form of society is still being sought for, and the concept of sustainable development is one of the possible solutions.

Industrial ecology advocates the concept of sustainability by promoting the sustainable use of resources i.e. minimal energy use and reduced use of non-renewable resources so that planned activities should be certain for a long time. The task of industrial ecology is primarily the change of the industrial processes linear nature by which raw materials provide products, by-products and waste in a cyclic process in which waste becomes the input material for another process which leads to increasing its efficiency and reducing the strain on natural resources.

2. THE CONCEPT AND DEFINITION OF INDUSTRIAL ECOLOGY

The term *industrial ecology* emerged in developed countries in the late 1960's and early 1970's. The term itself presents a belief that modern industrial activity has to explain its impact on the environment. According to the principles of ecology, ecosystems continually recycle matter in its own perpetuated cycle. Given this fact, it can be said that these principles paved the way for the development of *industrial ecology* as a separate scientific field within the protection of the environment. The problem of protecting and preserving the environment is a systemic problem and therefore requires a systematic approach that can only be provided by a complete review and problem identification. Accordingly, the development of industrial ecology is an attempt to provide a new conceptual framework for understanding the impact of industrial systems and processes on the environment. This new framework is used for identification, and then implementation of the strategies to reduce the impact on the environment of products and processes which are associated with industrial systems with the ultimate goal of sustainable development [1].

Industrial ecology studies the physical, chemical, and biological interactions and their relationships within and between industrial and ecological systems. At the same time it studies the movement of mass and energy through industrial systems and their transformation during the manufacturing processes. Most authors believe that industrial ecology should combine the problem identification, solution strategy and thereby enable harmonious functioning of the industrial systems according to the principle of sustainable ecosystems. Therefore, when it comes to industrial ecology as a separate scientific field, it can simply be said that it is the study of the interaction between industrial and ecological systems. However, it should be noted that the focus of study may be at different levels of the system which is the fact that brought the field the status of a scientific discipline [2]. When it comes to industrial ecology there is still not a generally accepted definition. However, most of them contain similar attributes with special emphasis on some of them and they are:

- systemic view on the interaction between industrial and ecological systems;
- studying the flows of materials and energy and their transformations;
- a multidisciplinary approach;
- change from linear (open) processes to cyclical (closed) processes, so that the waste from one industry could be raw materials or input for other industries;
- reducing the impact of industrial systems on natural ecosystems;
- reducing the environmental impact of industrial systems on natural ecosystems;
- integrating industrial activity into ecological systems;
- the idea of creating an efficient industrial system modeled after sustainable natural ecosystems;
- systems identification and their comparison with the natural systems that indicate the field of potential research and activities [3].

The lack of clear and uniform definition shows that it is still a new field of a multidisciplinary science. Given the foregoing, in defining industrial ecology, it is necessary to consolidate all previous definitions into a unified one.

3. THE RELATIONSHIP BETWEEN INDUSTRIAL SYSTEMS, PRODUCTION AND ECOLOGY

When analyzing the relationship between industrial systems, production and ecology, it is thought that environmental protection comes into conflict with the needs of economic growth and living standards. However, the experience of rich countries confirms that the capital invested in environmental protection, energy saving and development of clean environment, reduces the cost of the depletion and degradation of the environment and human health, and thus highlights the importance of the prevention invested. An industrial system cannot be dissociated from the society and nature. The literature often emphasizes the three interrelated systems [4]:

1) the industrial system,
2) the human community (the society),
3) the natural system.

There are ecological aspects between the industrial system and nature, economic aspects between the industrial system and the human community while between human communities and nature we speak about humane and ecological aspects. But in the end it is necessary to identify the most complex aspect andit is the social and environmental one. The social and environmental aspect includes the following relationships: the nature provides resources to the community which through work inputs them into the industrial system, the system offers products and services to the community and by using them the community once again affects the environment.

It is in the field of these relations that the basic task of industrial ecology is crystallized and that is the evaluation of industrial systems with the mediation between nature and man. In line with this, the most important role is reflected in the elaboration of the elements of environmental risk. This fact of individual and social life, ie. risk, in fact presents the probability of events that cause injury to people, their property and the environment. The elements of environmental risk include [5]:

- Economic Development Strategy (of a region, community),
- the state of industrial development in certain regions,
- locations of industrial facilities,
- types of production - ie. presence of toxic materials,
- training, environmental education and competence of the people,
- preventive measures of environmental protection,
- the organization of the overall system of environmental security.

In contemporary business process, a clear perception of the problems that affect human life and nature is very important. So, it is of great importance to properly manage material and energy consumption as well as to adequately direct them towards appropriate business systems. Starting from these directions, industrial ecology sets itself the task of changing the linear nature of the industrial system by which raw materials are used to obtain products, by-products and waste into a cyclic system, which takes waste as new energy, raw material or process. So, for a cyclic system, waste becomes a raw material input for the next process, which leads to increased efficiency and reduced burden on nature [6]. Recycling as an

important method of environmental management, redirects part of the output towards reproduction, and not towards waste or harmful emissions. However, sustainable management and use of resources increasingly require the use of multi-dimensional models that are represented by a complex network of relationships and interrelations between companies and certain industries.

An example of a complex industrial process can be seen in the eco-industrial corporation in Kalundborg (Denmark), in which processes are networked and which mutually exchange – by-products, waste and energy. Namely, a thermal power plant, refinery, plasterboard factory, sulfuric acid production plant, cement factory, pharmaceutical factory, fertilizer factory, fishery, biotechnology plant and local heating plantare part of the complex of the Danish eco-industrial park. Such a symbiosis of industry, agriculture and service processes with profitable conversion of by-products and waste materials into raw materials and resources achieves economic growth and improves the quality of the environment [7].

4. ECONOMIC AND ECOLOGICAL VIEWS ON PRODUCTION

Economic view on production is reflected in the transformation of raw materials into finished products. This "straight line" process from raw material to the finished product creates byproducts, pollution and waste. In addition, once the products are worn out, they also become waste. In the past, economic theory generally did not pay attention to what is going on with waste. The economy of the environment and resources can be seen as an effort to respond to the "free ends" of the production process – resource inputs and waste outputs. So, the whole economic process can be seen as embedded in a wider set of ecosystem processes.

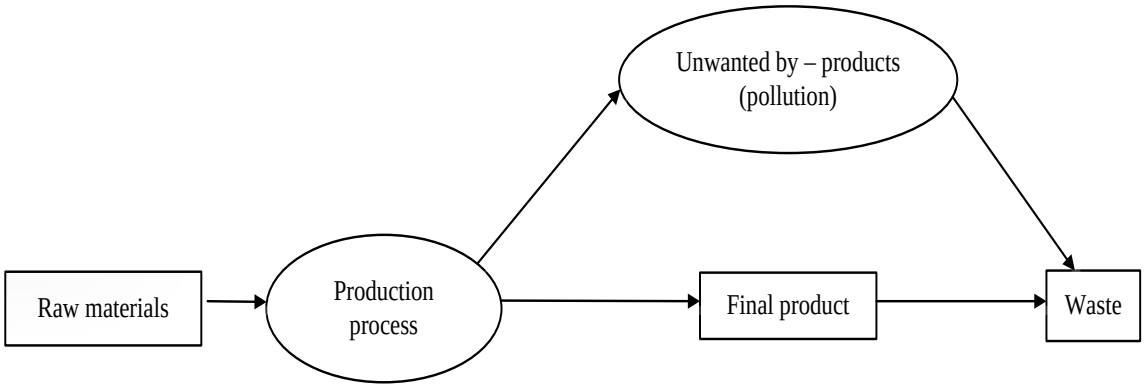

Figure 1. „Linear“ – traditional industrial process [8]

Unlike economic systems, natural systems take into account cyclic patterns, and the waste is recycled and used again. Accordingly, healthy natural systems show no accumulation of pollution and waste. Inorganic systems, such as water and nitrogen, circulate through the system. Dead and rotting organic matter creates fertile ground base on which new plants that support the life of new animals can grow. Instead of becoming a problem that requires a solution or disposal, the waste becomes input in the new phase of the cycle. Looking at natural systems, it is logical to ask the question: can this principle be applied to the economic system? Many inputs into the production process are non-renewable, but it is possible to

recycle them. So, recycling reduces waste generated by industrial systems and helps to reduce the consumption of resources primary reserves. Looking more broadly, the whole production process can be viewed as a circular flow in which waste (except for waste energy) can potentially become the raw material for future production.

5. ECOLOGICAL APPROACH TO INDUSTRIAL PRODUCTION

Along with the development of production, the waste problem and its environmental impact have been developing,too. Once there was a belief that the environment can absorb and degrade all the waste, and then, in some strange way,it regenerates and returns to its original state. Today, we are well aware that the situation is quite the opposite. Environmental pollution due to various toxic materials not only destroyed but also reduced the power of nature's regeneration. Therefore, we can say that today the state of the environment is alarming, and therefore it is high time to change our relationship towards the environment and especially the impact of industrial production on it. For this purpose, efforts have been made and principles and tools developed to try to reduce the impact of industry on the environment.

According to the impact on the environment, there are four basic approaches to production [9]:

1) ***The traditional approach*** is the way in which we have so far treated the environment as an inexhaustible waste reception center. This behavior has led to the state of the environment as it is today, which is totally unacceptable. According to this approach, the waste is disposed of in landfills and "end of pipe technologies" are used (treatment and disposal of waste after it has been created).
2) ***Preventive approach*** represents a modern approach to the problem of the environment and waste. This approach recognizes the link between industry and the state of resources as well as the need for their effective use and therefore, solves the problem of waste at the source. The preventive approach includes:
    a. cleaner production while minimizing waste,
    b. EMS-Environmental Management System,
    c. production focused on the most efficient use of available resources.
3) ***Product-focused production*** tries to influence the environment through more efficient "eco" product design so it takes into account its impact on the environment throughout the whole lifecycle. In this case, the entire lifetime of the product is taken into account, from the raw materials used to produce it to the disposal of the used products. Some of the methods used in this approach are:
    a. eco-design,
    b. eco-efficiency,
    c. LCA - life cycle assesment,
    d. LCM - life cycle management.
4) ***Dematerialization*** sees a product as a way or path by which a consumer gets a service. If the focus is put on the better fulfillment of the service, it automatically leads to a better product design and its more efficient use through the use of materials, energy consumption and waste disposal.

The clearest example of the application of these principles can be seen in the automotive industry which is in both the production phase and the phase of use the biggest polluter of the environment. It is clear that the intervention in the production process and the use of the

recycled and quality materials will significantly contribute to the reduction of harmful substances emissions into the environment. Also, by paying more attention to a car as a product and the service that it provides to the consumer, even greater improvements in terms of environmental impact can be achieved. In the design phase more focus should be put on fuel economy, emission reduction and longer product lifetime, at the expense of some purely cosmetic additions (which require extra energy and materials and unnecessarily raise the cost of the product and its impact on the environment). At the same time, through a system of information and the provision of intangible services we should raise the awareness of consumers about the product. Only when all of the above has been realised, one can really talk about environmentally conscious production and consumption.

6. THE GOALS AND IMPORTANCE OF INDUSTRIAL ECOLOGY

The primary goal of industrial ecology is to promote and enhance the sustainable development of the industry at the global, regional and local level. The basic principle of sustainable development contains: controlled use of raw material, protection of natural ecosystems (structure and function maintenance), protection of human health and the promotion of the right to a healthy environment. For an economic system to switch to the goals of industrial ecology that are less harmful to the environment, we need major technological innovations aimed at:

- Minimizing unwanted byproducts of output such as pollution and CO_2 emissions,
- recycling of waste from industrial processes and worn out goods into raw materials for further processing.

Based on the foregoing, it can be concluded that industrial ecology contributes to the closing of the so-called ,,free ends "of the production process in a way that it would turn the straight flow into a cyclic model (figure 2.)

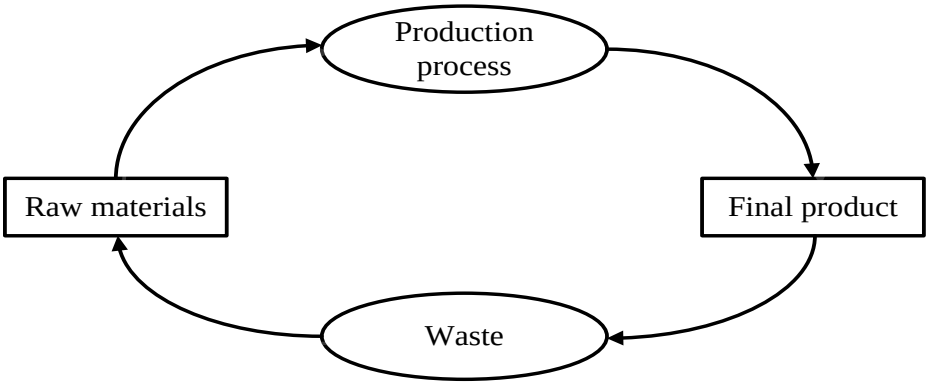

Figure 2. Cyclic modern industrial process [8]

The increased environmental efficiency of resource use and waste and pollution reduction can be achieved through the following strategies [8]:

1) ***Dematerialization-*** achieving the same economic goal by using less materials and increasing the efficiency of the use of materials;
2) ***Substitution of materials***– replacement of the scarce, dangerous and highly pollutive materials with substitutes that are less harmful to the environment;
3) ***Repair, reuse, processing and recycling***;

4) ***Waste rummage***- taking valuable materials from urban, industrial and agricultural waste.

Each of these strategies implies specific economic incentives and institutions. ***Dematerialization*** has appeared in many industries as a result of technological advances and increased efficiency. Aluminum cans for beverages, for example, now contain 30 percent less metal than in the 1970s, and the aluminium cans in their own part replaced the cans made of much harder metal that had been used in the decades before. Achieving the same features by using less material is good for both the supplier and the environment because they reduce resource consumption and waste flow even if cans are not recycled.

Market incentives have led to the ***substitution of materials***. For example, copper has been replaced by plastic, fiber optics and lighter metals such as aluminum. Some market-motivated substitutes, however, may be more harmful to the environment. For example, the use of organic chloride compounds such as polyvinyl chloride (PVC) has expanded because of their relatively low price in many industrial and commercial products, and the compounds are connected to environmental hazards and health risks.

The detailed evidence examination of dematerialisation and substitution of materials leads to the conclusion that although evidence suggests that many economic processes have became,,lighter" because they use less material per unit of output, it does not necessarily mean that the overall impact on the environment is smaller. The trends of the decreasing use of inputs must be in balance with the increasing total demand generated by the growth of GDP. In order to separate or 'decouple' the growth of GDP from the material inputs, it is necessary that output can rise even when input use remains constant [10].

Although recycling has increased over the past few years, economic incentives for material recycling vary considerably. Recycling of certain materials, such as aluminum, is profitable because of the significant savings in energy and other costs when compared to using intact materials. Materials such as paper and plastic can be recycled efficiently, but the profitability of recycling these materials varies [11].

Waste rummage means looking forby-products and waste of low value in order to use them as industrial raw materials. Such sources are often more difficult or expensive to exploit than natural sources.

The development of ”green technologies"to reduce the use of materials and waste can be encouraged with economic incentives. Such as, for example, ‘‘green taxes" (taxes on pollution), and 'green subsidies’ (subsidies for technologies that do not harm the environment), as well as transferable permits.

7. CONCLUSION

To reduce the pollutants emission from pollution sources, to prevent the degradation of the environment, to preserve resources and healthier people are a must at present. Based on the projected goals, industrial ecology influences the spirit of reshaping the world of work, insisting that the industrial development complies with the environmental principles. From all of the foregoing stems the strategic importance of industrial ecology, which is reflected in the

creation of industrial ecosystems for the sustainability of life on the planet, achievement of maximum productivity with minimum consumption of material and energy, as well as minimal production of waste and pollutants. The practice shows that the knowledge and information about environmental development problems are still insufficient. Since this lack reflects on the process of implementation of sustainable development model, the systematic and organized ecological knowledge production is of paramount importance.

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ECOLOGY OF RISK IN VIEW OF WORKING ENVIRONMENT

EKOLOGIJA RIZIKA SA ASPEKTA RADNE SREDINE

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Abstract: *The risk is part of life and follows the man in all spheres of its activities. In some cases, the risk may be large and cause a breakdown or accident at work, and also the reason of diseases. In other cases, the risk is lower, and the consequences not so dangerous, for example, trauma or less irrelevant material losses.*
Key words:*Risk, methodologies, criteria, legislation.*

Apstrakt: *Rizik predstavlja sastavni deo života i prati čoveka u svim sferama njegove delatnosti. U pojedinim slučajevima rizik može biti veliki i predstavljati uzrok havarija ili nesrećnih slučajeva na radu, a takođe, razlog nastanka profesionalnih bolesti. U drugim slučajevima, rizik je manji, a posledice ne tako opasne, na primer, manje traume ili beznačajni materijalni gubici.*
Ključne reči:*Rizik, metodologije, kriterijumi, propisi.*

1. INTRODUCTION - GENERAL ECOLOGY OF RISK

In small businesses accidents and illnesses of workers present special problems and affect only the health of individual workers, but also the work of the entire company. The absence of one man can completely disrupt the technological process, altering work rhythm, etc.

The employer is obliged, according to the **Law on Safety and Health at Work (Official Gazette of the Republic of Serbia 101/05),** employee to perform the job at which they applied measures of health and safety at work and to adopt an act on risk assessment in writing for all positions place and determine the manner and extent of their elimination by the **Regulations on the procedure for the assessment of risks in the workplace and work environment (Official Gazette of the Republic of Serbia 72/06).**

The risk assessment is intended as a basic directives of the European Union 89/391/EEC, and special directives, within it, the safety of the workplace (89/654/EEC, 89/655/EEC, 89/656/EEC , 90/269/EEC, 90/270/EEC, and other) and the directive on the protection of workers from chemical, physical and biological risks (98/24/EC, 2000/54/EC, 2002/44/EC and others). Basic assumptions of analysis, risk assessment and control are included in the following international standards: quality management in environment **ISO14001** (Environmental management system standards), quality standard **ISO9001** (Qualitysystems: model for quality assurance in design, development, production, installation and servicing), the system management of occupational health and safety **OHSAS18001** (Occupational Safety Healthand Assessmentseries).

Policy in the field of safety and health protection at work is edited by the International Labour Organization **(ILO-OSH).**

In the document of the European Union HEALTH AND SAFETY AT WORK (ESDOC/05/20/97) gives general guidelines for risk assessment in the workplace in the form of User Guide or Risk assessment at work "GUIDANCE ON RISK ASSESSMENT AT WORK, Luxemburg: Office for Official Publications of the European Communities 1996 to 2000". The following chapters are in concentrated form the theoretical aspects and basic procedures, methods, and examples of the matrix of risk assessment in the workplace, according to EU directives 89/391/EEC, the International Labour Organization (ILO), and the strategies of the Union in the field of security and health.

2. GOALS OF THE RISK ASSESSMENT

The goal of the risk assessment is to eliminate the proffesional risk and that is a main task, however, it is not always possible to implement in practice. In cases where it is impossible to eliminate the risks, it is necessary to reduce their volume and residual risks brought under control. In later stages, the remaining risks are re-evaluated in terms of new knowledge, is considering the possibility of their reduction or complete removal.

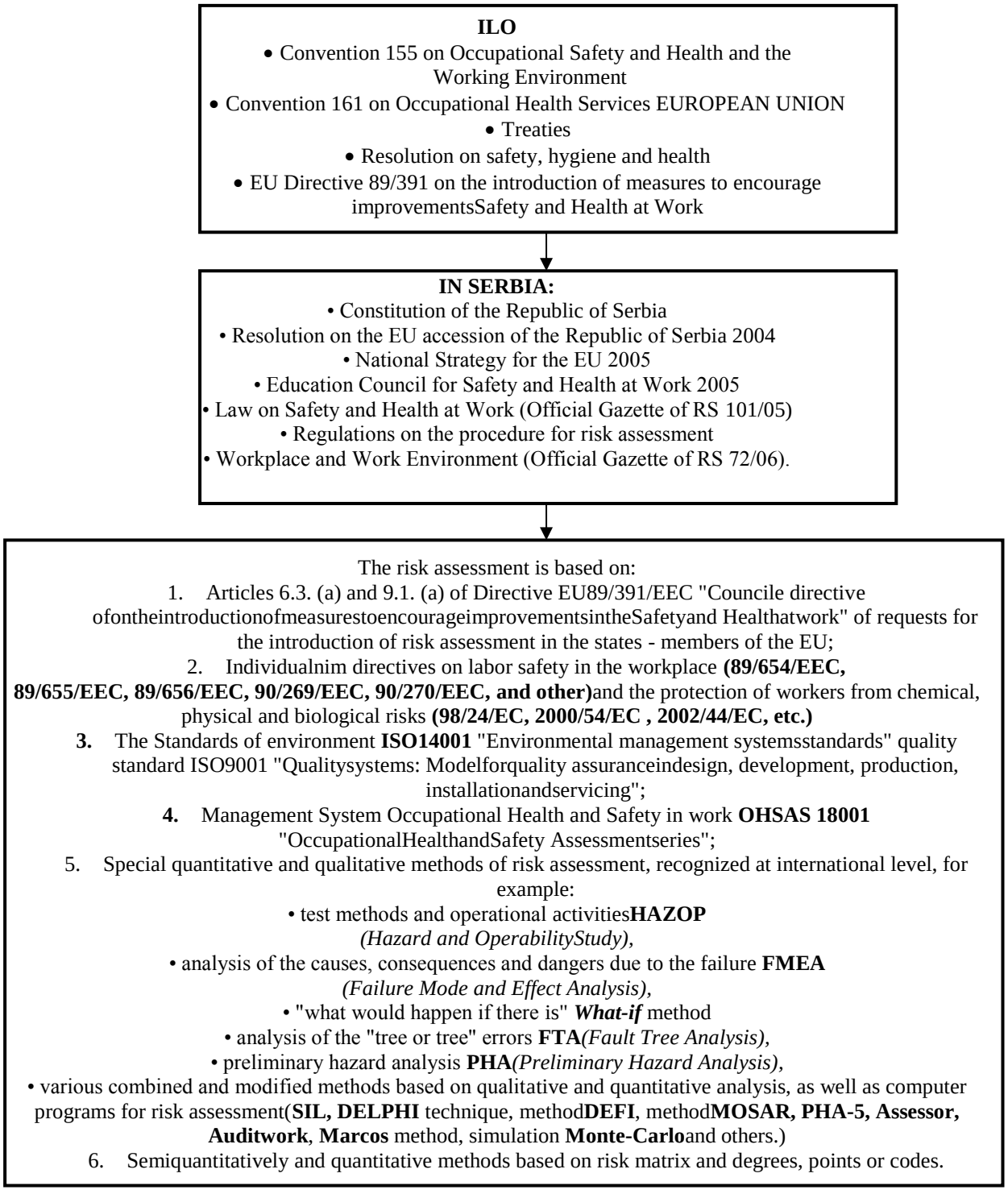

Figure 1. The legal basis of the risk assessment

Risk assessment should be organized and implemented as a help to employers and personnel that controlling the production process:

- after performed risk assessments.

- identify the hazards involved in the work process and associated risks, to, adhering to applicable laws, decide what measures should be taken for the safety and protection of health of workers and others.
- assess the risk, to the basis of the information would be properly organized work process, to select the necessary equipment, the chemicals, the materials, etc.
- check that the measures taken adequate for safety on work;
- prioritize activities, if the risk assessment has resulted in the need to undertake new measures;
- demonstrate to workers and their representatives, that all factors related to work, take into account, and also taking all the necessary safety measures at work;
- provide improved health and a higher level of security employees with preventive measures, methods and ways of working that need to be introduced.

The degree of risk in the workplace require evaluation each time when any changes are introduced that result in changes in risk factors, such as new work processes, new equipment or materials, changes in work organization or new work opportunities as well as new workshops or other premises.

When assessing the risks and consequences of their removal, and also in the implementation of control measures, it is important that the risk does not spread further. For example, are uncertain advantages to be obtained in the office window blinds to minimize external noise, while if it does not provide enough ventilation.

It is important that the risk is not transferred to another place. For example, the removal of toxic substances does not violate another room or public place (in the air from a hospital morgue ventilation system is taken out of the windows of the building near the Children's Hospital).

Risk assessment the employer should not be implemented in isolation, but in the process involving employees and their representatives. It is necessary to consult with workers and put them at the disposal of information about its decisions and the implementation of protective measures.

An important element that should always have in mind the possibility of the presence of employees from other companies or other persons in the workplace, not so much because of their exposure to risk, but because their actions may jeopardize permanent workers. For example, when the subcontractors used by the objects of their transport vehicles and equipment that presents a potential risk when it is in the alleys and paths of movement of the permanent employees of the company.

The employer is required to conduct a risk assessment taking into account the relationship between employees and the work process in a certain company. It is also the duty of the employer to inform the hired workers, other employers and their employees in the company to which it relates, the risks involved and the necessary protective measures.

We should not forget that some labor organizations and businesses visited, students, patients, community representatives and others, whereby it is unlikely that they are all aware of the inherent dangers and risks and provided safeguards. For these reasons, many businesses have special rules that give insight to each visitor.

3. METHODOLOGY

There is no specific law regulating the manner of conducting the risk assessment, but there are two fundamental principles that govern the risk assessment:

- it is necessary to take into account the risk factors and potential hazards;
- for the identified risk it is necessery to declare whether it was possible to avoid it altogether.

If such a possibility does not exist, then you need to consider the possible consequences of risk.

Can be used very different methods of risk assessment (and combinations thereof), provided that they contain all the necessary elements. Risk assessment methods are typically based on processing:

- data obtained by observing the work environment (for example, working conditions, safety, equipment management, fire and smoke, temperature, lighting, noise, etc.);
- defining tasks (identify all the tasks to be confident that they are included in the risk assessment);
- reviewing work assignments (risk assessment as a result of job duties);
- consider and predict if there are certain risk procedures originating in the work process, or other risks;
- nature of the work (to assess potential danger);
- environmental conditions that influence the position (ie., the climatic conditions for the workers who work outdoors);
- report on the psychological, social and physical factors that may be causing stress in the workplace, as well as their mutual relationships and connections with other factors, work organization and work environment;
- labour conditions (rest periods of employees and others.).

Data collected should be harmonized with the criteria and standards of hygiene and other normative acts in the field of safety at work, taken as a basis:

a) legislation;
b) the standards and rules promulgated by the relevant ministries, the instructions from the occupational safety and health rules early schedule, the degree of vulnerability, declarations of manufacturers, etc.;
c) the principles of hierarchy in the elimination of risk:
    - risk avoidance;
    - replacement of dangerous risks harmless or less harmful (for example, replacement of toxic chemicals, substances less harmful to human health);
    - liquidation risk to their very source;

- introduction of the first collective, not individual means of protection (for example, to protect the priority of a local smoke ventilation system, rather than the use of protective masks);
- adapting to technical progress and the exchange of information;
- increase the level of security.

4. RISK ASSESSMENT CRITERIA

What will be the method used for assessing the risk depends on:

- the character of the place (for example, permanent or temporary position);
- vision services (for example, actions that are repeated, changing the work process, the high demands of the position);
- tasks are executed (for example, data processing, working with toxic chemicals, work in the vicinity of high voltage operation in limited space, etc.);
- the degree of technical complexity.

In some cases one method may include the entire post and all significant risks on it, while the other, for a job can use several different methods.

For example, in a large engineering-technical workshop where handles a large number of products, risk assessment is necessary to perform special considerations:

- equipment and other mechanical hazards character;
- materials to be processed or used in the processing (during melting, coolant, etc., and their potential impact on human health);
- general work environment (microclimate, ventilation, noise and lighting);
- means of access (elevators, stairs, transport, etc.)
- electrical safety;
- other activities (uploading and exploitation);
- psychological, social and physical factors that can cause stress in the workplace.

Some effects of the workplace, which are estimated separately can have a big impact on the work process in general. For example, washing windows, and replacement lamps, the selection of new equipment, training of new employees.

At the same time, appreciating these effects separately, it is certainly important to clarify whether there is a connection between them that can affect the risk assessment.

A large number of risk assessment, in the above mentioned cases, almost always conducted on the basis of analysis operations. However, in certain situations, such as the use of computer technology and the specific operating conditions required more detailed approach.

In practice it often makes sense to think of the risk assessment as a multistage process, with each step forward the next stage, in order to further rated the job at which the identified risks.

Specifically, these stages can be characterized as:

- general estimates, when risks are well known, we can easily determine and achieve control measures;
- risk assessment when there is a necessity to take great attention. It is important that, independently of the applied methodology should consult interested persons employed on the work which is being valued. To be determined risks must:
    - use knowledge of risks, for example, the properties of chemical substances, hazardous equipment parts, etc.;
    - apply knowledge of the negative effects of working conditions, which may be unexpected. In the case of an individual or group of workers, develop severe symptoms of the disease, we need to define risk, and valuations.

In risk assessment in the workplace, most importantly safely and quickly get the right information-the very best from employees, using a questionnaire. They know the execution order of activities, problems that can occur at the same time, the possibility of execution of complex tasks and safeguards applied. It is important to make sure, no matter who is doing the risk assessment, it was an expert in the field of occupational safety and health of the company or the consultant, that he talked with the employees who actually perform these tasks.

It is necessary to pay attention to those risks that are inherently difficult to notice. These are problems that occur as a result of improper operation of the organization and that people generally accept as they alone understand or reconcile with them. Problems can create a way to fulfill the employer insists on working assignment. So employees may be considered unreasonable tasks to be carried out quickly, requiring forcible postures, frequent stretching, and that can cause severe pain.

In general assessment:

- should determine the risks that can be reduced or eliminated. In many cases, this is difficult to do, but it is important to keep these facts in mind;
- to define risks slaughter are easily recognizable and which is easy to determine and implement control measures;
- should consider actions that are necessary to further assess the risk in the event of emergency situations at work (possibility of damage, fire or explosion). Thus, for example, a detailed risk assessment is required if carry heavy loads by the stairs if the handheld instrument used for crushing stones.

5. BASIC REQUIREMENTS FOR DETERMINATION AND RISK ASSESSMENT

In the same paragraph, "Guidelines for risk assessment at work" are mentioned the following recommendations:

- ***generalization of date;***
- ***perform audits, risk assessment, monitoring and control measures as necessary additional proposals;***
- ***set priorities;***

- ***assessment of whether the risk assessment necessary to engage other competent specialists;***
- ***keeping a register;***
- ***to inform all persons involved in the business;***
- ***controlling consistency.***

In fulfilling these recommendations do not forget to include the work of employees and/or their representatives so that they could participate and give advice.

1. Generalization of date.

Please note the following characters:

- identifying hazards characteristic for appropriate work environment;
- measures for safety that are necessary for compliance with applicable standards, laws and regulations;
- measures for safety that proved to be very valuable;
- appropriate criteria for the implementation of the risk assessment, for example, the inscriptions on the labels of certain risk;
- communication of workers of perceived risks, their representatives, supervisors and employers.
-

2. The review-risk assessment, control measures and checks if necessary, propose additional measures.

*Content preview.*It aims to illustrate the observed actions, which may cause hazards that are specific to the appropriate area of work (job or work environment). Determine where hazards arise, whether it is always and everywhere used is required, suggested, or other practical measures for the protection and safety.

Preview mode. Method of inspection includes:

- overseeing operations or processes;
- verification of employment;
- the conditions and ways of organizing work;
- special hazards or risks.

Before examination. Viewing can be done by comparing the ideal with the real situation, the present situation, using:

- check lists are provided showing the potential hazards and appropriate forms of control measures;
- control lists protective measures;
- guidelines for occupational health and safety;
- data sheets on the safety of chemicals, including guidelines on control measures implemented;
- standards, laws and regulations.

3. Prioritization.

Requires the determination of the necessary emergency measures and assessment of risk factors that may lead to danger (fire, explosion, and the possibility of poisoning, etc.) and

which ones should be removed in the first place. The priorities should also include the mandatory medical examinations.

4. Assess whether the risk assessment necessary to engage other competent specialists.
In assessing the risks and making decisions about taking appropriate measures, these individuals still have to assess themselves to question whether they have sufficient knowledge and skills to properly assess the situation regarding the protection of health and safety at work.

5. Keeping the register.
It is necessary to conduct a combined register of measures for the protection at work (report on health and safety). It should be emphasized when it is necessary to control the risk, by entering the appropriate measures for the protection and safety.

These registers can be used as the basis for:

- information to all interested parties;
- determining whether all necessary measures have been introduced;
- confirmation that perform the control of the institution;
- each revision, if the conditions of the work.
  Recommended preparation registry that contains at least the following information:
- name of the person who checks (if necessary, also the duty), and also the date of the evaluation;
- enterprise, department;
- workplace, activity;
- threats and risk factors that are incurred as a result of the company;
- the necessary measures for the safety (if necessary - the rules which are subject to such requirements);
- the necessary preventive measures (eg., exercise, home office workers, etc.);
- detailed information on the implementation of the necessary measures (for example, the name of the responsible person, date);
- detailed information on continuous control measures, for example, the date of regular checks, reference is made to a competent person.

6. Informing all persons involved in the operation:
It is necessary to inform all interested parties of the existence or threat of any possible harm they may suffer, but also of all the necessary safety measures to prevent or mitigate the violation.

7. Controlling consistency.
It is necessary to regularly check the health of workers and workplace protections, to find out how workers follow safety measures.

According to the essence of things, and actions related to the elements of risk management and the employer match for them, exercising internal control of the working environment.

More detailed instructions for risk assessment in the workplace, which are caused by manufacturing equipment and hazardous chemicals, are given in the EU document "Guidelines for risk assessment at work" in attached 2B.

6. CONCLUSION

Each risk has objective and subjective causes, its origin can be natural (hurricanes, earthquakes, floods, etc.) or technogenic (differential effect of chemical, biological active, explosive, flammable or other substances, and other technological processes associated with the working environment such as the storage of hazardous materials and transport of goods). The causes of workplace accidents are usually industrial character, as events in the traffic and transport, in which people are at risk of serious consequences. The risk of accidents is an important local source of danger (flow of hazardous substances or fire), hazards resulting size depends on the distance to the city average. How often hurt a lot of people when there are hazards, can speak not only of the individual but also on the social risk.

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ENVIRONMENTAL ANALYSIS OF EXISTING TECHNOLOGIES AND DISPOSAL OF WASTE MANAGEMENT OF RUBBER

EKOLOŠKA ANALIZA POSTOJEĆIH TEHNOLOGIJA ZA RASPOLAGANJEI UPRAVLJANJE OTPADOM OD GUME

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Abstract: *Of all the ways to manage waste, reducing waste and waste prevention is the preferred technology in the management of waste rubber. In the diagram (Figure 3) (modified from [1]), it is observed that the decrease in demand of new tires and industrial rubber product demand, eventually causing a decrease generation of waste tires and waste rubber industry.*
Keywords: *Tires, rubber, tire retreading, recycling of materials.*

Apstrakt:*Od svih načina za upravljanje otpadom, smanjenje nastajanja odnosno prevencija otpada je najpoželjnija tehnologija u upravljanju otpadnom gumom. U dijagramu (slika 3) (modifikovano iz [1]), uočava se kako je smanjenje potražnje novih pneumatika i potražnje industrijskih gumenih proizvoda, na kraju uzrok opadanja stvaranja otpadnih pneumatika i otpadne industrijske gume.*
Ključne reči: *Pneumatici, guma, protektiranje, recikliranje materijala*.

1. INTRODUCTION - Reducing the amount of discarded tires

The first step in the genesis and waste disposal is waste reduction. This refers to the reduction of waste tires entering the waste streams. Measures that should be considered in the realization of this goal are:

• **reduce the number of passenger cars**. By reducing the number of cars reduces the demand for tires in the future as a direct impact on the reduction of discarded tires,

• extending the life of the tire. This can be achieved in several ways:

- **the reduction in kilometers driven for the same time period** - using alternative forms of transportation,
- **research and development** - depends on tires manufacturers that are supposed to provide life prolonging tire. One of the ways that the new vehicles are built high-end tires that can exceed the high mileage, thus reducing the negative impact of old tires because they will be a year or less to be rejected. These activities will certainly have the effect, at least at the present development level of tire production technology, tire recyclers difficulty because of their complex chemical composition and complex structure,
- **on changes in driving habits** - avoiding those behaviors that lead to increased tire wear (sudden departures, sudden braking, high-speed, undisciplined driving, etc..),

- **increase the quality of roads** - this measure depends on those who build and maintain roads and surface quality because,quality basis and maintenance in good condition reducesboth wear and unnecessary tear of tires,
- **increased use of retreaded tires** - tires used at the end-of-life show no signs of damage can be used to restore tread so called retread (Figure 1 and 2). This prevents the tire at the end of its life ends up as waste, but is extending its exploitation. At the same time postpone the purchase of new tires for a shorter or longer period of time.

2. GENERATING REDUCTION WASTE INDUSTRIAL TIRES - Replacement of industrial rubber products with thermoplastic elastomer products

Thermoplastic elastomeric materials (TPE) are defined as materials that have many of the same characteristics as the tires. Unlike conventional vulcanized rubber TPE can be processed and recycled like thermoplastic materials. After recycling, reuse production performs as pressing and extrusion.

Statistics and areas of application

In the early 90's, TPE has become an attractive substitute for rubber in certain products. At the end of the 70-TPE market grew an annual rate of 8%. Today approximately 12% of total industrial production in the world rubber production translates into production of TPE and is expected to continue growing. TPE also takes up about 15-20% of parts of non-rubber in the auto industry. With the development of different types of TPE that are resistant to hot oil and high temperature, the number of products manufactured from TPE [1].

Advantages and disadvantages of TPE compared to conventional vulcanized rubber

TPE has a significant advantage over conventional vulcanized rubber. Compared with the production of conventional tires, complete manufacturing process for TPE is simpler, and when it is easier and cheaper product quality control. No mixing and curing processes within the production line for TPE, because the production cycle time is shorter and the pace of production is much higher. The total energy used in the production of TPE product is lower due to shorter cycle time and the absence of the vulcanization process. This provides an economic benefit to producers. Economic and environmental benefits of TPE is that the waste created during production can be chipped and returned to production without negative influence on performance.

Besides the advantages TPE has several disadvantages. TPE materials are relatively new and still have the necessary research and development in terms of their performance and capabilities. Due to the lack of knowledge of many products from conventional vulcanized rubber can be manufactured from TPE.

Benefits of recycling TPE today are available only in certain industrial rubber products (this is not feasible for use in the manufacture of tires TPE). Another problem, the initial investment in fixed assets that are required for the new product line is crossed when the manufacture of conventional vulcanized rubber to TPE products.

Figure 1. The principle of retreading [1]

Figure 2. Retreading machines [2]

The role of TPE in recycling car tires in the context of recycling

Industrial rubber products which are used in the automotive industry constantly declining market share at the expense of TPE. This increased use of TPE in the auto industry, is usually due to:

- design to reduce vehicle weight to reduce fuel consumption,
- estetic changes as far as interior comfort,
- reduction of noise,
- elevated operating temperatures,
- consent to the possibility of designing with thermoplastic elastomers in the system design combined with hard thermoplastic,
- facilitate the recycling of rubber auto parts produced from TPE compared to conventional vulcanized rubber.

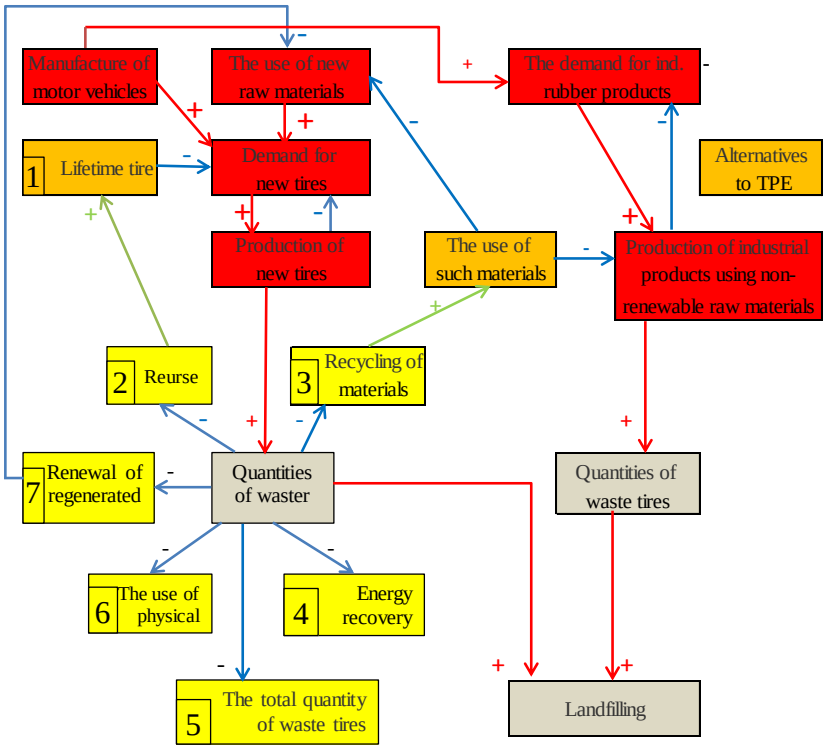

Figure 3. Diagram of the origin and movement of waste tires

3. REUSE

Concept of re-use of old tires are twofold retreading (Figs. 1 and 2) and physical re-use. According to estimates, 40-50% of discarded car tires and 60-80% truck tires in industrialized countries are suitable for retreading and reuse.

3.1. Retreading

Retreading is one way of managing waste at end of life, where the tires reused in accordance with their original purpose. This is an ideal way to extend the life of the product and put the problem of waste disposal, and thus a reduction in the amount of old tires in the waste stream. Each tire can be retreaded tire tread replacement or renewal of the tire over the entire outer surface. Retreading extends the life of the tire with the addition of new tires on the worn skin, because this procedure is considered before reuse than recycling.

In tire surface is about 60% tire mass, by retreading is achieved a significant effect. Quality tires can be retreaded up to three times, and tires for large vehicles and up to 12 times. However, only about 10% of automobile and light truck tires is retreaded.

Retreaded tires are widely used in trucks and buses, mainly because of the high price difference between new and retreaded tires and also consumers are satisfied with the general characteristics.

In terms of conservation of energy and materials, there are significant savings in retreading old tires. Retreading saves the crude oil for the production of passenger tires 21 lit/pc, for truck tires 68 lit/pc, and saving Indian rubber is 4 kg/piece and 44 kg/piece.

In the EU is done about 25% of retreading tires (especially for freight trucks and buses).

The factors responsible for the low percentage of retreading:

• poor public awareness about retreading,

• design/production of most of the tires, regardless of the need for retreading,

• low cost and quality of retreaded tires ineligible,

• tire prices that prevent retreading.

In goal to optimal solution to the problem is necessary:

• improve public awareness on the use of retreaded tires,

• prescribe rules for the production of retreaded tires,

• stimulate the purchase of retreaded tires.

3.2. Prolonged physical use

a) **Greening**

Worn tires can often be repaired. Restoring profile (cutting profile) performed in many developing countries, where regulations are more lenient and standards are lower (and where the rate lower) than in developed countries. This procedure is usually performed manually.

Using tires with a repaired tire surface saves precious energy and other resources. New tire requires 23L of crude oil equivalent as raw materials and 9L energy to the process compared with 7L relatively 2L for tires with a new tire surface. Passenger car tires can be repaired once, while truck and bus tires can be repaired up to six times. Repaired tire is accepted practice.

b) The use of whole tires

The exploitation of whole tires is the next step in the hierarchy of waste management. Tires are often used because of their condition, weight, shape and volume. Some examples of re-utilization in the industrial countries include the use of erosion control, protection of trees, the artificial reefs, fences or garden decoration. In developed countries lake ponds line with the old tires, docks are often built from old tires because they are good absorbers and similar barriers can be constructed from old tires.

3.3. Material recycling - recycling tires historical review

Recycling old tires started in 1853. Since the beginning of recycling to the beginning of the 20th century, half of the material used for rubber was shaped recycled. After World War II, the rapid decline in the use of recycled tires, due to the low prices of raw rubber and a trend for a higher quality product, especially the advent of radial tires. The imposition of strict environmental regulations in order to reduce negative impacts on the environment during processing, the new and different barriers to the recycling industry in the last decades.

For years, the widespread use of recycled rubber as a secondary raw material in the production of new rubber products. To maintain tire processors strict requirements for quality recycled rubber content is very low (up to 5%). But the situation has slowly changed over the last decade.

Legislation should encourage recycling and limited storage in landfills. These regulations are already being implemented in the EU.

By improving the quality of recycled materials increases the use of recycled tire rubber in the manufacture of new products. High quality products can now be produced even though they have recycled content.

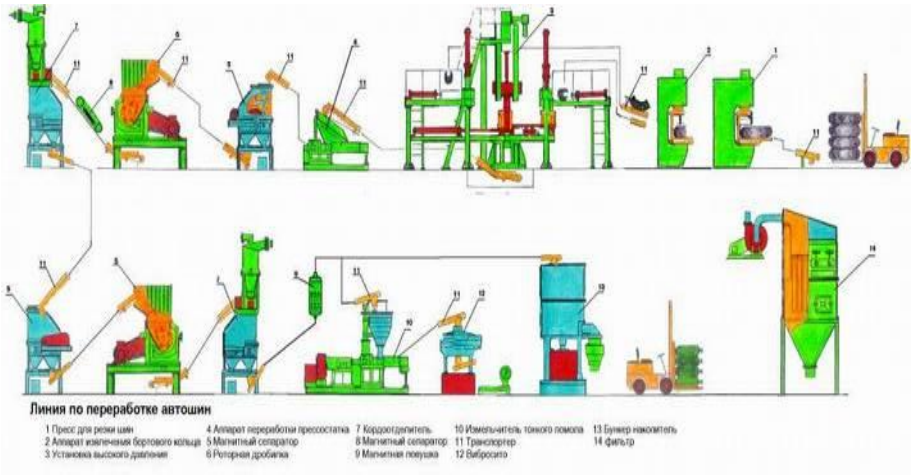

Figure 4. Tire recycling process

Significant reduction of available resources, the increase in raw material prices in the market (especially those that depend on the price of crude oil, and the production of synthetic rubber is directly dependent) and waste disposal costs are the main incentives for processors to rubber in their products using recycled rubber and to increase its percentage of in a new product.

3.3.1. Recycling technologies

Quality recycled components from old tires, cost and technical feasibility, determine their use (eg. as TDF (tire-derived fuel), in addition to new tires, asphalt for waterproofing). The material to be used in new tires must be of uniform composition, structure, and must have the proper quality and performance, and as a raw material and as a material for vulcanization.

3.3.1.1. Crushing

The first step in the process of milling waste tires is usually shredding. Chopped tire has a range of applications, among them the most common use in the construction works.

Construction offers a large range of application of crushed old tires and waste tires. In almost all applications, the material from old tires replaced by other materials used in the construction of such materials are easy to fill, such as crushed shale, or blocks of polystyrene insulation, drainage masses, and even the ground. Coarsely shredded tires can be used for the construction of the railway embankment. This particularly applies in the construction of railway embankments on soft, loose soil. Granulated rubber is suitable for applications because of their small mass. In many projects, which uses granulated rubber as lightweight fill material, it was stressed that it is cheaper than other alternatives. Examples of projects where used tires are fragmented leveling slope and railway embankments.

Granulated rubber used to fill retaining walls and retaining walls at all bridges. Small mass of chopped tire pressure and reduces the horizontal design enables thinner and hence cheaper walls. Granulated rubber also reduces problems with water and frost, which occur behind the walls because it has good drainage properties and is a good thermal insulator.

In addition to the application for the construction of retaining walls and railway embankments granulated rubber can be used as a base for roads. This particular can be used in colder areas, and areas that are rich in spring water. Place a layer of chopped tires from 15 to 30 cm below the road surface prevents freezing times in the first place. In addition, good permeability chopped tire provides good drainage from the roadway preventing damage to the road surface. [1]

3.3.1.2. Production of rubber granules

The process of milling is usually necessary to separate textile and metallic reinforcement of rubber parts and rubber granules to prepare for use in other ways (compound rubber, retreaded asphalt, etc..) or the next step in the process of recycling processing (retreading, surface activation).

There are several types of milling processes, which differ according to the mechanism of mutual getting recycled rubber:

• Dry grinding at ambient temperature is the simplest process of milling. Tires first chop in small size scales, then chop (10 to 40 mesh openings). The process consists of the following activities [1]:

- coarse granules,
- fine granules,
- separation of metals,
- separation of the fibers,
- packaging and
- the measuring.

Particle size and particle size classification produced by milling at ambient temperature, depends on how many times the rubber granules pass through the mill, and the mill of the type used. The main mill can cut large pieces of tires up to size 11, and within 10 to 40 mesh. This size is provided for products that are not dynamically loaded,

• Cryogenic grinding is a process that consists of chopped rubber cooling below freezing, liquid nitrogen or compressed air, after which the tire can be easily frozen mechanical chop to a fine grit. Nearly all textile and steel can be extracted from recycled rubber so that a usable product and very little loss of the tire. Particle size in this process are the 30 to 100 mesh. In the last decade, the production of low temperatures strives to reduce the use of liquid nitrogen and compressed air is used as an alternative. These developments significantly reduce overall manufacturing costs.

Cryogenic process is obtained a smooth surface grain. The process is exothermic low. This gives a small degradation of rubber.

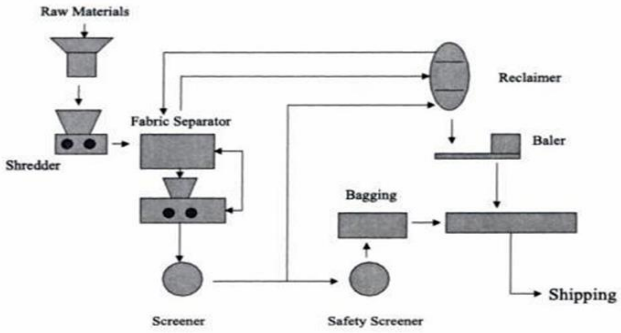

Figure 5. Schematic representation of the process of milling at ambient temperature [2]

Approximately 35% of cryogenic production of granules from old tires, are used in the auto industry for a wide range of products including tires, brake linings, insulation and friction materials. Also, much of the use in the production of asphalt.

Operation of cryogenic milling is given as a result of any harmful gases or significant amounts of solid waste that would have to be sent to landfill. Compared with other solid waste management options, as well as cryogenic grinding operations in waste tire recycling technology will have a competitive advantage in all countries where stricter legislation in the field of ecology. In Europe, it is possible that the manufacturers of tires in the future be responsible for the final, the end of life, dispose of their tires. For this reason, these tire manufacturer should be interested in supporting the development of these environmentally friendly tire recycling system. [1]

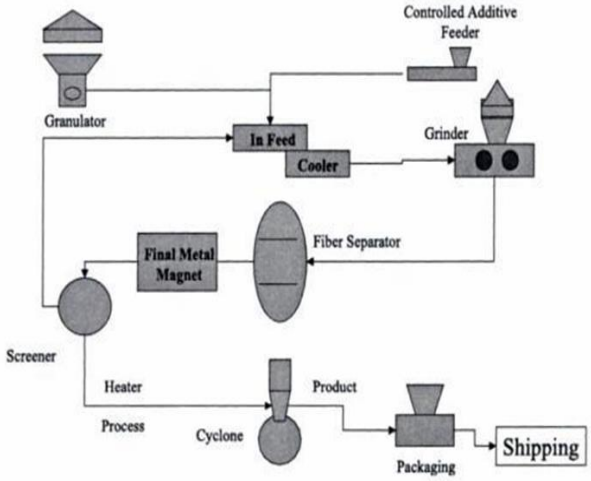

Figure 6. Schematic representation of the process of cryogenic grinding [3]

• Wet grinding is done by pulling large pieces of rubber through the water, followed by grinding between the close-packed cylinders (such as a mill). The material is so fine grained and in the range of 60 to 120 mesh, can still be used.

• **Chemical, physical and microbiological degradacija**.Methods such as microwave, ultrasonic, chemical non vulcanization and microbial degradation also can be used to produce recycled rubber.

3.3.1.3. Renewal (regeneration)

The use of different processes, such as heat, thermo-mechanical, or other chemical processes, oldvulcanized tire elasticity is returned, and it is the process of regeneration or renewal. The process of regeneration is performed in two steps: an old tire is cut into pieces first and then fine-grained, where it gets rubber granules. The next step is to perform his heat with chemicals followed by grinding friction. Rebound can be used as a supplement mixture for making rubber products for lower prices. Statutory requirements for durability and abrasion resistance, rebound impede implementation of the radial tire.

Traditional tire regeneration, rubber granules are mixed with water, oil and chemicals and then heated under pressure. During the process, carbon-sulfur links are broken and the rubber becomes the most part non vulcanized; to the last processing operation was formed in the plate. Manufacturers tire use softeners as a alternative to the clean Indian rubber for use in new tires or as part of other rubber products. Because regenerated rubber has reduced elasticity it is usually used only to 5% of the total production of new tires.

In the past, large items like protectors on tires, tubes and other products have been used for regeneration using various additives. According to some sources, 350 thousand tons of regenerated rubber is used in the U.S.during fifties. New environmental regulations and the decline in the price of styrene-butadiene rubber, led to the complete elimination of regenerators. The primary use stayed to a bias tire. Regenerate is currently used for flooring, bumpers, wedges, lower-performance tires, and other low dynamic loads rubber products.

Used in the manufacture of auto parts (shock absorbers, battery casing, tubing, matting). Hard tires and bicycle tires, endless belts, shoes, belts and so are some of the application that are used to produce different kinds of reclaimed rubber. Using reclaimed rubber achieves some advantages in the processing of raw materials and reduce costs.

Expected to be very fast growth industry for repairing tires since the application of modern technology greatly improved the quality and cost-effectiveness.

3.3.1.4. Surface activation

An alternative to the regeneration is surface activation of recycled rubber. There are several methods that can be used to modify the surface composition or granulated rubber to make it more compatible or useful. Methods can be classified into three groups: activation by adding chemicals, activating action of gas and mechanical or physical activation.

Today, about 75% of regenerated natural rubber and surfaceactivated rubber granulates is using as a raw material in the auto industry. Additional 5% may be used in the manufacture of tires.

3.3.1.5. Non vulcanization

Technology has become so expected for waste tires is non vulcanization, a process by which the rubber can break the chains and recycled.

At this point, less than 5% of the world's tire is recycling. New processing methods include chemical, thermal and ultrasonic vulcanization. Recent innovations in this area have open space for true recycling tires. Vulcanization is the process in which the tire is composed of other compounds, heated and hardened in order to be able to get them as a corresponding items. Vulcanization is a process that is irreversible.

Chemical vulcanization is process in which chemicals are added to rubber to break chains and chemically remove sulfur compounds from the rubber.

Thermal vulcanization is a procedure where the rubber at high temperatures has broken long chains.

Microwave vulcanization is considered as much as the heat. Microwave energy causes the movement of molecules, thus raising the temperature inside the tire and leads to chain brake. If microwave energy can be finely controlled, it will be severed ties sulfur-sulfur and carbon-sulfur but not carbon-carbon. The process has been in use for years, but it was rarely used because of the high costs.

Ultrasonic vulcanization is a procedure that uses ultrasonic waves to sever ties sulfur-sulfur bond. Research related to this method implemented from the beginning of the 1980s. Increasing the share of carbon black increases the vulcanization degree, and ultrasonic procedure is easy to cause partial deactivation of soot.

Former vulcanization methods such as microwaves, supersonic waves, alkalescent metals in organic solvents, give 1 to 2% new material.

Goodyear has a new process of vulcanization which restores 80% of rubber from old tires, which can be retread and can be used in a new product (including tires).

When the tire or waste tire vulcanized, may be returned to the process, and vulcanized shaped like pure rubber. The technology is based on using very strong ultrasonic. The procedure can be applied to all kinds of rubber, crosslinked thermoplastics such as PE, EVA and others.

The technology is cost-effective, market potential vulcanized rubbers are great because it is able to replace the rubber clean a large percentage, so the recycled content ranges up to 40%. Imports of natural rubber and polypropylene production is measured in the multi billions of

dollars, because it suggests the exploitation of market potential for their replacement vulcanized rubber.

3.4. Landfilling

Due to the growing interest about conservation of resources and energy, landfills are not a long term solution regarding old tires. With the proposed EU directives since 2003 prohibition applies to all tires since 2006 as it relates to the fragmented and tires. Loss of material and energy, the risk of fire and possible pollution of land and water are the main reasons you are forbidden to dump old tires in the EU.

While vulcanization and real recycling processes are developed, there remain some other alternatives burning tires and one of them, and the use of landfills for the disposal of crushed tire. They differ from other landfills because they contain only a waste tire that can later be used as granules in asphalt or as vulcanized and recycled into new tires.

Crushing reduces volume and eliminates other problems associated with landfills and storage. These landfills are only a temporary solution, but when combined with other technologies similar to vulcanization, they are now real and permanent alternatives to burning tires.

3.5. Difficulties in using recycled tires

The main obstacles to launch new products using recycled waste tires are financial. Costly research and development in various recycling techniques, the initial investment and operating costs of the recycling process are the major obstacles to be overcome.

Recycling of waste tires must be efficient, economically viable and environmentally friendly business. Recycling must be based on sound methods and technologies for recycling. The State shall promote the development of the tire recycling industry with effective marketing strategy to present to the public the importance and the quality of products made from recycled tires.

In industrialized countries, the activities in the field of environmental protection and new regulations contribute to more waste is recycled. Companies tend to portray "green image". In the EU, the problem of waste tires has deserved attention. Quality relationships are built between the industry and the Government in the approach to this problem.

The EU also proposes to increase the distribution and sale of retreaded tires in the private sector until it reaches a level of 25% of the market. Leading for retreading in Europe, are Italy and Denmark. Retread tires for passenger automobiles is performed on a small scale in the small difference in price between new and retreaded is not so great. It is necessary to better advertising retreaded tires. Only 2-3% of discarded tires in Europe ends up being a rubber granules. Further development of new technology will do that rubber granules are suitable for further use.

4. FINAL CONSIDERATIONS

Given the options for waste tire management - reduction, reuse, recycling of materials, energy recovery and landfill - there is a clear trend towards the restoration of power. The use of waste tires as an alternative fuel reduces the amount of old tires, conserve natural resources and increasing energy independence. In many cases, this is a rational option. There are plenty of viable options, great use of old tires that exist today and that will grow (using recycled rubber in asphalt retreaded, in the mixture with rubber to manufacture various rubber products, various building purposes).

Based on the method, the apparent diversity in the quality and quantity of recycled materials is of primary importance for use in new tires. The methodology of production, costs optimization, and quality control require further research and efforts to standardize these processes.

In the last decade, passenger tires and light truck tires contain from 0.5 to 5% recycled material. Sporadically used 10 to 15% recycled content in new tires, indicating range of applications new technologies but so far without knowing performance of these new tires.

Due to economic factors, security of supply and consistency of quality, marketing factors, tire manufacturers generally use up to 5% recycled material.

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CYCLES OF PRODUCTION AND CONSUMPTION AND STOCK MARKET INVENTORIES OF COPPER

CIKLUSI KRETANJA PROIZVODNJE I POTROŠNJE I BERZANSKIH ZALIHA BAKRA

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Abstract: *In a globalized world, the precursor of the globalization of world metal market trends are based on long-term and medium-term management of mineral resources exploitation. This paper presents the trends of world production and consumption of copper, and the overall stock market and stock prices, average annual values for the period from the year 1960 to 2012. Determined by interpolation of analytic functions and the price of stocks and their charts allow the identification of long-term, medium-term and short-term cycles of movement, their interdependence and possible simulations for predicting future movements at certain intervals. In this paper, beside mathematical methods, there are methods of description and analysis-synthesis model which provides a framework identifying the main cycle of global tendencies in the international copper market - the foundation for sustainable management.*
Key words: *copper, copper international market, cycles, management.*

Apstrakt: *U globalizovanom svetu, u preteči globalizacije svetska kretanja na tržištu metala predstavljaju osnovu dugoročnog i srednjoročnog upravljanja eksploatacijom mineralnim sirovinama. U radu su prikazane tendencije svetske proizvodnje i potrošnje bakra, ukupne i berzanske zalihe i cena, srednjih godišnjih vrednosti u periodu od 1960 godine do 2012.*
Utvrđene analitičke funkcije interpolacije cena i zaliha i njihovi grafički prikazi omogućavaju identifikaciju dugoročnih, srednjoročnih i kratkoročnih ciklusa kretanja, njihove međuzavisnosti i moguće simulacije za predviđanje budućih kretanja u odgovarajućim intervalima. U radu je pored matematičkih metoda, metodom deskripcije i analize-sinteze dat okvirni model identifikacije globalnih ciklusa glavnih tendencija na međunarodnom tržištu bakra-temelj održivog upravljanja.
Ključne reči:*bakar, međunarodno tržište bakra, ciklusi, upravljanje.*

1. INTRODUCTION

Prediction of future price trends on the world market has fundamental importance for successful management and production of copper exploitation. The task is realized by analyzing data on the global level, the average annual value of production, consumption, stock and total copper stocks, the growth rate of industrial production of the world in the period since 1960. to 2012. Interpolation functions corresponding approximate the mathematical models, which follows that the possibility of extrapolation that is prediction of a selected interval in the future. Analytical of description shown a tendency of certain factors stand out are the main factors affecting the growth or decline in copper prices and the stock market to the world's total reserves and production supplies manufacturers in the world. The London Metal Exchange is considered the basic is referential as is evident in the practice of international trade in metals.

The aim of this paper is determination the cycle of growth and falling copper prices in three domains: long, medium and short term. In view of the stability of the periodic appearance and

approximate determination of these cycles is the key to successful management of the production of copper. This paper shows in detail trends and confirms the hypothesis of being able to predict the dynamic markets of copper.

The character of mining economy is determined by small (low) elasticity of costs (32% Coefficient of elasticity; Cvetanovic N., 2005[1]), inflexibility and rigidity of the final terms of the consequences of long-term decisions in mining (by determining the capacity of the mine in the long centuries of exploitation, for example.) Repairs for which the price of one major cycle (depression.) medium-term decisions may be poorly adjusted or mitigate the negative effects of an ideal and can increase profits in the cycle of high prices, of course, you can provide sufficient reliability. Losses or gains are enormous and poorly "fixable" and international market knowledge of copper and its legality is imperative successful management of quality mining organizations.

2. THE MAIN FACTORS ON THE CYCLING OF AN INTERNATIONAL (GLOBAL) COPPER MARKET

The main factors of cycling in the international copper market trends are world production, consumption, prices, stock inventory and stocks of manufacturers, industrial output growth trends of the world, and their respective indices (base and stack). Their monitoring and connectivity not only gives the possibility for graphical display and simulation with appropriate reliability and high degree of correlation, but enables higher quality of decision-making of top management and maximizes business results, too. Charts of the tendency of world production, consumption, prices, stock inventory and stocks of manufacturers, industrial output growth trends of the world, and their respective indices (base and chain), their processing is performed by the author based on data collected from existing statistical publications available [3].

2.1 Global trends in production, consumption and prices Cu from 1960 to 2010. (Figure 1.)

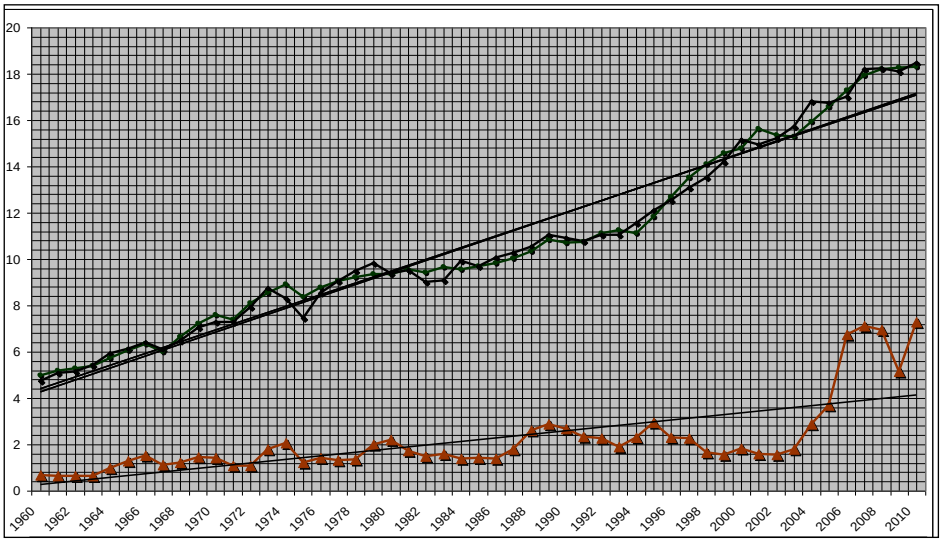

Figure 1 - Global trends in production, consumption and prices Cu from 1960 to 2010.
(--Δ-- prices Cu in US $ x 1000/t, -•- production Cu in 1000000t/year, --•-- consumption Cu in 1000000t/year, — linear trends)

Global trends in annual copper production, consumption, and their average linear lines show the following characteristics: high degree of correlation at certain intervals, and generally over 85%, the periodicity of growth and decline, a different coefficient in the direction of three major cycles of 1960 to 1975 and, since then of 1975 to 2001 and since 2001 and beyond. Observed intervals result from the 50-year tracking the movement of the oscillation between linear trend line (deviations, cutting) are implying the first criterion for determining the major cycle interval of 25 to 30 years. Statistical analysis, by calculating the correlation coefficient and linear trend line coefficients will receive the first initial criterion for determining the boundaries of large intervals of large cycles in the market of copper metal. In the same interval limits can be determined that the correlation coefficients in separate intervals ranging over 60% (even 70 %!), depending on the selected interval. Inclusion of 1.5 to 2.5 years during the late phase reaction of the market move gets a high correlation coefficient and average prices of supply and demand of copper over 80%. This leads to criteria for determining the correction cycle. This criterion gives the possibility of determining the medium-term cycles of about 4.5 years, which would make mid-term management decisions more reliable.

2.2. Global lines trends in production, consumption and prices Cu and Gross Domestic Product world from 1960 to 2010. in indices(Figure2.)

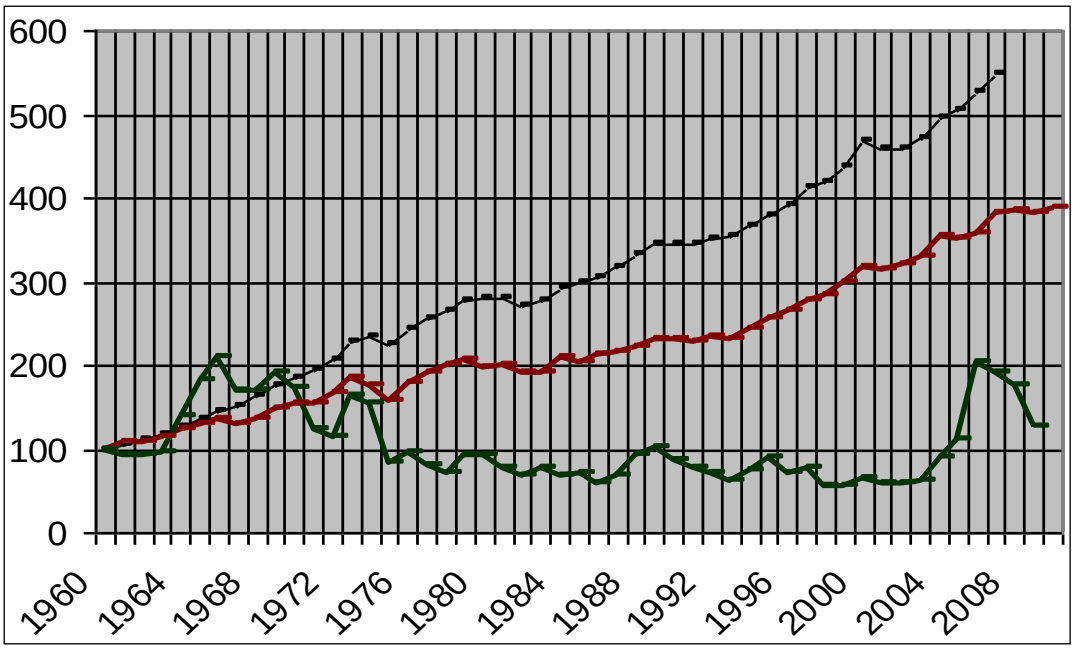

Figure 2. Global lines trends in production, consumption and prices Cu from 1960 to 2010.
(— consumption Cu in indices, — prices Cu in indices,, — GDP in indices)

2.3. Global lines trends production, consumption Cu and Gross Domestic Product world from 1960 to 2010. in indices (Figure 3.)

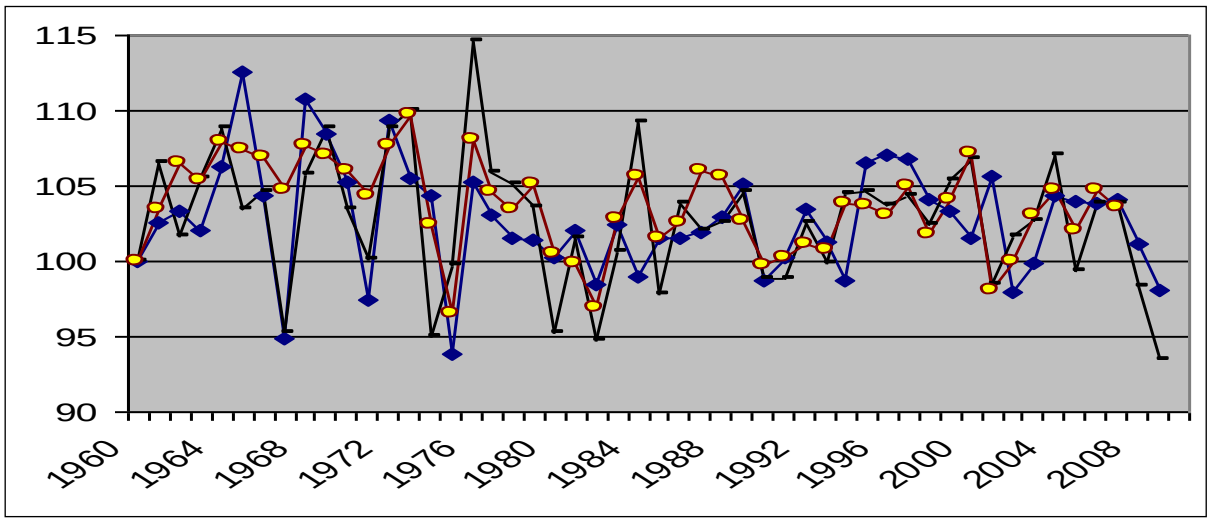

Figure 3. Global lines trends indices production, consumption Cu and GDP from 1960 to 2010.
Indices products Cu, 1960=100;
Indices consumption Cu 1960=100;
Indices GDP-world;

Trends indices of production, consumption Cu from 1960 to 2010 and GDP, clearly confirm the observation of medium-term cycles of 3.5 to 5.5 years and their periodic removal.

2.4. Global trends lines prices Cu and stock (stock market and converted total annual stock world) from 1960 to the 2010th(Figure 4.)

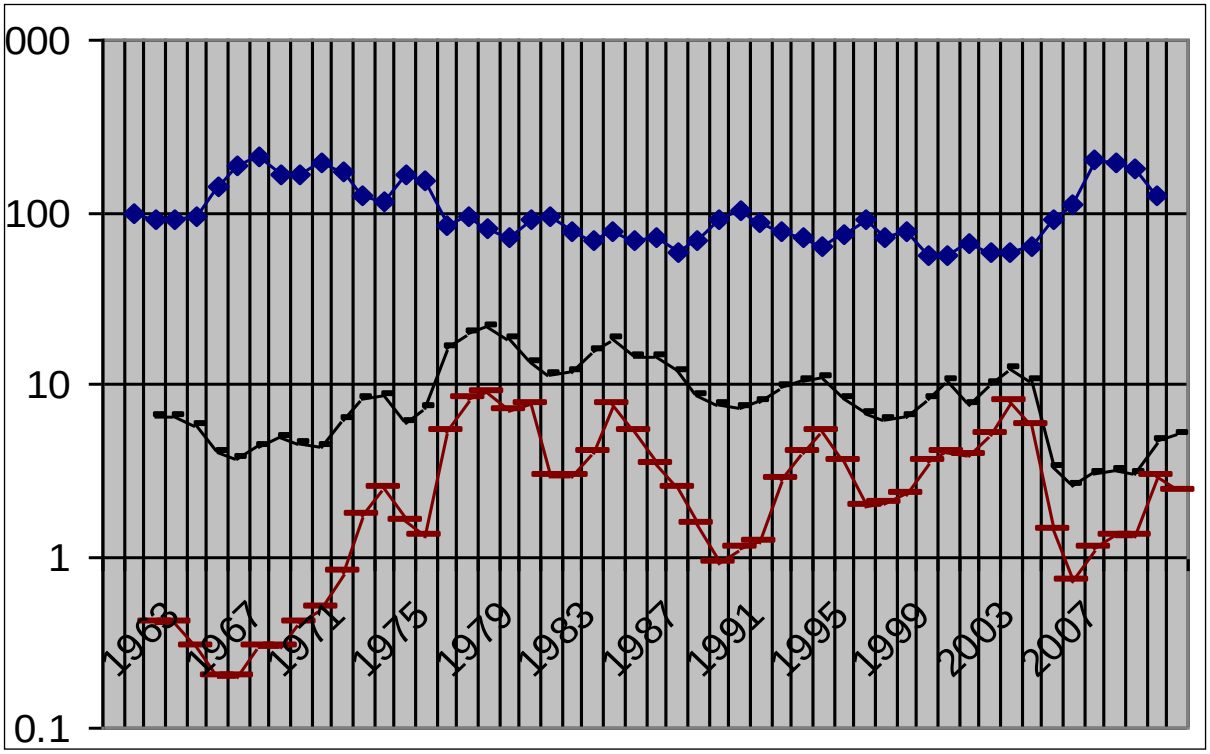

Figure 4. Global trends (half logarithmic) lines of Cu prices (in indices) and stock (stock market and converted total annual stock world) from 1960 to 2010

For a more precise determination of the rise and fall depending on the price of copper was found to depend on the main factors and the stock of inventory to total inventory (stock + producer! [1], [2]). This paper stocks expressed as a percentage and in relation to the total global consumption in the previous year.

3. APPROXIMATION AND THE ECONOMETRIC ANALISYS OF STOCK AND STOCK GROWTH INDEX PRICE OF COPPER

3.1. Growth index approximation copper price and stock inventories (Figure 5.)

In order to predict the proper and precise identification of the cycle (large, medium and small) increase or decrease of price of copper was performed polynomial and sinusoidal approximation in MATLAB (Figure5.), and calculated the root square error (tab. 1.) for the corresponding row of the functions.

Tab.1. Root mean square error of approximation appropriate

	RMSE (root mean-square error)	
	A polynomial approximation	The sum of sinus functions
Prices USDx1000/tCu	23.85	17.76
% of total copper stocks in relation to total consumption	2.601	1.232
% Stock Exchange in relation to the total. consumption	1.655	1.154

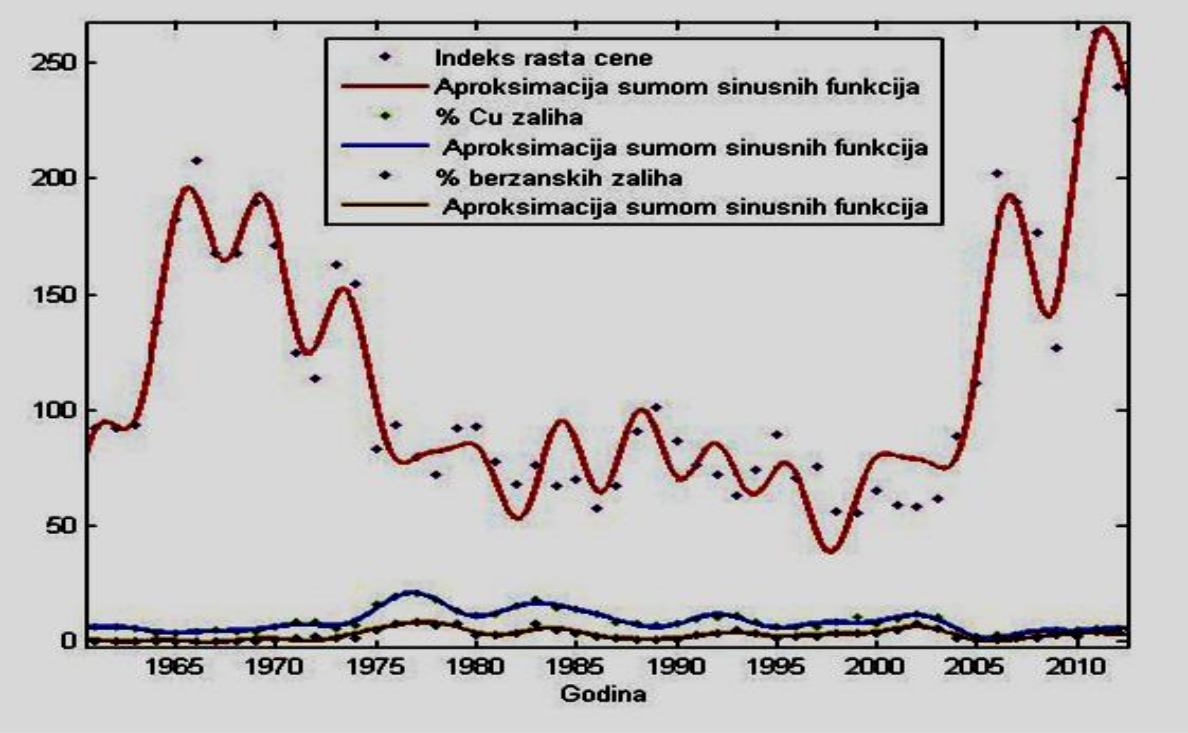

Figure 5. The approximation of the sum of sine functions price index Cu, stock and total stock (stock and producer)

3.2. Econometric analysis of the retail price index and stock inventory Cu (Figure6. - Figure8).

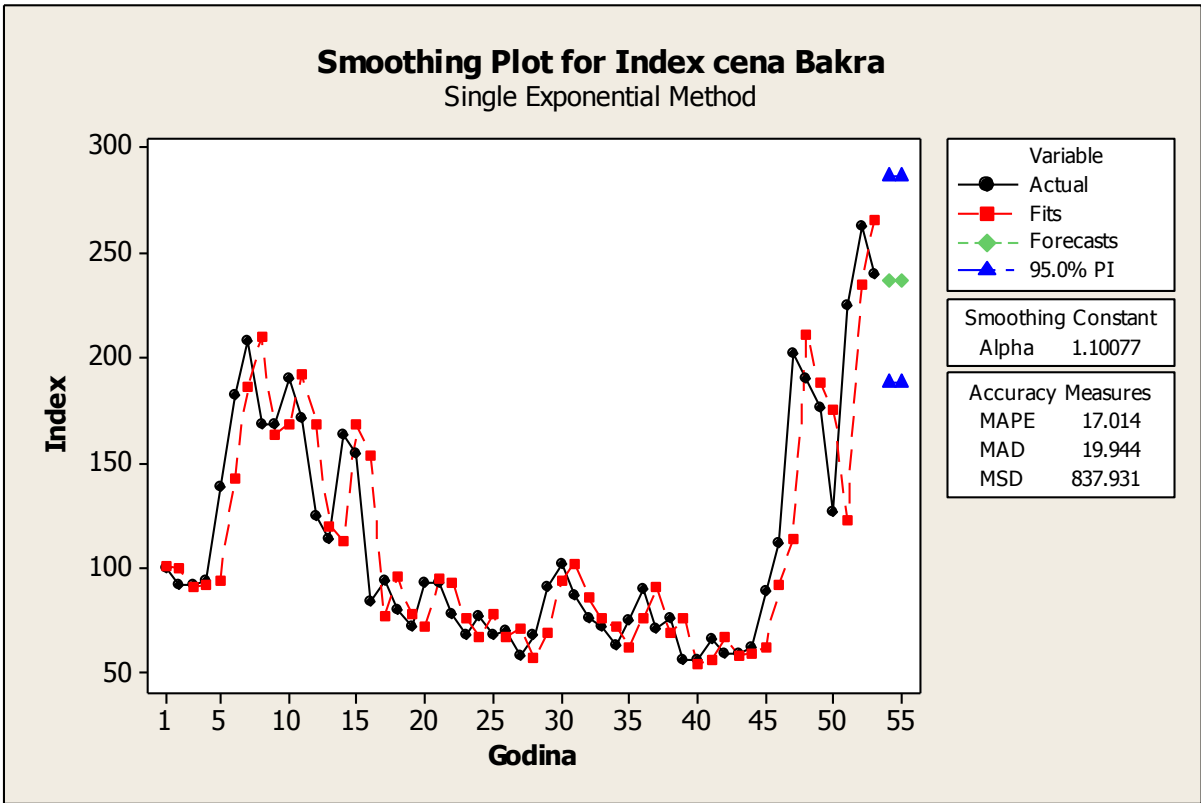

Figure 6. Approximation of time-series price index Cu in MAT TAB 16

The time series of the index increase / decrease in prices of copper has a cyclic character with cycles of about 5 years, and if we look at longer trends, then one can see two cycles of growth and decline of about 10 years and a great lasting more than 25 years (30 years!).

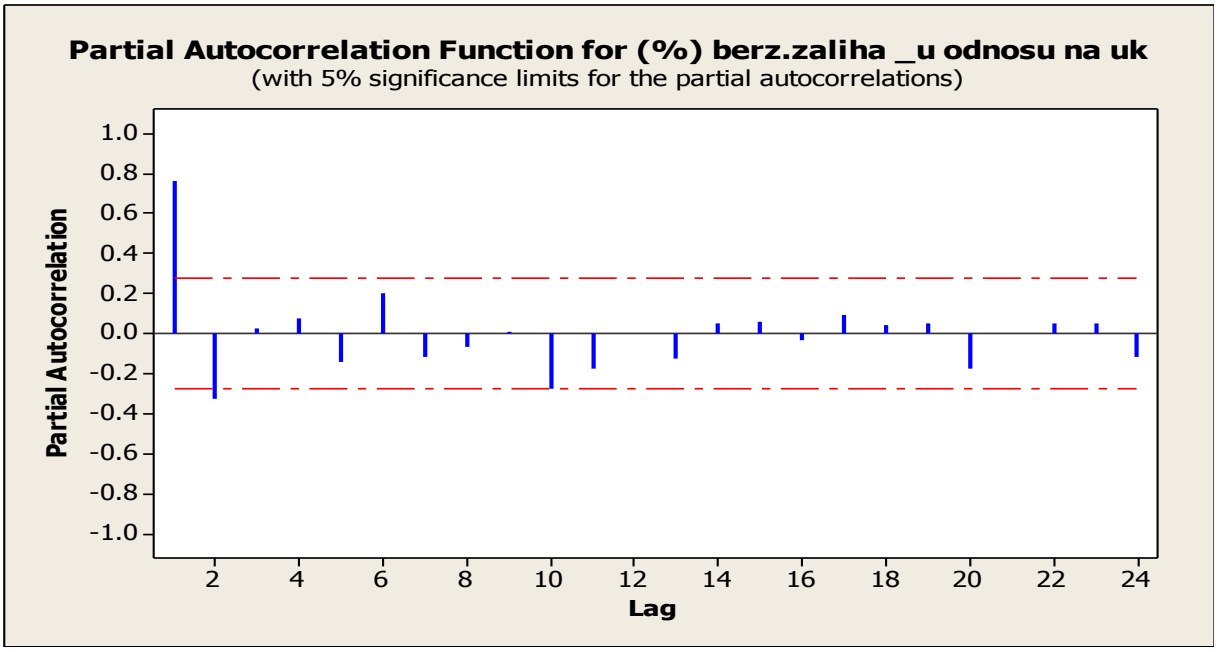

Figure 7. Autocorrelation index prices Cu in MAT TAB 16

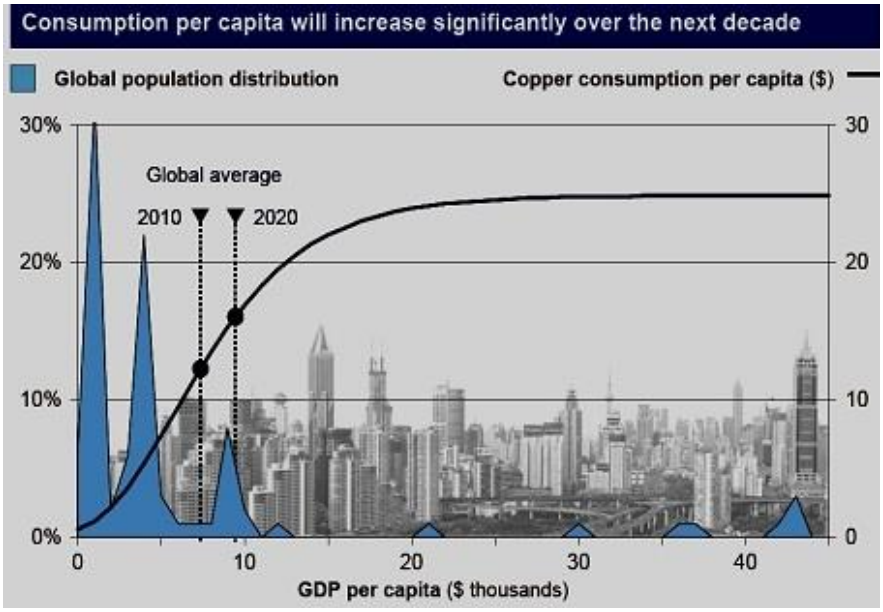

Figure 8. Autocorrelation in stock Cu in TAB MAT 16

The partial autocorrelation function shows that the price of copper in the current period statistically significantly affect copper prices in the previous period (the first year!) And moderately significant copper price 5 years ago. This confirmed the duration of a small cycle for 5 years, which will be important for mathematical modeling problem.

The partial autocorrelation function shows that the percentage of the stock of inventories of copper in the current period statistically significantly affect the percentage of the stock of inventories of copper in the previous period (**the first year**!) And moderately significant percentage of the stock of inventories of copper 2 and 11 years, confirming the length of the middle and small cycles.

4. CONCLUSION

Approximate analysis and time series analysis presented stock, index stock prices of copper and recalculated inventories are real values gives a sufficiently reliable to predict their response cycle trends in the global copper market with an error of less than 20%.

The goal of future research is to reduce the prediction error is below 10% and iterative methods and definition and numerical response with the inclusion of approximately one year.

The possibility of determining the trend line in the main cycles of movement of global copper market is very important for strategic decisions of top management of the respective companies. The importance of simulation of the main factors in the major cycles of global copper market gives rise to forecasts of business conditions in the future, its importance is remarkable. Be sure to confirm the significance of copper price forecasts see the graph of global average growth of copper consumption per capita is created by: Global Insight, Brook Hunt a Wood Mackenzie Company, McKinsey, Rio Tinto (Matthew Holcz 2010 [4]).

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THE IMPACT OF FOREIGN EXCHANGE POLICY ON THE EXPORT OF GOODS IN REPUBLIC OF SERBIA

UTICAJ DEVIZNE POLITIKE NA IZVOZ ROBE REPUBLIKE SRBIJE

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Abstract: *Inadequate foreign exchange rate policy has influenced the weak competitiveness of domestic products in the world market, the import sector and stimulating effect on exports of domestic products. As a result, there is consumption of imported goods that have, due to the appreciation of the local currency, increased competitiveness. In this regard, the paper aims to show that a policy of appreciated exchange rate impact on reducing demand for domestic products, all using a smaller capacity and a deficit in the balance of payments as a brake economic development of the Republic of Serbia.*
Key words: *exchange of goods, foreign policy, balance of payments.*

Apstrakt: *Neadekvatna devizna politika deviznog kursa uticala je na slabu konkurentnost domaćih proizvoda na svetskom tržištu, što je pogodovalo uvoznom sektoru a destimulativno delovala na izvoz domaćih proizvoda. Kao posledica toga javlja se potrošnja uvoznih proizvoda koji imaju, usled apresijacije domaće valute, veću konkurentnost. S tim u vezi, rad ima za cilj da ukaže da politika apresiranog kursa dinara utiče na smanjenje tražnje za domaćim proizvodima, sve manjim korišćenjem kapaciteta i deficitom u platnom bilansu što predstavlja kočnicu privrednog razvoja Republike Srbije*.
Ključne reči*: robna razmena, devizna politika, platni bilans.*

1. INTRODUCTION

Foreign exchange rate policy is a part of the economic politics that is managed by government. In that sense, watching the long period of years, governments had access to different regimes of exchange rates that can roughly be separated into systems of fixed and flexible exchange currency. Fixed exchange currency is characterized by the price of foreign currency that is expressed in a fixative amount of domestic amount of units whose amount is determined by a monetary authority. Flexible currency exchange is formed based on the relation of supply and demand of foreign exchange currency on the foreign exchange currency market while the monetary authority should not have any impact on its forming and value. Accepting liberalistic and market concepts, Serbia has accepted politics of "unclean" fluctuating (flexible) exchange currency, while this policy is based on a concept of unrealistic currency of diner that has negative consequences on product competitiveness, company, and economy in general. "It thus our economic neo-liberal reformers and their supporters since 2000. were especially proud of was fix diner rate and "healthy" bank system that is almost completely left to foreign investment"[1]. The essence and character of foreign rate currency policy cannot be viewed without the insight in all of its changes as well as the basic characteristics of solutions in economic and political system, conditions during which the international happenings developed and their influence on economic relations with foreign countries, primarily in merchandise exchange. Unreal foreign exchange rate which caused a number of consequences for firms and economy is in motion in Serbia. It is not leaving even the alternatives to adequately solve and remedy the problems without negative consequences on future situation in economy, which is pretty unsatisfactory.

2. FOREIGN EXCHANGE RATE POLICY IN SERBIA

In ten-year period (2001-2010.) the policy of overrated diner rate compared to euro was managed. Cumulative rate on inflation was 252%. During that period, diner constantly apprised compared to euro and it affected competitive of our products, especially agricultural and food industry on the world market a great deal. Overrated value of diner (Table 1) has benefited to import sector and had de-stimulating effect on domestic products export. Stimulating imports forced consumption of foreign consumer goods was forced, which low euro value, made considerably bigger competitiveness than it is realistic. It brought to reducing demand for domestic products and lesser level of using domestic producers' capacity. [2]

Table 1. Motion of realistic diner rate, 2001-2010 [3], 2011-VIII/2012

Year	**Chain indexes** End of previous year =100**)[4]**	**Cumulative**	**The official exchange rate Euro/RSD [5]**	**Real exchange rates Euro/RSD**
2001	130,0	-	59,7000	77,6100
2002	116,8	151,84	61,5845	93,5100
2003	101,9	154,72	68,4861	105,9617
2004	98,9	153,02	79,0803	121,0087
2005	101,6	155,47	85,5000	132,9269
2006	114,2	177,55	79,0000	140,2645
2007	109,7	194,77	79,2362	154,3283
2008	95,1	185,23	88,6010	164,1156
2009	97,7	180,97	95,8888	173,5300
2010	96,9	175,36	105,4982	185,0016
2011	104,4	183,08	104,6409	191,5766
VIII/2012	92,9	170,08	118,4517	201,4627

In the ten-year period, diner has cumulatively a pressed 75, 36%. In the 2004. it has insignificantly depressed, as well as in the period 2008.-2010., while the level of depression was considerably lower than the level of oppression of diner,[6] "Which negates all struggles of firms to maintain competitive on foreign and domestic market" [7]. By a pressing the domestic currency, conditions were made in which overrun of cheaper foreign products has destroyed the market of domestic products and made them incompetitible on national as well as on the international level. In the year to date, the diner weakened in nominal terms against all leading world currencies – pound sterling (13.3%), US dollar (12.2%), Swiss franc (10.9%), Japanese yen (10.3%) and euro (9.7%). Year-on-year, the diner depreciated by 11.5% against the euro – at end-June 2011 the exchange rate of the diner stood at 102.4631 EUR/RSD compared to 115.8203 EUR/RSD at the end of June this year. The diner's weakening against both the euro and the dollar in the first half of the year led to depreciation of the nominal effective exchange rate by 10.2% (measured against the "basket" of currencies including euro and dollar weighted at 80% и 20%, respectively). Such movements in the first half of the year, along with domestic inflation of 5.3% and inflation rates of 1.2% and 1.7% in the euro area and the US respectively, resulted in depreciation of the real exchange rate of the diner against the euro by 6.0% and against the dollar by 9.0%. The real effective exchange rate of the diner depreciated by 6.6% in the period under review. In Q2 2012, the diner weakened in nominal terms against all leading world currencies – Japanese yen (12.5%), US

dollar (9.6%), pound sterling (7.3%), Swiss franc (4.2%), and euro (3.8%). Due to such movements and domestic inflation of 3.2% and inflation in the euro area and the US of 0.3% and 0.0% respectively, the real effective exchange rate of the diner depreciated by 2.1% (0.9% against the euro and 6.7% against the dollar). [8]

3. THE IMPACT OF EXCHANGE RATE POLICY ON EXPORT IN THE REPUBLIC OF SERBIA

Bearing in mind that exchange rate varies and it influences trade exports, it is necessary to look at the structure of balance sheet as a category that sublimes all national economic transactions with foreign countries, while effects that exchange rate has on import and export with special review on export are contained in it.

Table 2. Republic of Serbia: Balance of Payments, 2007-2012 (in million USD) [9]

I T E M S	2007	2008	2009	2010.	2011.	2012
I. CURRENT ACCOUNT	**-6,931.7**	**-10,438.8**	**-2,858.9**	**-2,795.0**	**-3,850.4**	**-3,155.1**
I. a) CURRENT ACCOUNT BALANCE, BEFORE GRANTS	**-7,160.5**	**-10,750.7**	**-3,134.1**	**-3,051.1**	**-4,127.1**	**-3,299.4**
1. Goods (1.1.-1.2.)[/2]	**-9,721.3**	**-12,545.8**	**-7,120.4**	**-6,334.9**	**-7,400.9**	**-5,449.8**
1.1. Export of goods, f.o.b.	8,756.4	10,957.4	8,365.1	9,808.0	11,775.6	8,822.3
1.2. Import of goods, f.o.b.	-18,477.7	-23,503.2	-15,485.5	-16,142.9	-19,176.5	-14,272.1
2. Services (2.1.-2.2.)	**-354.6**	**-283.1**	**30.2**	**9.1**	**217.9**	**152.4**
2.1. Receipts	3,167.5	4,033.2	3,489.5	3,531.1	4,220.9	3,091.1
2.1.1. Transportation	724.1	960.5	729.4	781.0	941.3	729.5
2.1.2. Travel	865.3	944.3	865.4	798.4	991.7	707.8
2.1.3. Communications	109.0	128.5	138.9	156.7	237.3	374.9
2.1.4. Construction	199.2	359.2	225.2	230.3	287.5	168.7
2.1.5. Other	1,269.9	1,640.9	1,530.6	1,564.7	1,763.2	1,110.2
2.2. Expenditure	-3,522.0	-4,316.4	-3,459.3	-3,522.0	-4,003.0	-2,938.8
2.2.1. Transportation	-1,000.7	-1,284.1	-930.0	-992.3	-1,080.3	-808.5
2.2.2. Travel	-1,041.4	-1,253.7	-958.7	-952.6	-1,113.6	-795.4
2.2.3. Communications	-85.2	-117.6	-113.1	-112.1	-185.2	-267.1
2.2.4. Other	-1,394.7	-1,661.0	-1,457.4	-1,465.1	-1,624.0	-1,067.8
3. Goods and services balance (3.1.-3.2.)	**-10,075.9**	**-12,829.0**	**-7,090.2**	**-6,325.8**	**-7,183.0**	**-5,297.4**

From table 2 we can clearly see a big difference between export and import and services in balance sheet in favor of import. It is significantly higher than export, which consequently has a deficit in balance sheet. Export is marked by negative motion and its value is almost two times smaller than the import (Picture 3). The reason of this lies in a fact that the compatibility of our products is weak, that the import is higher than the export due to appreciation of domestic currency, as well as in the fact that, because of the rising input expenditure of producing sector, service sector is taking over. It cannot be a bearer of the economy development unless primary and secondary economy sectors are developed prior to it.

In the ten-year period (2001.-2010.), the policy of overrated diner rate compared to euro was managed. Cumulative rate on inflation was 252%. During that period, diner constantly deprecated compared to euro and it affected on competitiveness of our products, especially agricultural and food industry on the world market a great deal. Overrated value of diner (Table 1) has benefited to import sector and had de-stimulating effect on domestic products export. By stimulating import, spenditure of foreign consumer goods was forced, which, with low euro, made value considerably bigger competitiveness than it is realistic. It brought to reducing demand for domestic products and lesser level of using domestic producers' capacity. [10]

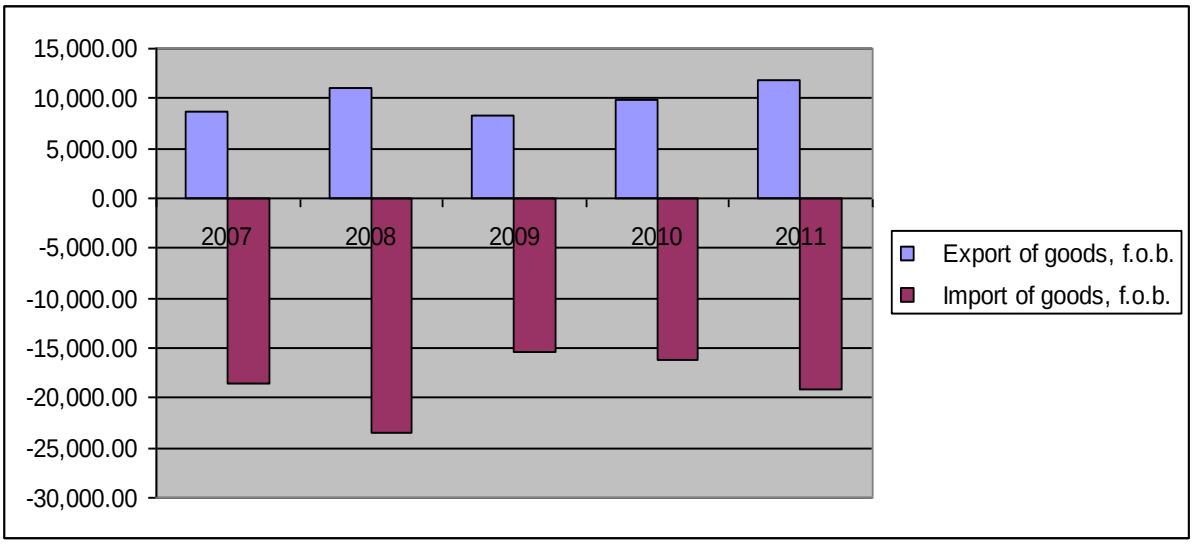

Figure 1. Relation between export and import (USD), 2007-2011.

In the ten-year period, diner has cumulatively depreciated 75, 36%. In the 2004. it has insignificantly depressed, as well as in the period 2008.-2010., while the level of depression was considerably lower than the level of oppression of diner, "Which negates all struggles of firms to maintain competitive on foreign and domestic market". [11] By apprising the domestic currency, conditions were made in which overrun of cheaper foreign products has destroyed the market of domestic products and made them incomprehensible on national as well as on the international level [12]. Because of that, as it is already mentioned, in international exchange with foreign countries favors dominate, and that certainly cannot be a foundation of economic development. Negative consequences of economic (and within it foreign exchange currency) policy will affect negatively on the development of domestic production because the domestic market will be opened to penetration of this products from the countries that have developed technology, during which domestic products will not be competitive neither by price nor by quality. This kind of policy prevents development of domestic technology, and as consequence of this we will be exporters of primary products, we will be base of raw material for developed countries. [13] To increase share of higher phases product processes in Serbia export it is necessary to activate economic political measures that support export. [14]

This kind of current in great deal explains state of national economy and suffocation of domestic production that is not competitive with prices neither on foreign nor on domestic

market while “Foreigners are given over a good part of domestic market without struggle, which is simply incomprehensible while, at the same time, value of our companies are going down.” [15]. What is most worrying is a fact that the problem of exchange rate is still looked at isolated as incident or defect that needs to be solved with higher or lower correction of national currency rate, and is not treated as one of important element of standard of economical doctrine, which is, unfortunately, dominating in our scientific and professional public. [16], so the question is whether this is by accident or result of conscious action. [17]

4. CONCLUSION

Goods export in analyzed period can be evaluated as negative. Export has suited to service sector due to lower input expenses. Input is mostly conditioned by inadequate exchange rate policy that is foremost suitable for import sector because the imported goods are more competitive by price as well as by quality.

Due to deep overview of exchange rate policy influence it is necessary to analyze elasticity of real exchange rate on certain sectors of economy and viewing its impact in long period.

In any case, inadequate foreign currency policy supports development of service sector overlooks production sectors in which are branches that are bearers of economy development.

Politics of apprised diner rate affect on decreased demand for domestic products, capacity usage and balance sheet deficit, which presents obstacle in economy development of the Republic of Serbia. Also, one should bear in mind that, under influence of other measurements of economy policy, companies of the Republic of Serbia are operating with loss and under efficiency limits, and every fifth economy subject is in a phase of blockade. With that, the liquidity of whole economy is disrupted and potential measures of recovery shall be long and painful.

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ENERGY RESOURCES AND INVESTMENT ANALYSIS OF THE ELECTRIC POWER SECTOR IN REPUBLIC OF SERBIA

ENERGETSKI RESURSI I INVESTICIONA ANALIZA ELEKTROENERGETSKOG SEKTORA U REPUBLICI SRBIJI

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Abstract: *The current issue of power sector raises the issue of adequate energy resources management, and investment analysis of this sector, which is vital to the functioning of the economy and businesses and households. Responsibility and sustainable business practices is crucial for managing and securing investments in capacity building and restoration of natural resources through capital, technology and trained personnel as well as the fact that investment, particularly in terms of negative economic shocks overly sensitive to external sources of financing. Bearing this in mind, this paper will look at investment-resource management of this sector given the strategically important sector of the Republic of Serbia.*
Key words: *energy resource, electricity sector, investments.*

Apstrakt: *Aktuelna problematika elektroenergetskog sektora otvara pitanje adekvatnog upravljanja energetskim resursima, odnosno investicionu analizu ovog sektora koji je od vitalnog značaja za funkcionisanje privrede i preduzeća i domaćinstava. Odgovorno poslovanje i održivost poslovne prakse je od krucijalnog značaja za upravljanje i obezbeđivanje investicija u izgradnju kapaciteta i obnavljanje prirodnih bogatstava kroz kapital, tehnologiju i obrazovane kadrove kao i okolnost da su investicije, naročito u uslovima negativnih ekonomskih šokova preterano osetljive na spoljašnje izvore finansiranja. Imajući u vidu navedeno, u radu ce se sagledati investiciono-upravljački resurs pomenutog sektora imajući u vidu starteški značaj ovog sektora za R. Srbiju.*
Ključne reči*: enegetski resursi, elektro-energetski sektor, investicije.*

1. INTRODUCTION

Power sector as energy sub-sector record losses in its operations in the long run. As this sector is of great importance for the economy, businesses and households, and is based on the binding energy resources, it is necessary to examine the causes that led to the collapse of this propulsive area, on which we have everyday data on the possible sale of Electric Power Industry of Serbia which could have far-reaching consequences not only for the population but also on the domestic economy as a whole. Therefore, part of this paper will be devoted largely to investments in this sector and related management of large public companies in the power sector.

2. LARGE COMPANISE REPRESENTING THE POWER SECTOR

In late 2005, in accordance with the Energy Law [1] and the Decision on the Establishment of the Public Enterprise for production, distribution and trade of electricity [2], there was a harmonization of the organization of work and business, and 11 subsidiary companies (6 for energy production and 5 for electricity distribution) were established.

Most activities of the Public Enterprise "Electric Power Industry of Serbia" include electricity trade, and business of electricity generation, power distribution, distribution system, production, processing and transportation of coal, steam and hot water production in the

combined processes are performed in a subsidiary founded by PE EPS to carry out these activities, which are systematized to: I The subsidiary for power generation and coal and II subsidiary for the distribution of electricity. Public Enterprise "Electric Power Industry of Serbia" realized founding rights of three public power utilities in the territory of the Autonomous Province of Kosovo and Metohija, whose organization, functions, and operations are to be aligned with the Company Law and Energy Law when the necessary conditions are met. In the Republic of Serbia, in the process of harmonization with EU standards and the standards of the European Statistical System, Classification of Activities (CA) has been adopted on the basis of the classification of activities [3] and Decree of the Government of the Republic of Serbia of 29 July 2010 [4]. In accordance with the above regulations, in the area of generation, transmission and distribution of electric power, there are 10 following companies operating: HE Djerdap, Drina-Lim HE, TENT, TE-KO Kostolac, Pannonian TE-TO, Elektrovojvodina, Electro Belgrade, Center, Southeast and Elektrosrbija Kraljevo. Listed companies present research sample on whose balance reports from 2008 (in order to avoid "the effects of the crisis") investment-management analysis has been studied since this is the sector which consists of companies that operate within the industry for the production, transmission and distribution of electricity, while the analysis was performed of all companies operating in this sector which is vital for the production and transmission of electricity, and has the monopoly position and is public property. In Serbia, the production of energy is based on thermal power and hydroelectric, which currently represents a significant competitive advantage [5], and belongs to the industry that owns technical progress, and are the driving force of economic growth and the creator of synergy effects in the economy. [6]

3. IMPORTANCE OF POWER SECTOR INVESTMENT

Viewed from a macroeconomic point of view of investment, as the most important factor of economic growth, development and well-being of a society, they represent a domestic product for replacement and extended reproduction of production funds. In microeconomic terms, observed by individual businesses, investments are sacrificing present consumption for future consumption, namely, they represent that part of the available resources (money, equipment, knowledge, etc.) invested in the creation or renovation or expansion of existing business capacity and enterprise. Thus, each organization is forced to invest because investment is the only way to fulfill the aims of the development [7] of the power sector in particular. Investments are, therefore, a necessity because the further development of each company is related to **good planning and efficient implementation of investment** [8] because there is a strict correlation between risk and return [9].

Due to the long-term effects they have on economic growth and the financial status of the company investment, decisions are no doubt one of the most critical aspects of financial management, particularly in the context of scarcity of funds [10]. In further parts of this paper, investment sources will be broken down into internal ones comprising accumulated net income, long-term provisions and depreciation, and external ones that make loans or borrowings. Analysis of the use of internal investment opportunities will show the utilization of part of the investment potential of the power sector.

4. POWER SECTOR INVESTMENT CAPACITY

Investment companies that make up the sample are given in Table 1. Total investments in land, buildings, plant and equipment, intangible investments and investment property amounted to 21,931,996 thousand dinars, where the real-investments are 99.34%, and the financial investments are 0.66%. Since the above-mentioned companies operate in the industry, which requires high levels of investment in fixed assets, it is necessary to evaluate and assess the degree of investment company capability and implications for business performance [11].

Table 1. Investments in 000 RSD. [12]

	Land	Buildings	Facilities, equipment and other resources	Construction in progress	Intangible assets	Self-directed investments	Investment property	**TOTAL**
PD Đerdap	-	62066	317627	601132	331	-	-	**981156**
PD Drimsko-Limske HE	279	21	32872	614442	1637	-	3892	**653143**
PD TENT	15076	17857	166965	5840659	24705	-	-	**6065262**
PD TE i kopovi Kostolac	203596	305996	180025	7343277		-	-	**8032894**
PD Panonske TE	-	-	-	46643	6291	-	-	**52934**
PD Elektrovojvodina	-	9246	364842	642890	38251	944468		**1999697**
PD Elektrodistribucija BG	-	24740	482981	733647	28983	-	-	**1270351**
PD Elektrosrbija	121	36411	167960	1732501	9704	119	-	**1946816**
PD Jugoistok	2588	-	234552	204912	20491	164767	-	**627310**
PD Centar	782	2636	116925	314550	14173	-	-	**449066**
TOTAL	**222442**	**458973**	**2064749**	**18074653**	**144566**	**1109354**	**3892**	**22078629**

Upon review of investments, it is necessary to examine the internal capabilities of these enterprises in order to identify rational use of them for investment purposes (Table 2).

Table 2. Internal sources of financing investments in 000 RSD.

Company	**Net result**	**Amortization**	**Long-term provisions**	**TOTAL**
PD Đerdap	-332.413	3.673.454	368.619	3709.66
PD Drimsko-Limske HE	-656.003	1.935.767	106.718	1.386.482
PD TENT	-8.695.287	14.936.872	828.345	7.069.93
PD TE i kopovi Kostolac	-2.746.911	4.336.07	678.332	2.267.491
PD Panonske TE	148.453	210.584	88.119	447.156
PD Elektrovojvodina	-689.64	3.457.747	451.297	3.219.404
PD Elektrodistribucija BG	-1.272.786	3.381.611	252.402	2.361.227
PD Elektrosrbija	-2.449.969	3.909.913	643.781	2.103.725
PD Jugoistok	-2.324.223	2.103.477	454.877	234.131
PD Centar	-1.082.245	1.276.504	150.907	345.166
TOTAL	-	-	-	**23.144.37**

Based on the data in Table 2 it can be seen that almost all companies operating with a net loss, and on that basis it is impossible to form accumulation to finance investment. However, the amounts of depreciation and long-term provisions are in high enough amounts to be compensated for the negative net result but it should be noted that this is not a desirable feature observed in the long term. It is also necessary to consider the structure of long-term provisions as they have a high share of total self-financing sources [13].

The total amount of long-term provisions is 4,023,406 000 accounted for 18% of total investments in the year, of which 13.5% are benefits for employees, so there is a question of justifying the high amount of employee benefits, given the fact that the analyzed company operated at a loss. In this sense, it is necessary to examine the relationship between costs based on reserves and total reserves. The costs of benefits for employees make 89.5% of long-term benefits and provisions for 66.2% of total long-term provisions as for litigation expenses represent 55% of provision for litigation and 14.2% of total long-term provisions. The high amount of long-term provisions for employee benefits raises the question of non-existing provision for restructuring costs as [14] "many facilities are not repaired for years, that 53% of installations that produce energy more than 30 years and noted that the importance and topicality of the issue that can be solved by restructuring" [15].

5. MANAGEMENT INVESTMENT IN THE POWER SECTOR

The medical and scientific literature consider the benefit, as part of variable pay, is given to the employee for his work and is used to reward a greater impact [16] and is in a positive correlation with the actual accounting income within certain implicit or explicit profit margins [17]. When viewed in terms of accounting, education, wages, bonuses and other financial compensation represent the expenses for a company that is recognized in the income statement and in reduction of liquid assets on which payment is recorded in the Statement of Cash Flows [18]. Therefore, companies should restructure the organization to go towards reducing the number of management levels and thus of the number of Directors-General, which determines that the big companies have to change their personnel policy, remuneration and promotion policies [19], because companies are not able to be developed, but attention is turned to solutions that will be found by the state [20].

Based on previous data analysis and data it can be concluded that the analyzed companies have a high degree of financial capability due to the relatively low share of investments (except in two companies) in total resources. This would mean that businesses after completion of investments are left with sufficient funds to conduct other business activities. Three companies show a low dependence on external sources of funding, while the remaining three companies show high dependence on external sources of funding.

Given the above, it can be concluded that the available funds have been spent for the wrong purposes and that the development of this sector was not taken into account. Also, we should not lose sight of the fact that the "responsibility and sustainability business practices is vital to ensuring investment in capacity building through capital, technology and skilled personnel" [21]. Inadequate management of available financial resources causes problems for potential investors and analysts to assess the performance, liquidity, financial flexibility and operational

capacity [22]. Also, one should not lose sight of the social dimension as already impoverished population is unable to meet its obligations under this sector, although the current price does not cover its costs, for the most part, and the arrival of new investors or buyers rather impose higher electricity prices to offset the costs of investments and income generated. Probably the produced electric energy would be exported as domestic entities will not be able to withstand the new rates, which raises the question of whether Serbia will remain in the dark? This is especially important because Serbia was once an exporter of electricity.

6. CONCLUSION

The power sector is of great importance for the economy, companies and individuals who recorded losses for many years and which are due to negligence in the management of the sector both by the state and by the company's management which led to the collapse of the propulsive area. Search for solutions, such as reducing to "bare", unprepared and full privatization and sale is an unacceptable solution without any prospects for EPS and its employees, for the sale of EPS and other vital business of large infrastructure systems risk the total destruction of the Serbian economy in order to settle short-term foreign currency obligations in respect of loans received, since every year there are more new annuities to be collected; and it raises the question which sources will be used when they "sell everything" especially at a time when the domestic economy "exists" in terms of an unprecedented economic crisis [23]. Also, one should not lose sight of the social dimension as already impoverished population is unable to meet its obligations under this sector, although the current price does not cover its costs. The given opens a new question: Will Serbia remain in the dark?!

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ANALYSIS OF COMMODITY EXCHANGES OF SERBIA WITH FOREIGN COUNTRIES

ANALIZA ROBNE RAZMENE SRBIJE SA INOSTRANSTVOM

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Abstract: *Trade between the Republic of Serbia and foreign countries over a longer period shows a negative result as a consequence of higher import than export of goods and it is manifested in deficit in the balance of payments. In this sense, the deficit in goods balance within the current transactions, will be an object of this paper through the presentation of import and export of goods by economic zones, purpose, type of merchandise and intensity of production factors, in order to highlight the importance of the development and competitiveness of the manufacturing sector for the economic development of Serbia.*
Key words: *commodities, trade, import, export, analysis.*

Apstrakt: *Robna razmena Republike Srbije sa inostranstvom u dužem vremenskom periodu beleži negativan rezultat koji je posledica veceg uvoza od izvoza robe a koji se manifestuje i na deficit platnog bilansa. U tom smislu, deficit robnog bilansa u okviru tekućih transakcija, biće premet ovog rada kroz prikaz kretanja uvoza i izvoza robe po ekonomskim zonama,nameni, vrsti robe i intenzivnosti faktora proizvodnje, kako bi se ukazalo na značaj razvoja i konkurentnosti proizvodnog sektora za privredni razvoj Srbije.*
Ključne reči*: roba, razmena, uvoz, izvoz, analiza.*

1. INTRODUCTION

Trade with foreign countries is an element of competitive advantage because it shows the level of quality tests (products), their competitiveness and, depending on the exchange rate regime, it affects the balance of goods in the current account, which can affect the surplus or deficit.

In the period since 1989 to 2002 the RCA (Revealed Comparative Advantage) showed a large decline in export competitiveness of the former Serbia and Montenegro. In 1989 trade deficit was only 7.3%, in 1990 12.4% share, while in 2001 and 2002 it reaches values of 43.5% and 47.1%. Number of group of products with positive RCA dynamically reduces since 1989. Number of group of products that reviled comparative advantage in trade with the world was effectively halved in comparison to 1989. [1]

The structure of the products that were the subject of export is dominated by the half products at the expense of higher phase industrial products. In this sense, the object of this paper will be the representation of fluctuation of import and export of goods by economic zones, purpose, type of merchandise and intensity of factors of production, in order to highlight the importance of the development and competitiveness of the manufacturing sector for the economic development of Serbia.

2. ANALYSIS OF IMPORT AND EXPORT OF GOODS

Analyzing the import and export of goods in Serbia, the tendency of these variables with a special accent to the time period and the economic conditions that have characterized certain periods will be considered (Table 1, Figure 1).

Table 1. Import, export and coverage of import by export of goods in Serbia,1997-2006.000 EUR [2]

	1997.	1998.	1999.	2000.	2001.	2002.	2003.	2004.	2005.	2006.
I. CURRENT ACCOUNT	-1,135	-469	-455	-153	-285	-1,247	-1,420	-2,880	-2,223	-3,966
1. Goods (1.1.-1.2.)[/2]	-1,753	-1,438	-1,244	-1,582	-2,308	-3,228	-4,021	-6,469	-5,289	-6,271
1.1. Export of goods, f.o.b.	2,610	2,898	1,548	1,645	1,821	2,212	3,319	4,082	4,972	6,442
1.2. Import of goods, f.o.b.	-4,363	-4,336	-2,792	-3,227	-4,129	-5,440	-7,340	-10,551	-10,261	-12,713
Export/Impotrt %	1,67	1,48	1,92	1,96	2,27	2,46	2,21	2,58	2,06	1,97

In the analyzed period, we can see a negative balance in the balance of goods and import is larger than export. The largest export of goods was recorded in 2006 while at the same time we also recorded the highest import. The most drastic drop occurs in 1999 where the volume of foreign trade makes just a third of the volume in 1990, or less than half the volume of 1991 and the reason for this is certainly the NATO bombing of the country and its consequences, which reduce the volume of foreign trade.[3] However, import ratio was the highest in 2004 (which is explained by the introduction of a fiscal levy-VAT) and in the entire period, imports of goods by far exceed the export.

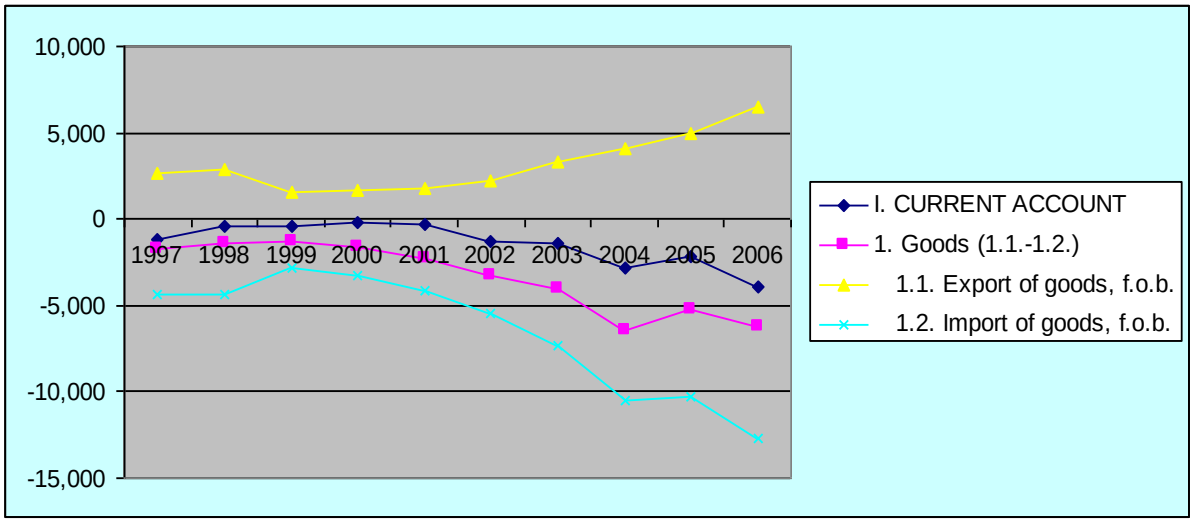

Figure 1. Trend of import and export of goods and current account, 1997-2006

Figure 2. Illustrates a high amount of import of goods and it can be concluded that it has a significant effect on the deficit in the current account.

Table 2. Import, export and coverage of import by export of goods. Serbia, 2007-2012. 000 EUR [4]

	2007.	2008.	2009.	2010.	2011.	2012.
I. CURRENT ACCOUNT	-5,052.5	-7,054.2	-1,910.1	-1,887.2	-2,870.0	-3,155.1
1. Goods (1.1.-1.2.)	-7,068.7	-8,501.2	-4,946.4	-4,581.0	-5,318.4	-5,449.8
1.1. Export of goods, f.o.b.	6,382.5	7,416.0	5,977.8	7,402.5	8,439.6	8,822.3
1.2. Import of goods, f.o.b.	-13,451.3	-15,917.2	-10,924.2	-11,983.6	-13,758.0	-14,272.1
Export/Impotrt %	2,11	2,15	1,83	1,62	1,63	1,62

In the period from 2007-2012 downward trends in import of goods is also noted. Coefficient of coverage of import by export in the period 2007-2009 was almost 2, while in the following it shows a decline in stagnant form (table 2, Figure 2).

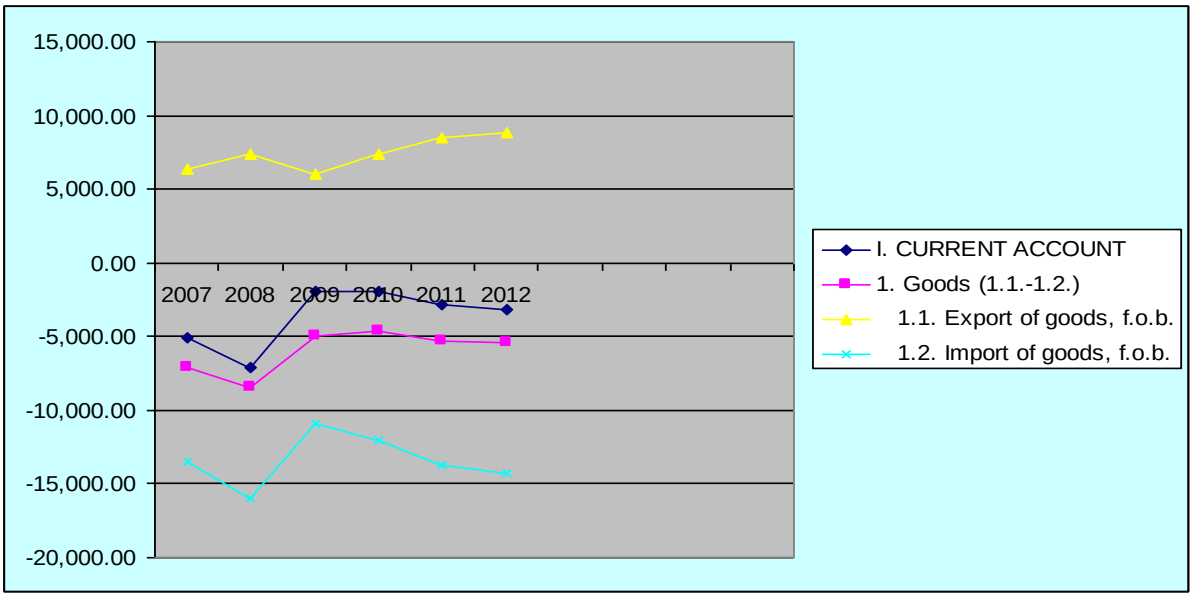

Figure2. Trend of import and export of goods and current account, 1997-2006

In the analyzed period, it can be seen that the current account recorded a negative relative stagnation in the period from 2008-2012, although export of goods recorded mainly the growth. Due to the high amount of export of goods the deficit is explained by a greater share of the export sector in the area of services, i.e. terciary sector, which certainly can not be the driving force behind economic development in Serbia.

3. ANALYSIS OF INTERNATIONAL COMMODITY EXCHANGE OF SERBIA

Analysis of the import and export of goods by economic zones demonstrates the international exchange of goods between Serbia and foreign countries. In addition, it is very important to see what type of goods is subject to international trade (Table 3).

Table 3. Serbia's Exports, f.o.b., 2006-2012. [5] 000 EUR

	Total (2+4 to 6) =(7 to 10)	By economic area[1]					By purpose of goods[2]				Total (12 to 21)
		EU	Of which: EU 15	CEFTA	CIS	Other	Investment goods	Consumer goods	Intermediate goods	Unclassified by destination	
	1	2	3	4	5	6	7	8	9	10	11
2006[4]	5,102	2,681	2,087	1,553	368	500	309	1,382	3,410	2	5,102
2007	6,433	3,603	2,458	2,072	455	303	493	1,721	4,217	2	6,433
2008	7,429	4,029	2,646	2,458	545	397	688	1,957	4,782	2	7,429
2009	5,961	3,196	2,063	1,881	408	476	579	1,841	3,539	2	5,961
2010	7,393	4,235	2,656	2,126	599	433	604	1,978	4,810	1	7,393
2011	8,441	4,868	2,979	2,298	777	498	707	2,134	5,599	1	8,441
2012	8,837	5,132	3,005	2,229	880	596	874	2,598	5,364	1	8,837

International trade of goods registered a growth in the period from 2006 to 2012 and in the most part it was realized with EU countries. If we observe the type of the goods, the largest international exchange of goods was realized with intermediary goods in other words raw materials, and they are mostly involved in the export structure.

Observed by SMTK sectors we have a situation that is presented in tables 4 and 5:

Table 4. Serbia's Exports, c.i.f. mil USD

	Food	Beverages and tobacco	Crude materials, inedible	Mineral fuels and lubricants	Animal and vegetable oils and fats	Chemical products	Manufactured goods	Machinery, apparatus and transport equipment	Miscellaneous manufactured articles	Commodities and transactions, n.e.s.
2006	845	90	221	180	23	518	1,919	562	714	31
2007	987	128	299	168	69	667	2,257	914	912	32
2008	1,016	169	306	254	100	752	2,423	1,288	1,054	68
2009	1,076	178	208	276	86	473	1,557	1,054	962	91
2010	1,331	176	350	379	109	662	2,147	1,199	932	108
2011	1,503	196	469	353	144	718	2,492	1,406	1,083	77
2012	1,642	223	459	312	152	719	2,050	1,982	1,214	84

Table 5. Serbia's Imports, c.i.f.mil USD

	Food	Beverages and tobacco	Crude materials, inedible	Mineral fuels and lubricants	Animal and vegetable oils and fats	Chemical products	Manufactured goods	Machinery, apparatus and transport equipment	Miscellaneous manufactured articles	Commodities and transactions, n.e.s.
2006	650	160	627	2,595	37	1,870	2,743	3,365	1,109	17
2007	648	90	604	3,099	28	2,131	3,504	4,048	1,475	3,537
2008	864	108	849	4,380	47	2,614	3,904	4,761	1,807	4,996
2009	747	116	461	2,380	45	2,023	2,624	3,088	1,262	3,061
2010	875	170	681	3,254	40	2,455	3,270	3,461	1,301	963
2011	1,055	198	792	3,963	45	2,975	3,843	4,527	1,510	954
2012	1,085	192	614	3,338	49	3,100	3,458	4,406	1,349	1,422

Observed by SMTK sectors the biggest export is realized in the processed products or half products, while the largest importwas made in investment products, processed products and mineral fuels and lubricants. Thus, we mostly export labor-intensive products and import capital-intensive products because by "the unrealistic exchange rate policy we stimulated import and discouraged export of agricultural products, which has resulted in" unrealistically "low productivity" [6] which is significantly influenced lower competitiveness of domestic products in the world market. Overvalued dinar favored the import sector and had a discouraging effect on export of domestic products. Stimulation of import forced the consumption of foreign consumer goods, which by the means of cheap euro exercised much greater than the actual competition, which led to a decrease in demand for domestic products and declining levels of capacity utilization of domestic producers. [7]

4. CONCLUSION

• Unrealistic exchange rate policy has significantly reduced the competitiveness of domestic products and foreign products have become cheaper. [8]
• The appreciation of the domestic currency gave a boost to the import sector and local products are uncompetitive both in cost and quality.
• Keeping this type of economic policy is an impediment in development of Serbia. In this sense, strong efforts should be made by makers of monetary and exchange rate policies in the area of fiscal policy and in sectors that are priorities for development.
• reducing fiscal burdens, increasing tariff rates, slow introduction of the real exchange rate, reducing reserve requirements we will somewhat create the conditions for an increase in capacity utilization, increasing employment and purchasing power, particularly in the manufacturing sector, and thus aggregate demand. That way there would be a shift in the growth and development of the economy and the competitiveness of the final product.
• If the above measures are implemented, it would not be realistic to expect a short-term positive results but consistency in applying these measures would in the long run put our economy in a much better position and thus would reduce the deficit in the balance of payments because we would not be addicted to import.

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INTERNET MARKETING A NEW RESOURCE IN BUSINESS

INTERNET MARKETING NOVI RESURS U POSLOVANJU

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Abstract: *The development of the Internet itself means a new dimension of economy, a new resource in business operations. Therefore, marketing strategies of the new digital age have been developed, such as E-business, E-commerce, and E-marketing among others. By means of the digital data processing we can reduce everything into small pieces, which are then combined into packages and integrated into software objects that can further be linked into programs used for products. The obtained results are thousands if not even millions of innovations that can shape up digital economy and are a solid basis for the new marketing paradigm and new economy. There have been many strange things that could not be explained by the traditional marketing philosophy. New companies have appeared out of nowhere and managed to shift from the garage to the status of a global empire, in a period of just a few years. Something like that has never been possible before. This signified the beginning of something new.*
Keywords: *Internet marketing, new resources, new economy, innovation*

Apstrakt: *Sam razvoj Interneta postaje nova dimenzija ekonomije, novi resurs u poslovanju. Na osnovu toga, razvile su se marketinške strategije novog digitalnog doba kao što su E-poslovanje, E-trgovina, E-marketing. Digitalnom obradom podataka svodimo sve na sitne delove koji se potom spajaju u pakete i integrišu u softverske objekte, a ovi se onda povezuju u programe koji idu u proizvode. Rezultat su hiljade, ako ne i milioni inovacija, koji oblikuju digitalnu privredu i predstavljaju osnovu za nove marketinške paradigme i novu ekonomiju. Dogodile su se mnoge čudne stvari koje ne bi ni mogle da se objasne tradicionalnom marketiškom filozofijom. Niotkuda su se pojavile nove kompanije i uspele da od garaža pređu u status globalne imperije i to za samo nekoliko godina. Tako nešto nikada do sada nije bilo moguće. Ovo je značilo početak nečeg novog.*
Ključne reči: *Internet marketing, novi resursi, nova ekonomija, inovacije*

1. INTRODUCTION

The development of the Internet itself means a new dimension of economy, a new resource in business operations. Therefore, marketing strategies of the new digital age have been developed, such as E-business, E-commerce, and E-marketing among others. By means of the digital data processing we can reduce everything into small pieces, which are then combined into packages and integrated into software objects that can further be linked into programs used for products. The obtained results are thousands if not even millions of innovations that can shape up digital economy and are a solid basis for the new marketing paradigm and new economy. There have been many strange things that could not be explained by the traditional marketing philosophy. New companies have appeared out of nowhere and managed to shift from the garage to the status of a global empire, in a period of just a few years. Something like that has never been possible before. This signified the beginning of something new.

2. INTERNET COMMUNICATIONS

The latest phase of the development of society and economy is based on the development of Information and (tele)communication technology, first of all. In its broadest sense, the basic infrastructure which enables the existence of electronic (digital) economy is information technology and the Internet. Apart from Serbia, there are also countries which have taken a step into a new century in which the new resources, methods and tools are used, which are improving a business atmosphere and the life standard of its citizens in spite of the world economic crisis. The ever-present globalization process which is followed by the expansive development of technology and media, contemporary social progress, as well as further economic development of mankind, for the most part is based on the development of information society, where information, i.e. knowledge and understanding of the Internet, is one of the most important resources. When knowledge (i.e. information that are available) becomes a key factor of successful economic development, there is a change in traditional patterns in business and creating a new business model – which needs to respond to challenges of the global market.

Business people promptly realize all the benefits of Internet communication, so that it is becoming a new dimension, a new resource in the business. Almost everyone is connected to the Internet, from educational, research institutions to various commercial organizations, as well as military and government information servers.Users are allowed countless activities: searching various databases, collecting and reading millions of files that are available to them, sending and receiving files, music and video clips, pictures, sending and receiving e-mails, browsing the various catalogues, sales of goods and services, conducting marketing tests, setting up their own presentations and the like.Some of the web services that enable the realization of all these and many other activities are: e-mail, Telnet, FTP, WWW, specialized services, IRC, Sig files.

The development of the Internet, as already stated, is becoming a new dimension, a new resource in the business. On this basis, marketing strategies, such as E-business, E-commerce, E-marketing have developed for the new digital age. Electronic business (E-business) includes the use of electronic platforms - intranets, extranets and the Internet in business activities and in business communication of a company. Electronic commerce (E-commerce) involves the purchase and sale mostly on the Internet.

While e-business includes all the electronic exchange of data within or among companies and customers, e-commerce involves just a process of buying and selling. E-commerce includes e-marketing (the selling side of e-commerce) and e-purchase (the buying side of e-commerce). Electronic marketing is in fact the company's efforts to inform the public about products and services, and to promote and sell via the Internet. Benefits for customers are multiple: clients can avoid traffic jams, there is no need to look for a parking space and browse the shops and shelves in pursuit of the product they need. They can compare offers through catalogs they receive by e-mail or surfing the web pages. The online shops are open around the clock, 24/7 and 365 days a year, from your apartment or any other place.

The importance of the Internet as a global medium is invaluable, as it creates a global market. Benefits for vendors in this business may include: lower costs; selling goods around the country and the world; simple order processing; goods are sold even while you are on vacation, on weekends, at any time; inventory management can significantly increase the sale of products. Furthermore, the benefits are also considerable in delivery and improving trade. In addition to these benefits, companies can access the communication with customers and thus learn more about their specific needs and wishes. E-marketing also offers greater flexibility, which allows the merchant to constantly adapt their offer and programs. Electronic catalog, in addition to creating a lower cost than printing, also allows easy alteration at any time.

3. NEW INFORMATION TECHNOLOGIES AND MARKETING

Information technologies have fundamentally changed the nature of marketing. Changes in information technology are both threatening and those that promote the ability of the owner, subject, to develop long-term relationships with their customers, thereby supporting marketing relationships.

Internet marketing emerged in the very recent past, almost parallel with the development of the Internet, providing customers with direct contact with business subjects at any time of the day or night, from any location, so that customers could gather the necessary information and then make a purchase. This information can be personalised according to the individual customer's needs.

The Internet allows buyers to gather information on competitive products and services in an easy way. This is exactly something which gives strength to the customer, and as a new resource, it provides help for a business entity to find new customers and at the same time improve and enhance the service for the existing ones. For these purposes E-marketing uses a database in order to develop personal profiles and then focus on the processed information to identify the specific needs of customers. For example, Amazon.com personalises e-mail, processes web sites and offers products based on the previous purchases of the customers.

The development of e-business system enables business entities to enhance information technology, thus developing relationships with customers. Managers of these business entities *must get to know this new resource very well* so that they can develop a plan and reach organizational goals, considering the sources and nature of the business environment in which it operates. All components of the business should operate smoothly in order to facilitate the functioning of the marketing system in its environment. This system must organize itself and find an advantage over their competitors, to ensure long-term sustainability.

Electronic business systems support numerous changes which marketing system includes: standardised products, increased price pressure, which results in lower prices, shorter distribution channels, nonlinear promotions, electronic transfer of funds, as well as information management systems oriented to databases. All of the above takes place in a dramatically variable environment, requiring from the management to reorganize and develop

new strategies. E-business improves and enhances relationships, allowing business entities to focus on their customers on an individualized global market.

In accordance with the previous findings, it is possible to define electronic internet-marketing as "the fulfillment of marketing objectives through the use of the Internet and the Internet-based technologies".[1] In defining the concept of e-marketing, the analysts point to the de facto existence of a specific globally spread global market structure, subsuming it under the term of the new economy or a new economic resource, where the Internet economy (Internet Economy) also occurs both as a consequence and a cause. Thus in the narrow sense, e-marketing can be seen as the process of creating offers, pricing, distribution and promotion in order to profitably meet the needs of customers solely on the electronic market. This range may also include software solutions whose marketing mix is almost entirely carried over the Internet.

Completely pure forms of e-marketing which is applied by cyber companies, for example, ISPs (Internet service providers) emerged as the business models which meet the needs of the Internet access and provide a range of additional services. *The Internet for such a company is a new resource*, a market niche, where it does all its marketing activities and implements a complete marketing program, from creating products and services to meeting the needs of users, from pricing in competitive terms with the same or similar businesses to the e-promotion and e-distribution. These firms use conventional marketing techniques, only to a slight extent (for example, the promotion in specialized magazines dedicated to the Internet users, or distribution and software solutions on CDs through retailers).

Digital era has created technological facilities, and the Internet as a medium has opened the space for practical operation of interactive marketing type, aimed at consumers, not as a group of similar individuals, but consumers as individuals. The other forms of e-marketing are more or less hybrid solutions, in which the possibilities of e-marketing are used in different ways and in a varied range, which depends on the type of ownership of the business entity and the specificity of production and service program. Today it is almost impossible to find a serious company which is not present on the Internet at least through the website, as the initial form of e-marketing. Besides the commonly used concept of e-marketing, the term online marketing is often used as a collective term for all types of online marketing (e-marketing, cyber marketing, online marketing, and web marketing). Regardless of the name, marketing which is assisted or fully based on digital technology, must be creative, and subject to constant change, due to the abundance of information which is nowadays provided to the users.

The Internet as a new resource has brought a great and quality change which is succinctly called a " business opportunity of the small," because all the web sites are "visible" to other users. It has led to the fact that small companies can be included in "the competitive game" with the market leaders over the Internet, which was unthinkable of in the field of classical markets and marketing. The essential features of the marketing concept or the key principles of marketing in this case remain the same: creating values for customers, achieving competitive or special benefits and directing and focusing on goals, the other resources and efforts of the company on strategic basis.

Specificity or a new qualitative factor, which primarily brings the Internet networking into marketing context, is interactivity - direct i.e. indirect contact of the Consumer and Marketing oriented organization at the same time (real time). Therefore, the phenomenon of the Internet, from the standpoint of its application within the marketing concept of each organization should be viewed rather as a revolution in communication than in the technological context. However, online marketing is a new discipline, and a small number of business people are familiar with the characteristics necessary for a successful business, regardless of the uses and benefits. The Internet is a powerful marketing medium and provides new ways for the implementation of the marketing mix, as shown in Figure 1.

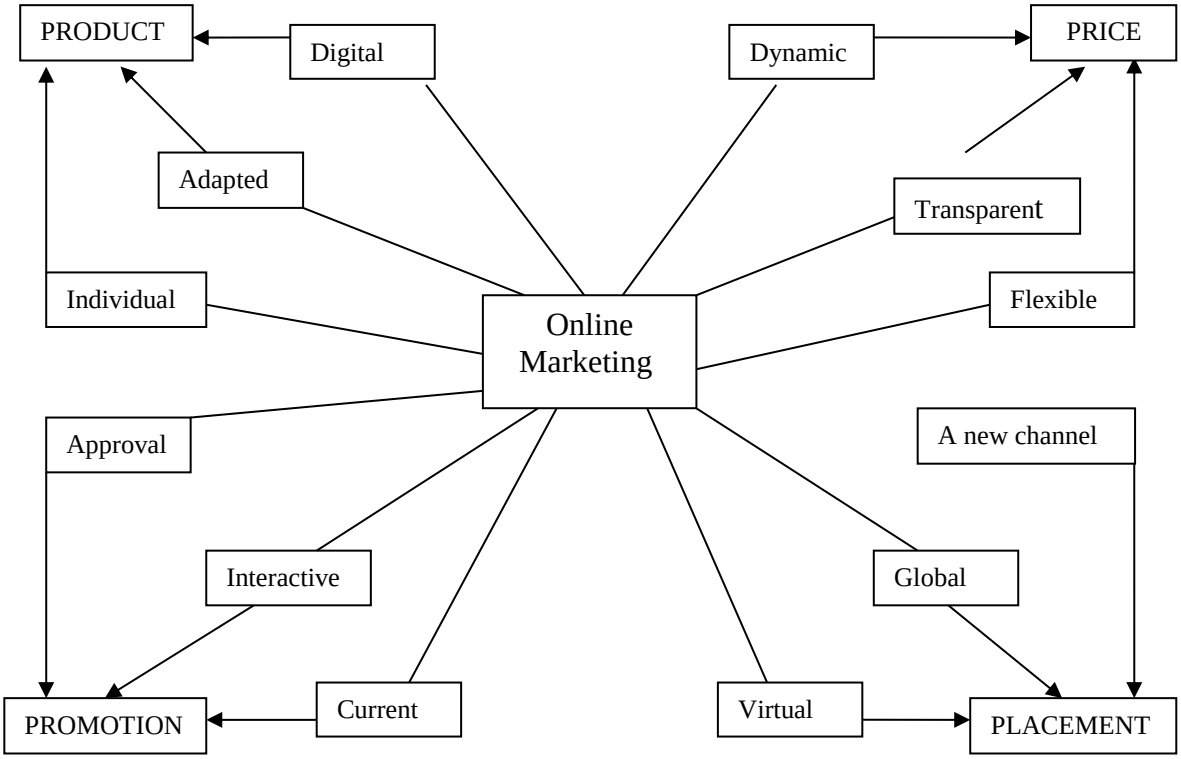

Figure 1. The relationship between marketing and marketing mix

The presence of companies on the Internet makes sense and will bring success if marketing strategy and activities of a company are properly designed. Owning an e-mail address or a web presentation does not mean that the Internet activity is over and that this alone will bring some financial benefit, according to the "sit and wait" principle. To make e-marketing a real comparative advantage, a leading resource for the organization, it is necessary to create opportunities for interested users to easily find the company ("visibility" of the company on the Internet). Achieving possibilities for the Internet to reach a large number of potentially interested users, is a major problem because of the large number of companies that are already online. This problem can be resolved by adequate promotion of a company on the Internet.

Creating an online credibility means providing free quality information in the field of the company activities, and which will get many users interested so that they will want to bookmark your site or keep your email address to get further information on your organization (product / service - the company). Direct communication with potential and actual customers

company provides an insight for a firm into the real situation and atmosphere related to its products and services and also enables the user to be "somebody" and not an anonymous buyer.

4. THE PRESENCE OF AN ORGANISATION ON THE INTERNET

The concept of Internet presence must include strictly defined scenario for all its stages of development, from the application of the idea of internet presence to the ways of improving its effectiveness. To reach the goal, first of all it is necessary, to act towards creating the strategy of the Internet presence. The preparation phase of the Internet presence is from the moment when it comes to the idea of the presence of a company on the Internet, to the moment when the company web presentation is functional and there are one or more email addresses that a company can use.

Our internet market offers of products, services and content are still in the infancy stage. Having defined the idea and a certain general concept of the presence of a company on the Internet, it is necessary to define the company performance on the World Wide Web service. Web is an internet service which allows a continuous presence (24/7). To define a unique appearance on the web, it is necessary to examine how far has competition gone in its appearance, and what it offers. The unique performance is a "springboard" for a Unique Selling Proposition, potential or actual customers who come to the web site as a visitor. Unique offer on the site can be viewed as a mission, i.e. as a target, since everything on the site is directed precisely to the aim of a company. Achieving marketing within their own site puts emphasis on the visual, organizational and substantial parts of the website, which sends a clear and precise message about what a visitor can expect and where it is located on the site.

The real effects of the internet promotion are achieved through the research of habits of the target user groups, as well by arousing their interests through strategically placed promotional messages which often can be an image, animation or a text on one of the Internet service providers. Proper advertising on the web is achieved by using the Internet technology and placement of advertising messages in a manner suited to the medium. The most obvious examples of advertising on the web are banners (image-advertising) and email advertising messages. In the initial stages of a company’s presence on the Internet, you should get the basic information about who the potential customers are, what their interests are, what the competition offers, how it offers it and how competitors are advertising on the Internet.

The main effects of online promotions allow you to attract attention and offer some value to users (information, entertainment, help in solving problems), while, the higher the value offered to a consumer, the higher the effects of promotion. Quality propaganda message is the one which will leave an impression on the user, without making it rude or primitive in any way, because the trust of the users is lost more quickly than it is won. It is necessary to allow the user to react as soon as they decide on the offered product or service, as well as seeking feedback (feedback), providing the user with an opportunity to instantly send feedback on the product or service.

Email marketing is by far the most effective marketing technique online. Creating a collection of email addresses of the interested service users or visitors to the presentation is the most cost-effective promotional activity. Using mail service for business purposes, in addition to direct communication with users, from the promotional aspect represents a possibility for inexpensive quality direct marketing. Consumers and staff of an organization can quickly and directly exchange messages, thus raising services to a very high level, which greatly exceeds traditional communications systems. Quality business communication by e-mail service requires the prior permission obtained. This system is called business communication marketing based on this license (Permission Marketing).

Given the far-reaching consequences of the appearance of spam (unsolicited system and bad marketing activities), a marketing model has been created, which is based on the license given to companies to advertise their product. Opt-in services - business users get e-mails only if volunteered to receive them. Opt-out service is a "twin" of the previous service. It allows automatic abandonment of receiving opt-in messaging. When you have a product or service that you are promoting online, it is the first step in site promotion, and after it or going along with it there is an e-mail promotion, but email promotion should not start without a web promotion. These statements are important to note because the internet promotion is an integrated set of promotional activities that function and complement each other.

The advantage of email marketing is that it is in fact a direct communication with the user of the product or service (direct marketing). Due to technical (graphical multimedia) defects of e-mail, its greatest assistance is an appropriate website. Conversely, the web site of the product or service cannot provide the possibility of direct two-way communication with the customer who is possibly interested in the product or service. Some will say that the e-mail is improved with HTML supplements, but this type of promotion should be used only when users logging to a mailing list are asked if they want to receive HTML edition.

Viral marketing is a strategy technique, as any strategy that encourages individuals to spread the marketing message to others, thus creating the potential for exponential growth in the display of the message and its impact. When we mention the phrase "Viral Marketing", the first association may be the service for free mail - Hot Mail. For the first year and a half of its existence, 12 million registered users have applied to the service to, with a daily increase of 150,000 new users. Hot Mail has achieved this with a promotional budget of less than $ 500,000. Another example of advertising technique of e-marketing is *affiliate marketing* (associated or affiliated marketing). This technique was first introduced by Amazon.com, and later the others. The basic model functions in the way that small owners of web sites put links, banners or products of the Amazon or any other affiliate site on their own site. When a visitor clicks on the link or buys a book or some other product, the owner of a small site (affiliate) is paid for incitement (promotion) of sales.

In addition to the previous, one of the latest marketing techniques is called *referral marketing* and is considered in most professional circles to be the most effective way of promotion. The goal is to get through the service users, visitors or partners to the increase in traffic, sales and profits, and through one user to reach three of their friends or partners, and so on to several following levels. Referral marketing is applied in software sales, on the site or via e-mail

magazine. In sales programs it is usually conducted that each partner brings a new partner, receives a certain sum of money to their account. Referral marketing became widely used due to its effectiveness, which is higher than with other marketing tools because of the degree of neutrality in the recommendations.

Synonymous with Internet advertising since 1994 and until nowadays is so called banner, an image that represents an advertisement for a product or service. It can be found on the page of the website and is capable of interactivity, i.e. when the user clicks on it, they go to the web page where they will learn more about the advertised product or service. A banner on a Web page first can be compared with the classical method of advertising in newspapers and magazines. This form of advertising with banners is most common on the web. In the case of email marketing the most common reason for the introduction of HTML e-mail message is precisely the possibility of setting up banners that are easier to sell than a text advert. In addition to these basic promoting techniques, there are many more : the other techniques of internet marketing (web ads, e-mail discussion groups, news groups, Web forums, placing articles (content) to other sites, using pop-ups, sending informational e-mails, etc..

5. INTERNET TRADE

E-commerce is becoming more popular in the world, but Serbia is still far below those trends (research conducted at the Technical Faculty in Bor, 2013, a sample of 1000 respondents). The citizens of Serbia do not have confidence in buying online, nor have information on the procedure. They also have no serious offer of goods which are available to be purchased in this way (Figure 2).

Figure 2 The reasons for not using the online shops

Although e-commerce is in its infancy in the region of Southeast Europe, Croatia is in this respect 50 times better than Serbia. It is estimated that as many as 81.9 percent of the Internet users in Serbia have never bought in that way. The reasons are mainly the fear of fraud, loss of money and misuse of private information. However, the experts in this field agree that it is

needed but better education of people is necessary. However, e-commerce in Serbia is slowly catching up with the countries of the region, but the region is still far from the EU.

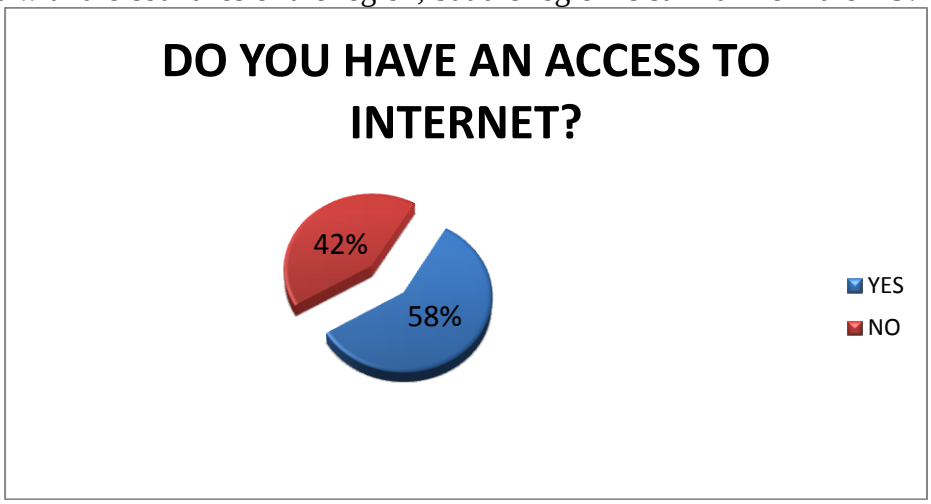

Figure 3 Respondants' access to the Internet

With the number of Internet users in Serbia (Figure 3), the demand for presenting and trading the product on the Internet also increases. When they are interested, most Internet users check the product on the Internet first - its features and prices, and then decide where to buy. This is just one of the advantages of the online shops. Internet shops are available to customers 24/7, without having physical contact with them or paying the employees to serve them; there is also no need for costly shop or extra storage space. Customers pay electronically, so you do not have to carry your sales money to the bank. Ideally, online shopping is a complete process that takes place *online* - from selecting and payment, to the activation of a service or packet arrival to your home, without having to hear someone's voice over the phone or to go out to the bank to fill in the payment form.

Figure 4. The structure of visiting the online shops in Serbia

The main advantages of the internet shopping should be lower costs, saving time, the availability of detailed information on products, the presence of previous customer reviews, and besides all that, there is no rush which is inevitable when you visit the shops. However, as people in different areas in this region manage to function in "creative" ways and, as a rule, improvising, the situation with online shopping is not different (Figure 4). Sales over the Internet to the seller means savings in business, primarily in the physical space, but also in terms of number of employees, with the consequence of reduced prices, in comparison to the traditional commerce. However, due to the insufficient volume of web sales in Serbia, which is practically negligible, a significant drop in prices has not occurred yet.

The consumers in Serbia are willing to buy *online*. However, as prices are often not lower than in physical sales, problems can arise practically everywhere, so it is no wonder that the situation in this area is bad. However, the benefits of online shopping can be experienced in our country as well, but it is important to be well prepared and informed before making a buying decision. As far as the internet shops outside Serbia are concerned, they are much more developed. U.S. is synonymous for great offers and lower prices than in Europe. Delivery costs "across the ocean" are just a little higher than the costs due to buying in Europe.

Another important, but somewhat risky destination, is eBay, the largest auction site in the world where you can find everything from a needle to an anchor, whether new, used, broken or even stolen. Besides the U.S, there are 37 local varieties. For us, the most interesting are the American, British and German. The main payment method on eBay is PayPal (the two companies are under the same ownership), so from Serbia it is now possible only through the payment of service PayPal account, with a commission. Credit cards, in theory, are the basic form of payment online. Domestic banks "for the sake of our security," usually deny support for web payments. In a number of local banks VISA offers the use of cards - Visa Internet or Virtuon, which serve to pay online.

6. CONCLUSION

The strong development of information technology, especially the Internet and the business models that have been developed and adapted to the business on this "world wide web", have significantly changed the traditional way of doing business and marketing. New forms of business and trade (the development of the so-called new economy and electronic trade) have changed the relationship and communication between marketing professionals and consumers. There is no doubt that it was the development of the Internet which has largely contributed to the new forms of electronic commerce and exploitation of new forms of marketing operations, which have "retired" traditional 4P marketing model, based on a rigid, outdated concept of the marketing mix. The current trends and our survey indicate that the economy is increasingly moving to the Internet which is no longer just a network connection but also a new business resource and the main generator of new development.

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MANAGEMENT OF BASIC RESOURCES IN THE TOURIST DESTINATIONS OF THE EUROPEAN UNION

MENADŽMENT BAZNIH RESURSA U TURISTIČKIM DESTINACIJAMA EVROPSKE UNIJE

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Abstract: *Since representing driving source of tourist destinations in the activities, resources are also the most difficult part in the management of their economic verification. The aim of the paper is to prove the economic volatility of the material and immaterial of destination options using basic resources. The paper is based on the following hypotheses:*

1. *If basic resources are part of the conversion functions of tourism in destinations, then it must be measurable and controlled goods at all times, and*
2. *If EU tourist destinations present penetration part of world tourism, then these destinations' resources must remain leaders in physiognomy of their tourism.*

Research results must demonstrate sustainability of resources and EU tourist destinations.
Key words: *resources, management, basic, destination, EU*

Apstrakt*: Pošto predstavljaju pokretačke izvore turističke aktivnosti u destinacijama, resursi su i najteži deo u menadžmentu njihove ekonomske verifikacije. Cilj rada je dokazivanje ekonomske kolebljivosti materijalnih i nematerijalnih opcija destinacijskih korišćenja baznih resursa. Rad polazi od sledećih hipoteza:*

1) *Ako su bazni resursi deo konverzione funkcije turizma u destinacijama onda on mora da bude u svakom trenutku izmerljiva i kontrolisana roba; i*
2) *Ako turističke destinacije EU predstavljaju penetracijski deo svetskog turizma, onda i resursi tih destinacija moraju da budu i dalje lideri u fizionomiji njihovog turizma.*

Rezultati istraživanja mora da pokažu održivost resursa i turističkih destinacija EU.
Ključne reči: *resursi, menadžemnt, bazni, destinacija, EU*

INTRODUCTION

While creating a global system of socio-economic development of the world, globalization carriers have neglected resource identities of individual countries and thus provoked antagonistic struggle between the major manufacturers and the largest consumer of world resources.Tourism, as a system of systems, and the economies of all economies, valorize resources in several ways, including:

- through attractiveness management resources in the original, natural state;
- through a modified resource base with respect to benchmarking model of management of tourist destinations, and
- through a highly-modified resource base, i.e. using Kajsen-costing, re-engineering, total quality and the competitive management model.

Analyzing the basic resources in tourism of the European Union management tourism destinations faces questioning tangible and intangible elements such resources into tourism

products, i.e. subordinates the leadership role of high-modified resource and the base function of anthropology, demography, and their continued education.

Trying to fully delineate what is Janis face of tourism, or to establish a consensus plagues and satisfaction in the use of basic tourism resources, there is a requirement that the management of these resources at anytime be strategically minded, prepared tactically and operationally precise.

THEORETICAL AND APPLICATIVE CONCEPTIONS OF BASIC TOURISM RESOURCES IN THE COMPETENT MANAGEMENT

When Richard Lecomber [6] wrote the book Economics of natural resources, began a serious theoretical and practical discussion about the resource potential. Place in these discussions also had found basic tourism resources, which are set to the highest level of sustainability, i.e. their evaluation in the transition from conflict to coexistence and symbiosis with all their producers and consumers. More detailed conceptions we find in work of Professor Skinner [13], which raises the question of limitations of these resources and opportunities for their adequate substitution. However, for management of basis resources in tourism of the European Union, we think that some of these conceptions are important:

- Holder of spatial theoretical discussion of tourism resources, the French scientist Defert, [2] said: "Tourism resources include facilities space that can stimulate tourism trends, dividing them into natural (hydrom, fytom and lytom) and anthropogenic resources." From this it follows that base tourism resources determine directions of tourist movements which in modern tourism provides the basis for macro-regional clustering of tourism and entrepreneurship deployment to numerous forms of tourism specific requirements;
- At the beginning of 90-ies of twentieth century, basic tourism resources are treated as attraction, which has a higher capacity for a compelling motivation tourists and accurate recognition of the importance of a tourist destination. Inskeep said that "attractiveness characteristics of a country or region are a basis for the development of tourism, they are the most important element of the tourism product" [5], or "tourist attraction is a place named with specific anthropogenic or natural features, which is a major focus for visitors and management attention" [11]. It follows that resources are (attraction) factors of the tourism product, and they will determine the identity of the tourism on which it will be formed appropriate management model;
- Tourism development, in conceptions of world economics, in 2002. was introduced into the analysis services, as upgrade of all basic tourism resources with the constant shaping of tourism destinations capacity and tolerability of all destinations in the European Union [3];
- Very interesting perception we find in Caccomba and Solonandrasana [1] who attractions classify into one of two categories - the discovery and escape, or D-attractions and E-attractions. This understanding fits completely modern and post-modern tourism or "tourism of capital-stress", which in a fugitive and discovery actually try to find the identity of tourists;
- For the modern European Union and its resource base of tourist destinations emphasize the following theoretical and practical view: "Management of "small"

attraction, which has the most, often has a problem with high fixed costs, the problem of seasonality in the business and not enough marketing knowledge and skills in sales today their products on very sophisticated tourist market" and "Big attractions such as the world famous festivals and theme parks, as a rule, are professionally managed. Often, management and marketing of these attractions are entrusted to management companies that are not directly involved in the property. In many countries, there are management companies that specialize in the management of attractions," [8].

As we can see from the presented basic conceptions of tourism resources, with the passage of time, always appears new observations, so that the management of tourism resources has been continuously development category. Insight into the current literature, which in any way deals with tourism resources will see that there are about 1200000 of published works, which means that the universal perception of these resources and their socio-economic evaluation does not exist.

THE PECULIARITY MANAGEMENT OF TOURIST DESTINATIONS AND ITS IMPACT ON BUSINESS RESOURCE ORIENTATION IN THE EUROPEAN UNION

In today's modern world, management has an important role in the economic and social life. On the other hand, society has manifested and has significant influence on management, or, in other words, society manifest request for competent management. Such tourism management aims at systematically, logically and scientifically based way to manage the resources of a tourist destination, which in this day and age really mean dominance paradigm of sustainable tourism in using them.

Tourism resources management objectives are to create the highest effect of using these resources, increasing the living standards of the local population in order to prevent its dispersal and create such environment in the tourism business, which brings interest, development, growth and function of the target - profit. Such management of tourism resources aims to create the best possible environment for business and development, as well as the expansion, i.e. diversification of new and existing tourism businesses, a range of tourism products and new markets in new areas.

Management of tourism resources in the European Union destinations include such a process that directs the activities to be based on the analysis and anticipation of possible opportunities and different forms, from the one hand, and the comparative values and stated weakness of tourism, on the other hand, determine the optimal growth rate and development of tourism resources available. Also, management should institutionalize the organizational structure of tourism enterprises, methods for effective management of resources, direction of their best evaluation, and to determine and build the appropriate business structure.

In managing tourism resources, it is best to start from four component parts of management:

1. Procurement management starts with precise identification of quality, research, market value of natural, labor, material and information resources. Here, as the original information appears economic price, accounting price, energy-slave, marginal utility of natural and economic resources, factors and components of tourism products. The supply management of base tourist resources in destinations of the European Union was

established good business relations between suppliers of primary and secondary resource parts and customer, i.e. manufacturers and suppliers of tourist products. For primary resource suppliers are countries, regions, local government, and population of destinations, and for secondary - associations, tourism societies, trade unions and all other DMO-s. Also, in this form of management vision is to keep all the basic tourism resources in the long term for present and future generations of tourists, tourist operators and local residents. The mission is a long-term sustainable development of tourism the European Union in co-existence with other sectors and industries, and guidelines are built to the point that they are manifested through quality systems, regulatory, entrepreneurial initiatives, cluster projections and the like;

2. Production management in tourism has the prime objective of forming tourism products on the basis of the best combination of all resources at low cost, or cost optimal, with demographic, geographic, economic and prestigious parameters of tourist demand to be met. In this management vision is permanent quality tourism product in destinations of the European Union with the use of basic resources. This product must continually to follow marginal costs and marginal benefits, so that incremental benefit unit increases while lowering costs. The mission, however, varies depending on the situation analysis of the social and economic systems, both in the EU and at the global level, so the use of resources is holder for sustainable tourism portfolio, with appropriate competing risk. The goals and policies in the production management fit into the goals and strategies of tourism development guidelines, as individual countries of the European Union and those provided for its TQM;
3. Turnover management, which distributes to accepted market while maximizing profits and future demand. In managerial positions of this management are include following premises:
   - Selling price and cost price of tourism products, which depend on whether to apply the British or the Dutch version. Also, in detail is tracked elasticity of tourist demand and supply in relation to changes of tourism product price and this required analysis of primary destination price and competitive destinations price;
   - Revenues from sales in the markets of goods, basic resources, and the final realization of the tourism product should be placed in the dynamic and static relationships, i.e. relations of reproduction and final consumption resources, with the one hand, and the multiplier effect of the income earned on the other hand. Management in the European Union destinations has not yet achieved an optimal balance between natural and anthropogenic resources, because, in the initial stages of tourism development, EEC used too natural, and today in the European Union use mostly anthropogenic resources;
   - Observed management always strives to fulfill obligations to customers and destinations as the suppliers. This means that the competitiveness has been placed on healthy legs, i.e. cut from the analysis are opportunity costs and all methods of modern marketing management were integrated into competence TQM, and
   - Income distribution in such management of basic resources encourages constant travel demand and tourist offer and the model of choice is always a multiple in cost-benefit analysis in tourist destinations all over the European Union, and
4. Financial management, as allocator efficient and effective management of financial resources for the purpose of tourism development opportunities. The main feature of this

management is that at any time he has adequate funds available for new programs and new investments, economic and socially desirable, because it meets all of those in the tourism activities of the European Union's and long-term airy, i.e. gives everyone a chance to make your own tourism business [9].

Properly and successfully managing the development tourist destinations in the European Union assumes overall actual results that are greater than the sum of individual results that can be implemented by individual business subjects in the tourism industry, which is particularly evident in the case of unique tourism market of the European Union. The very success of tourist destinations will be increasingly dependent on the sensitivity of destinations in relation to the intensity of the flow around her, and the realization of its objectives of business skills destinations to satisfy desires and needs of tourists using appropriate combinations of instruments market performance, that is it will depend on finding their optimal combination through choice of strategic alternatives. Strategic management, thus, from available tourism resources receives information about state and development of these resources, available capital resources which can in next stage to invest in profitable development programs. The process of making strategic decisions in tourist destinations management of the European Union consists following phases:

- identification, inventory and find the best resources that determine the final options for making strategic decisions;
- identification and accepting the best output elements of system analysis for the strategic review and final valorization;
- assessing and controlling implementation of strategic decisions, especially those that have the force of economic action, and
- creating projects rated successful functioning of strategic plans and actual results of destination economic valuation [10].

Since management involves the integrity of the tourism resources, which is management of:

- Natural tourism resources,
- Commercial tourism resources,
- Human (labor) tourism resources,
- Information Resources,
- Fiscal trends,
- Monetary policy and
- Other forms of resource management control,it should be the highest authority in the field of management. Thus producing two types of entrepreneurship and management of resources, that is external and internal managing. The key elements that form the basis of modern tourist destination management that guides resource business orientation are:

- how to "create" new visitors, and then their return visit;
- creating performance standards and monitoring tourism business; and
- readiness for future changes in terms of needs and expectations of visitors (tourists) [7].

From the aforementioned follows that management of the European Union destinations is a complex process that has a significant impact on resource business orientation, taking into account the large number of member countries, and more destinations are the European Union

and the specifics of their individual efforts to develop tourism sector and achieving goals. Reflections of resource base management can be seen through the definition and implementation of tourism policy, which is focused on providing measures contribute to more efficient use of tourism resources and the realization of benefits for all stakeholders in the tourism development of the European Union.

European Union countries represent attractive touristic areas, whose comparative advantage stems from the abundance of natural and anthropogenic resources and a long tradition in tourism development. In this sense, we give examples of good practice tourism management destinations of the European Union based on management of basic tourism resources:

- Spain, and its good examples of management of specific destinations, which are due to destination management and appropriate and successful management of a number of natural and anthropogenic resources, experienced prosperity.Some of the measures that have contributed to this: Plan E also its plan, "Renove Turismo" as an example of good practice that focuses on the integration of SMEs in the development of tourism offer of Spain; plan "FUTURE", in order to define a model of development tourism in accordance with the challenges of climate change, management Andalusia, a rural tourism destination, through working together a network of enterprises that jointly manage basic tourism resources and on that basis develop a collective approach that contributes achieving the objectives and product placement to tourist markets [12];
- Austria, because holders of the tourism sector of the EU Member States have realized that they have to manage increasingly frequent crises, and it is therefore crisis tourism management Austriagained importance.Through a series of this management measures was overcome one of key problems in tourism mountain resorts of Austria, which is seasonality. Thanks to destination management laying on the base of tourist resources of the Austrian mountain resort in the Alps are increasingly developing into a rich tourist destination offering its tourist facilities throughout the year, that is strategies of the country destination management are focused on offering complex holidays, i.e. "inclusion" of natural and anthropogenic resources as well as riches in the area where the tourists find attractiveness and others, which are a product of innovation management;
- Germany, because its tourism industry is an example of good practice as one of the most organized and well-positioned retail destination. The reasons for this success lies: in the fact that tourism has an important place in the overall economy of the country, in financial aid numerous tourist destinations and attractions, in fact that organization of the Germany tourism sector represents an extensive network of institutions, which are responsible for the planning, development and promotion of tourism activities and in the fact that all existing tourism resources in Germany (the coast of North and Baltic Seas, the peaks of the Alps, plains, rivers, lakes, mineral and thermal springs, urban centers, national parks, cultural and historical heritage, etc.) were develop in complex and integrated tourism products [4]; and
- In other EU countries, management of basic resources tourist destination has the same or similar orientation with some outstanding features: projects, providing optimal methods for assessment of all key attributes and potential of tourism (one example is the project "Slovenian Tourism Strategy 2007-2011") then work of tourist institutions on the level throughout the state, which must, in addition to their standard duties, also

to anticipate events development at the global, regional and national tourism market (this is the practice of tourism institutions of France, which is on the top most visited tourist), the increasing orientation to social tourism, tourism that goes beyond recognizable cities and reviving traditional ethnic motifs derived from base resources (for example, in England, Scotland and Ireland) and the like.

Resource basic management of tourist destinations in the European Union is the management that must from utilized attractions and already agingculture of the European Union pull those elements that can be superior with intangible part of the tourism product converted to identifiable tangible parts of the same product.

CONCLUSION

Tourist destinations of the EU representattractive tourist area, which have competitive advantages of natural and social resource base (temperate climate, hydrographic resources - seas and many freshwater resources, diversity of relief and landscape forms, flora, fauna, exceptionally rich cultural and historical heritage, etc.) and its comparative advantage lies in the diversity of the potential for the formation of tourism offer that meets requirements of tourists. However, the very existence of attractiveness tourist resource base is not sufficient for attracting and retaining tourism demand in the increasingly competitive environment. What is essential is creation and continuous improvement of basic resources management in the destinations of the European Unionin order to provide an opportunity of quality and unique event for tourists on journey. Essential concept for achieving and maintaining the competitiveness of the European Union destinations in the global tourism market includes continuous planning, organization and control of tourism resource base, to ensure that their use will not grow in overexploitation of them, both by tourism and by other activities. Also, the efficiency and effectiveness of basic resources management in the destinations of the European Union depends on the type of attraction, their location, availability, the tourist markets, tourist expectations, management skills, partner cooperation at the global, regional and national levels, and the like.

Fundamentals of basic resources management in tourist destinations of the European Union is increasingly relying on use the relevant rules of economic behavior, such as:

- "Pigu’s tax" or the "polluter pays" principle, in order to fully maintain the balance between natural and anthropogenic tourist resources;
- "Coase rule", that is comparison of two different destinations and resource use in one and making a profit, and, in the second - creating costs that make use of those resources;
- Rule of "free riders" is more influential on management of tourist destinations in the EU, because those countries that are examples of good practice actually become leaders in tourism industry throughout the Union, and
- The principle of "non-yielding", that is creation of permanent educational management of human resources with constantly improve their knowledge, creativity and skills of all stakeholders in order to develop entrepreneurship, partnerships, constant innovation and similar.

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SUSTAINABLE PROJECTS FOR DEVELOPMENT OF GAMZIGRAD SPA

RAZVOJNI PROJEKTNI PRAVCI GAMZIGRADSKE BANJE

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Abstract: *Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Choosing and ranking projects are complex tasks in business operations. Ranking of projects considers Multiple-Criteria Decision Making as a very popular way to support decision makers. This paper deals with proposed projects for development of the tourist resort of Gamzigrad spa in Eastern Serbia and its thermo-mineral wells. The projects are ranked by application of the ELECTRE method and by application of the AHP method, as ancillary method to determine the weights of criteria.*
Key words: *project ranking, MCDM, ELECTRE method,AHP method, Gamzigrad.*

Apstrakt: *Održivi razvoj podrazumeva svaki razvoj u očuvanoj životnoj sredini, koji zadovoljava današnje potrebe čovečanstva, bez negativnog uticaja na mogućnost zadovoljenja potreba budućih generacija. Rangiranje razvojnih pravaca ili projekata predstavlja kompleksan zadatak savremenih operacija. Metode Višekriterijumskog Odlučivanja (MCDM) se često koriste kao podrška donosiocu odluka. U radu je akcenat stavljen na rangiranje razvojnih projekata Gamzigradske banje, malog banjskog mesta u Istočnoj Srbiji. primenom ELECTRE metode, kao glavne i AHP metode prilikom određivanja težine kriterijuma, kao pomoćne metode MCDM.*
Ključne reči: *rangiranje projekata, MCDM, ELECTRE, AHP, Gamzigrad.*

1. INTRODUCTION

Sustainable development is a process that combines economic, social and environmental principles of a modern society at all levels [1]. Great potential for development and protection of natural values lies in using up renewable energy resources [2]. The Gamzigrad spa is one of the important tourist destination of eastern Serbia. The paper presents the possibility of finding adequate solutions for strategic selection between several projects for sustaineble development of Gamzigrad spa.

2. MULTI-CRITERIA DECISION MAKING - ELECTRE METHOD

Multi Criteria Decision Making is one of the most well known branches of decision making. MCDM is divided into Multi-Objective Decision Making and Multi-Attribute Decision Making [3]. The ELECTRE method was made up by Bernard Roy, 1971 [4]. At the very begining of a process, it is necessary to define the initial decision matrix. Beyond that, it should be quantified matrix via the linear scale that has values ranging from 0 to 10. In the paper, the following grades of criteria are used: 1- very low, 3 – low, 5 – average, 7 -high and 9 –very high [5]. The first step involves calculating normalized decision matrix via adequate formulas (3, 4) by which normalized elements are calculated.

$$n_{ij} = \frac{x_{ij}}{\sqrt{\sum_{j=1}^{m} x_{ij}^2}} \tag{3}$$

The formula 3 is applied to the attribute of type max, while the formula 4 is applied to the attribut of type min. [6].

$$n_{ij} = 1 - \frac{x_{ij}}{\sqrt{\sum_{j=1}^{m} x^2{}_{ij}}} \tag{4}$$

The second step involves calculated weighted normalized matrix, where the decision-maker actively participates in the procedure of solving the problem by determining the weight of user's criterion (formula 5) [6].

$$TN = T \bullet N \tag{5}$$

In the paper, it is the section where the Analytical Hierarchical Process method is applied, so that by comparing in pairs, on the basis of opinion of three experts, it is possible to get more exact determination of criteria weights. The third step of the ELECTRE method, compares all pairs of the analyzed actions on the basis of value of elements from weighted normalized matrix[6]. Firstly, it is determined the assembly of agreement S_{pr} for the actions (actions mark the alternatives), made up of all criteria, for which the one alternative is more desirable than then the other, that is shown in formula 6 and is formed the complementary assembly of disagreement – NS_{pr} [7].

$$S_{pr} = \{j |\ xpj \geq xrj\} \tag{6}$$

$$NS_{pr} = J - S_{pr} = \{j |\ xpj < xrj\} \tag{7}$$

In the fourth step, it is defined the matrix of agreement on the basis of the assembly of agreements. The elements of the matrix of consent are the indices of agreement.

Based on the assembly of agreement, it is determined the matrix of agreement MS. For calculating the values of the matrix, it is used the formula 8 [5].

$$S_{pr} = \sum_{j \in Spr} t_j \tag{8}$$

The fifth step refers to determining the disagreement matrix on the basis of the assembly of disagreements. The elements of the matrix are the indices of disagreement, determined by the formula 9 [6].

$$ns_{pr} = \frac{\max\limits_{j \in NSpr} \left| tn_{pj} - tn_{rj} \right|}{\max\limits_{j \in J} \left| tn_{pj} - tn_{rj} \right|} \tag{9}$$

In the sixth step it is determined the matrix of agreement domination, on the basis of the value of the average index of consent - which can defined as average index of agreement - **PIS** (10) [6].

$$PIS = \sum_{p=1}^{m} \sum_{r=1}^{m} \frac{s_{pr}}{m(m-1)} \quad where \quad p \neq r \tag{10}$$

The matrix of disagreement domination (step seven) is calculated on the basis of the average index of disagreement, as it is analogous to the matrix of agreement domination. First, it is calculated the average index of disagreement – PINS (11) [7].

$$PINS = \sum_{p=1}^{m} \sum_{r=1}^{m} \frac{ns_{pr}}{m(m-1)} \quad where \quad p \neq r \tag{11}$$

The step eighth determines the matrix of aggregate domination wich elements are equal to the product of the elements on definite position in matrices of agreement and disagreement domination (12) [8].

$$mad_{pr} = msd_{pr} \bullet mnsd_{pr} \tag{12}$$

Finally, in the ninth step, less desirable actions are eliminated, while one or more alternatives is/are sorted out as most desirable. Therefore, the ELECTRE method I provides a partial order of actions [9].

4. Applying the ELECTRE method on Gamzigrad spa

The business operations of Gamzigrad spa is based on relatively modest tourist capacities of a hotel „Kastrum“. This paper emphasizes the choice of the best alternatives at making adequate decisions for the development of this region. The following five criteria were defined for evaluation of the projects:

1. FI financial investments,
2. EN (environment),
3. SD (solution delivery) – relating to subsequent appropriate solutions if initial ones are not adequate,
4. SC (strategic contribution – it was estimated that maximum is necessary,
5. RM (risk management) it is necessary to lessen risk to its minimum.

The table 1.2 shows the values of five projects and five criteria that were using for selecting optimum development project of Gamzigrad.

Table 1.2. Values of criteria and project

Criterias	F	SD	SC	RM	EN
Project	min	min	max	min	max
Healthy (P_1)	200,000	250,000	high	average	v. high
Sports (P_2)	70,000	90,000	v. high	average	high
Recreative (P_3)	60,000	70,000	v. high	low	v. high
Country (P_4)	120,000	140,000	high	low	high
Congress (P_5)	40,000	60,000	high	low	v. high

Majority of criteria were divided into simpler measures of well-defined attributes, combined in the way that a result for each project and each criterion could be obtained. On the basis of the table 1.2, it was created the initial decision matrix, shown on table 1.3. Applying the formulas 3 and 4 using the data from the table 1.3, it was obtained the normalized decision matrix (table 1.4).

Table 1.3. Initial decision matrix

Criterias	**F**	**SD**	**SC**	**RM**	**EN**
Project	min	min	max	min	max
P_1	200,000	250,000	7	5	9
P_2	70,000	90,000	9	5	7
P_3	60,000	70,000	9	3	9
P_4	120,000	140,000	7	3	7
P_5	40,000	60,000	7	3	9

Table 1.4. Normalized decision matrix

	F	SD	SC	RM	EN
P_1	0.790	0.800	0.398	0.570	0.487
P_2	0.275	0.286	0.511	0.570	0.380
P_3	0.236	0.222	0.511	0.341	0.487
P_4	0.472	0.445	0.398	0.341	0.380
P_5	0.157	0.190	0.398	0.341	0.487

Applying the formula 5, it is calculated the weighted normalized matrix -TN. In the case of the Gamzigrad, three experts (ecologist, sociologist, economist) were consulted to calculate

the weights of criteria. By using of arithmetic mean for the final weights, the mean values of criteria were found, and the same are shown in tables 2.1, 2.2, and 2.3.

The final values of criteria weights, obtained by calculating the arithmetic mean for each criterion, are shown in table 2.4.

Table 2.1. Weights of criteria – Expert 1

	F	EN	RM	SC	SD	Cr	Wt
F	1	1/7	1/3	1	1	F	0.072
EN	7	1	5	7	7	EN	0.580
RM	3	0.200	1	3	3	RM	0.188
SC	1	0.143	0.333	1	0.333	SC	0.061
SD	1	0.143	0.333	3	1	SD	0.099

Consistency Ratio (CR) =7,39%

Table 2.2. Weights of criteria– Expert *2*

	F	EN	RM	SC	SD	Cr	Wt
F	1	1/7	1	5	1	F	0.136
EN	7	1	3	7	7	EN	0.539
RM	1	0.333	1	5	3	RM	0.190
SC	0.200	0.143	0.200	1	0.333	SC	0.042
SD	1	0.143	0.333	3	1	SD	0.093

Consistency Ratio (CR) =9,30%

Table 2.3. Weights of criteria – Expert 3

	F	EN	RM	SC	SD	Cr	Wt
F	1	1/7	1/3	3	1	F	0.091
EN	7	1	5	7	7	EN	0.569
RM	3	0.200	1	5	3	RM	0.204
SC	0.333	0.143	0.200	1	0.333	SC	0.045
SD	1	0.143	0.333	3	1	SD	0.091

Consistency Ratio (CR) =9,50%

Table 2.4. Arithmetic mean - weights of criteria

Cr	Wt
F	0.100
SD	0.094
SC	0.049
RM	0.194
EN	0.563
Σ	1

The weighted normalized matrix –TN, is shown on the table 2.5.

Table 2.5. Weighted normalized matrix - TN

	F	SD	SC	RM	EN
P_1	0.078	0.074	0.020	0.110	0.274
P_2	0.028	0.026	0.025	0.110	0.213
P_3	0.024	0.021	0.025	0.066	0.274
P_4	0.047	0.042	0.020	0.066	0.213
P_5	0.016	0.018	0.020	0.066	0.274
$\mathbf{W_{Cr}}$	0.100	0.094	0.049	0.194	0.563

Applying the formulas 6 and 7 it the is determining the assemblies of agreement **- S** and disagreement **- NS** (table 3). Matrix of agreement – MS, for definite values of index is calculated applying formula 8 and it is shown on table 4.

Table 3 - Assemblies of agreement (S) and disagreement (NS)

Assemblies of agreement S	Assemblies of disagreement NS
S_{12} = 1,2,4,5	NS_{12} = 3
S_{13} = 1,2,4,5	NS_{13} = 3
S_{14} = 1,2,3,4,5	NS_{14} = -
S_{15} = 1,2,3	NS_{15} = 4, 5
S_{21} = 3,4	NS_{21} = 1,2,5
S_{23} = 1,2,3,4	NS_{23} = 5
S_{24} = 3,4,5	NS_{24} = 1,2
S_{25} = 1,2,3,4	NS_{25} = 5
S_{31} = 3,5	NS_{31} = 1,2,4
S_{32} = 3,5	NS_{32} = 1,2,4
S_{34} = 3,4,5	NS_{34} = 1,2
S_{35} = 1,2,3,4,5	NS_{35} = -
S_{41} = 3	NS_{41} = 1,2,4,5
S_{42} = 1,2,5	NS_{42} = 3,4
S_{43} = 1,2,4	NS_{43} = 3,5
S_{45} = 1,2,3,4	NS_{45} = 5
S_{51} = 3,5	NS_{51} = 1,2,4
S_{52} = 5	NS_{52} = 1,2,3,4
S_{53} = 4,5	NS_{53} = 1,2,3
S_{54} = 3,4,5	NS_{54} = 1,2

Table 4. Matrix of agreement - MS

0	0.757	0.563	0.612	0.612
0.437	0	0.049	0.806	0.049
1	1	0	1	0.806
0.437	0.757	0.194	0	0.243
1	0.951	0.951	1	0

The matrix of disagreement –MNS is calculated applying formula 9. It is shown on table 5. Matrix of agreed domination - MSD is shown on table 6. It is calculated applying formula 10. The matrix of disagreed domination – MNSD is shown on the table 7, applying formula 11.

Table 5. Matrix of disagreement - MNS

0	0.840	1	0.725	1
1	0	1	1	1
0	0	0	0	1
1	0.045	1	0	1
0	0.092	0.708	0	0

Table 6 - Matrix of agreed domination - MSD

0	1	0	0	0
0	0	0	1	0
1	1	0	1	1
0	1	0	0	0
1	1	1	1	0

Table 7 - Matrix of disagreed domination – MNSD

0	0	0	0	0
0	0	0	0	0
1	1	0	1	0
0	1	0	0	0
1	1	0	1	0

Table 8 - Matrix of aggregate domination - MAD

P_1	0	0	0	0
0	P_2	0	0	0
1	1	P_3	1	0
0	1	0	P_4	0
1	1	0	1	P_5

Table 9 - Final ranks of projects

$P_3 \rightarrow P_1, P_2, P_4$	**Dominate under P_1, P_2, P_4**
$P_5 \rightarrow P_1, P_2, P_4$	**Dominate under P_1, P_2, P_4**
P_2	Do not dominate
$P_4 \rightarrow P_2$	Dominate under P_2
P_1	Do not dominate

The next step is determining the aggregate domination matrix – MAD (matrix of aggregate domination). In this case, the matrix has the values, shown on table 8.

It is calculated applying formula 12. The last step, step nine, of the ELECTRE method, by eliminating less desirable projects, led us to the following reccommended projects [6].

5. Conclusion

Approach of the ELECTRE method, described in this paper, besides the ranking projects, also separates objective components from subjective ones. In the case of ranking projects of Gamzigrad, it has been allocated that the projects P_1 and P_2 do not dominate, while the project P_4 dominates under the project P_2. However, projects P_3 and P_5, dominate under the projects P_1, P_2 and P_4, which means that these two projects, P_3 and P_5, are the approepriate. The further question can be defined on the next way: between the two projects that have applied in the ELECTRE method as acceptable, which one is better? If we take into account the Financial criterion, then the development strategy of Gamzigrad should be based on Congress tourism, because the investments in this project are lower than the investment of the project Recreative tourism. Therefore, the project of Congress tourism is economically better than the others. In the experts' opinion and on its rank in the selected method, beside the least investment, this project, requires the shortest time of realization.

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THE IMPORTANCE OF CLUSTERS IN RURAL DEVELOPMENT OF SERBIA

ZNAČAJ KLASTERA U RURALNOM RAZVOJU SRBIJE

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Abstract: *The author discusses the place and role of clusters as one of the opportunities for faster development of rural areas and agriculture of Serbia. Cluster development is one of the ways of elevating the economy of rural areas to a higher level of growth. At present, modern business operations are based on speed, quality, flexibility, innovations, cohesion and building a critical mass of capital and production/service potential. This new style of business operations requires a team approach at the local level, i.e. the cluster approach. Clusters are particularly important for rural areas and developing economies and especially so for developing countries, such as Serbia.*
Key words: *cluster, rural development, economy, agriculture, partnering*

Apstrakt: *Autor razmatra mesto i ulogu klastera kao jedne od šansi za brži razvoj ruralnih oblasti i poljopivrede Srbije. Razvoj klastera je jedan od puteva za podizanje ekonomije ruralnih područija na viši nivo. Danas se savremeno poslovanje zasniva na brzini, kvalitetu, fleksibilnosti, inovacijama, povezanosti i izgradnji kritične mase kapitala i proizvodnog/uslužnog potencijala. Ovaj novi stil poslovanja zahteva timski pristup na lokalnom nivou odnosno klaster pristup. Klasteri su posebno važni za ruralna područija i ekonomije u razvoju a naročito za zemlje u razvoju kao to je Srbija.*
***Ključne reči*:** *klaster, ruralni razvoj, ekonomija, poljoprivreda, udruživanje*

1. INTRODUCTION

The concept of rural development, which is applied in the EU, implies a strong connection between entrepreneurship, agribusiness and a multifunctional development of rural regions. The new concept of rural development is encouraging the population in rural areas to enter into new forms of rural businesses. At present, within the rural economy and in addition to classic agriculture, the population of rural areas is given a chance to engage also in other activities, such as: forestry, crafts, tourism and many other activities aimed at preserving the rural ambiance.

Clusters are a new model of economic development that is created through networking of economic and non-economic entities and institutions in a field (Đurašović, 2009). Cluster is a word of English origin and means a geographically bounded concentration of similar or complementary businesses, with active channels for business transactions, communications, and collaboration. It is precisely these intensive channels of collaboration and association that give them also an unusual and sophisticated competitiveness compared to other, isolated, market participants. This term was first introduced in the literature by Porter. Clusters are new models of economic development that arise through networking of economic and non-economic entities and institutions in one area of operations at lower levels, of cities / regions.

Although this is a new economic form, there are different approaches to its definition, depending on the type, size and level of development.

2. MATERIAL AND THE WORK METHOD

Given the nature of the research, qualitative methods will be mainly used, while in the case of quantitative methods, simpler methods of research of the economic and theoretical statistics will be primarily used. In examining phenomena, method of analysis will be used, while in the process of concluding and finding solutions, the method of synthesis will be used.

The term cluster is still little known in Serbia. It is important to note that a cluster is not the same as other forms of association and cooperation in agriculture, such as cooperatives, associations, combines, cooperative unions, farmers' associations or chambers. Cluster development policy in Serbia is only just developing. This is especially true for agriculture and rural development in general. Clusters as development mechanism, of particular importance for the development of underdeveloped regions, is still emerging here.

3. RESULTS

The importance of clusters is in that that they allow companies to become more productive, more innovative, and more competitive than they could ever be when operating independently. Depending on the characteristics of a region and the participant companies, clusters set their priorities, use the resources of their region and establish formal ties that enable the achievement of common objectives (Đurašović, 2009).

Clusters are aimed at consolidating on both horizontal and vertical basis of various entities of supply, production and service providing in order to increase the added value of their joint product. The interconnection between companies is vertical, through purchasing and supply chains, for example, while the horizontal interconnection is through complementary products and services, the use of similar raw materials, technologies or institutions, and other connections. Most of these connections also imply social relations with the surroundings. Proximity encourages companies to establish contacts and can increase the opportunities of achieving effects through business networks. The geographical area covered by a cluster can vary significantly. There may be multiple levels of business operations, with regional, national and even international dimensions in some clusters.

Some of the main advantages of clusters are as follows:

- Clusters increase the productivity of companies;
- They provide a more efficient access to all inputs, especially to specialized labour force and suppliers;
- Clusters develop information base and infrastructure in a particular area and take advantages of access to a centralized network of information, data and other knowledge resources;
- It is easier to obtain the knowledge on new technologies and their introduction is being facilitated through joint investments;

- Collaboration frameworksare being created, cooperation and confidence are being built up (intersectoral competition fears are being mitigated);
- It is based on competition within the cluster, thus strengthening also the international competitiveness;
- Market needs are better perceived and innovations are being initiated and introduced more quickly;
- Clusters encourage new businesses;
- Clusters are taking advantage of government infrastructure development programmes and/or professional training programmes;
- They use the effects of the economy of scale;
- They provide support in development and strengthening of rural communities and regions in a country;
- They provide incentives for investments in infrastructure and provide the information needed for the improvement of education.

4. DISCUSSION

Inthe modern era of globalization, the question is why do we talk about geographically concentrated clusters of companies? The role of location has long been neglected, despite the obvious evidence that innovation and competitive success in many fields are geographically concentrated, whether it concerns the entertainment in Hollywood, the Wall Street finances or the electronics industry in Japan.In the era of globalization, wireless communications, increasingly comfortable, faster and cheaper transportation, it seems almost paradoxical to claim that location grouping of businesses plays an important role. However, the concentration of companies, exporters, institutions and agencies in a business and their concerted operations, along with high specialization of skills and knowledge, suggest that location grouping still has undeniable benefits.

Successful clusters worldwide

Clusters in the United States are a very good example of proper understanding of the cluster. Namely, in the economy of this country, almost each federal state has its own specifically developed clusters. Some clusters operate at the level of a city, some at the municipal level, and some at the regional level. For instance,the wine-growing cluster in California is particularly interesting, which includes 680 wineries, as well as several thousands of independent wine-growers.It includes a number of branches that provide support in the production of wine and grape cultivation, irrigation and in the supply of harvesting equipment,specialized PR and advertising agencies, which publish numerous publications on wine, which are dedicated to consumers and intermediaries. A large number of local institutions is involved in this cluster, such as the University of California, Davis, Wine Institute of California, special committees of the Senate and the California State Assembly.
It is useful to mention also the examples of successful clusters in other economies:

- Dutch transportation cluster, which owes much to the convenient location of the Netherlands, the expanded network of waterways, the efficiency of the port of Rotterdam and skills acquired through the long history of the Dutch Navy;

- Israeli irrigation equipment and other agricultural technologies cluster, which subsists due to the pronounced desire of Israelis for securing self-sufficiency in food, coupled with the fear of lack of water and heat;
- Cluster of leather goods and textile fashion in Italy, whose members enjoy all the benefits of multiple grouping and synergy of businesses. These clusters consist of several chains of related industries, ranging from well-known manufacturers of finished products and a number of specialized suppliers of inputs, to designers. These clusters use common, not only inputs, but also technology, channels, joint marketing media and compete with similar image in similar consumer segments;
- Two successful clusters are developed in India. One of them is a small city Tirupur, in the Tamil Nadu region, where there are over 2,500 small weaving mills, 600 dyers and 400 textile printing units. This cluster has, on the scale of Indian economy, a very significant export.

Clusters in agriculture of Serbia

Looking back into history, there have been some attempts to create clusters in the local economy, in a number of ways. The oldest institutions that partially resembled clusters were agricultural combines, which consolidated a large number of vertically related activities – crop husbandry, animal husbandry, vegetable farming, processing of primary agricultural products, storage, and even marketing (to retailers).

Several supporting institutions from Novi Sad and Belgrade have been associated with them, such as scientific research institutes and educational institutions (Institute of Field and Vegetable crops in Novi Sad, Maize Research Institute in Zemun Polje, university faculties, vocational secondary schools, etc.). A kind of a cluster also existed in the tourism industry in well-known centres in Serbia, such as Kopaonik or Vrnjačka Banja.

Why does Serbia today need a cluster in agricultural complex and what is being obtained by common strategies, cooperation and associating of all participants in the supply chain from production to sales.The following may be mentioned as the main advantages of clusters in agriculture:

- Clusters contribute to the increase of productivity and creation of business innovations in grouped companies; the weakness of each individual producer and their inability to follow modern trends is minimized precisely through the relationships of cooperation and collaboration within the cluster; through collaboration, it is made possible for companies to have access to all inputs, especially to capital, specialized suppliers, information, technology, marketing expertise;
- Permanent local competition within the cluster is a powerful incentive for productivity growth and the creation of international competitiveness;
- Cluster members also benefit from the diversity of associated marketing mechanisms, such as catalogues, trade fairs; especially so if the cluster is formed in such a way that the products complement each other;
- A very important feature of clusters is also the possibility of developing common standards of quality at every stage of product development;

- Clusters also contribute to the creation of new enterprises and the employment of labour force, considering that the concentrated customer base reduces the risk of formation of new businesses and facilitates potential investors to spot new market opportunities;
- From all the above mentioned, it follows that clusters would help in improving the structure of food for export supply from Serbia, i.e. in moving towards the export of finished products; in consequence, higher export prices could be achieved (profit grows with moving up the value chain) and, also, more opportunities for the application of differentiated marketing would open up;
- Finally, the benefits which clusters would provide is also in ensuring higher and steady export supply (multinational companies interested in purchasing products from our area require large quantities of goods in continuity), (Paraušić and Cvijanović, 2006).

Also, there are significant limitations of cluster development in agriculture:

- Precisely what should be encouraged through clusters (cooperation, coordination, grouping, confidence), in our circumstances is also the major obstacle for its development; namely, Serbian business philosophy is predominantly characterized by a desire for gaining personal interest and benefit with a minimum of cooperation and sharing with other market participants; at the same time, the lack of confidence and fear of cooperation and grouping, in our circumstances, is partly the consequence of all implemented agrarian reforms over the past few decades;
- The example of great conflicts of interest in domestic production and marketing of raspberries is most indicative of this problem and is a clear evidence that we are still far behind on the road to forming clusters;
- Successful development of clusters also implies an advanced network of supportive activities, especially in the segment of international market research, product development, development of its brand, logistics activities and the like; it is precisely this what domestic economy lacks andextensive theoretical knowledge in the field of marketing is very little used in practice;
- For the development of an activity or a cluster, the presence of complementary production and various kinds of services is also important, and this is also a major obstacle to the development of clusters;
- Productivity of enterprises from a cluster also increases by taking advantage of any government programmes in terms of infrastructure development and/or vocational education programmes; domestic clusters cannot count on such assistance, given the low overall investment in the economy; (Paraušić and Cvijanović, 2006).

5. CONCLUSION

One of the ways for successful clusters to appearin our economy as well, despite all the obstacles that hinder the development of clustering of the economy, is that the national government quintessentially, rather than declaratively, provide support in creating conditions for the development of clusters. As regards the role of the national government in the formation of clusters, there is difference in opinions. One can still say that there is little hope or benefit in expecting the national government itself to organize the formation of a new

cluster. The assertion that "the national government can do much to harm or to help, but it seems that it could not create a new, successful cluster by herself" is all too well known.
Essentially, the national government, by its policy, can affect considerably the creation of an adequate environment that encourages further development of clusters (supportive institutions). Primarily, this refers to the following:

- creation of a stable macroeconomic environment;
- development of transportation and market infrastructure;
- development of research and development institutions, professional consulting, knowledge bases;
- investments in education, technology, sophisticated methods;
- development of a system and institutions for standardization of quality (National phytosanitary coordinating body, National Authority for Food Safety);
- credit insurance, in the interest of ensuring major investments in modern technology;

Advanced economies nowadays are competing by innovative strategies and high productivity, and research and development have the critical role in the creation of these competitive advantages, along with knowledge, technology, finances and groups of professional individuals, which are easiest to assemble within a cluster. Clusters, as a form of location grouping of complementary businesses, through collaboration, cooperation and competition, specifically promote the development of productivity and innovation, by which it is only possible and reasonable to be competitivenowadays.

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PROMOTION OF RELIGIOUS TOURISM IN EASTERN SERBIA

PROMOCIJA VERSKOG TURIZMA ISTOČNE SRBIJE

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Abstract**:** *Eastern Serbia, in addition to its natural resources, which are reflected in the fragmentary relief, mineral and water resources, is characterized by prosperity of features from Orthodox monasteries and churches. These buildings represent the best encyclopedia of the history of Serbia. Monasteries architecture shows a special variety. Because of the sculptural decorations, icons, frescoes, and manuscripts, the attention of tourists from all over the world had been generated.*
Keywords: *Abbey, church, tourism, Orthodoxy*

Abstrakt: *Istočnu Srbiju pored svog prirodnog bogatstva koje se ogleda u razuđenosti reljefa, rudnom i vodnom bogatstvu, karakteriše i bogatstvo u manastirima i crkvama kao simblima pravoslavne vere. Ove građevine predstavljaju najbolju enciklopediju istorije Srbije. Manastiri i crkve svojom arhitekturom pokazuju naročitu raznovrsnost. Zbog skulpturalnih ukrasa, ikona, fresaka, rukopisnih knjiga privlače veliku pažnju turista iz celog sveta.*
Ključne reči: *Manastir, crkva, turizam, pravoslavlje*

1. INTRODUCTION

Monasteries are places for meeting with God, for shelter and hiding places, place of residence, work and spirituality. The first elements of Serbian literacy, schools, hospitals and medieval painting can be seen on the preserved frescoes and icons in an original way of describing the stages of Christianity and the Bible. What is actually typical of all the monasteries is life in them which is unchanged for centuries with little modernization, without acceptance of certain scientific and technical achievements. Besides spiritual prayers, the daily activities of monks and nuns include the application of various crafting skills, then engaging in farming, fruit growing, bee-keeping, etc.

2. CHARACTERISTICS OF RELIGIOUS TOURISM

Religious tourism worldwide is one of the leading forms of tourism and in its present form appears at the beginning of the twentieth century, when it reached significant level due to multiple correlated with economic, organizational, cultural and anthropological aspects that are present in different spheres of human concern. When it comes to this type of tourism, there were three forms in which religious tourism most often can be found:
1) Pilgrimage; 2) Mass meetings on the occasion of important religious dates; 3) Tour and visit the holy places and objects. [1]

An interesting fact is that during the global economic crisis the number of tourists were reduced for all types of travel arrangements, which in turn is not the case with religious tourism as it increased. In fact statistics show that 20% of all tourists in the world are those who practice religious tourism. [2]

Looking back on the experience in Europe, some churches, such as Notre Dame in Paris, gets around 12 million tourists a year. Churches such as the Mont Saint-Michel, the Sacré Coeur, and the Cathedrals in Rheims, Chartres, and Sainte Chapelle Vezelay belong to the twenty most visited places in France. In the UK the situation is similar, but with a much smaller number of visitors compared to France. Westminster Abbey is visited by 3 million tourists each year, Canterbury Cathedral by 2.25 million and the Cathedral of St. Paul by 1.5 million. Surveys conducted in Italy showed that the Florence Cathedral is very attractive for visitors (98% of all tourists visited this cathedral). [3]

As for the Republic of Serbia, this type of tourism has been neglected after World War II until the early nineties when radical changes comes into society (occurrence of wars, sects and cults), which affected the population return to religion. People that want peace of mind and tranquility, travel to monasteries and churches to worship the relics of saints. [1]

Also, visits to churches and monasteries are associated to baptisms, weddings and saying prayers for the health and salvation. As part of the Serbian Orthodox Church, there are pilgrimage services responsible for organizing the religious trips. Danko Strahinic, during the conference "Economics and Religion, Regional development and religious tourism" that was held in Belgrade last year, in the journal "Orthodoxy" states that the same religious tourism promotion was discussed in the context of regional development and shared its impact on the changes in the pilgrimage places. He further pointed to the conclusions of this conference that religious tourism improves regional development and therefore it is necessary for Serbia to put the effort to improve the representation of the country on the tourist map of Europe with the reduction of unprofessionalism and poor coordination of state authorities in this matter. [4]

3. MONASTERIES BRANICEVO'S DIOCESE

Branicevo’s Diocese is located in eastern Serbia, around the major cities of Pozarevac, Petrovac na Mlavi,Svilajnac, Paracin etc. Monastery Nimnik is first to visit in the Diocese when traveling from north to south.

Nimnik Monastery is located on the road Pozarevac – Gradiste, in the Kurjace Village. [5] Regards to the building tome of the monastery, there is no written evidence of this, but based on the architecture it is considered that it was built in the middle Ages (many claim it was built after the Battle of Marica in the 1371). [6] As there are no precise data on its construction, there are no precise figures on his benefactor. Nimnik Monastery is part of an old Marijaski Monastery that is dedicated to the transfer of the relics of St. Nikolai (St. Nicholas summer). [7]

Going from Nimnik to the west, one can visit the ***Rukumija Monastery*** located in the Bradarac Village, near Pozarevac, on the way to Kostolac. It is believed that the church is dedicated to the Ascension of the Lord Jesus Christ, and was built of stone, while the roof was made of the tile. [8] The church has been destroyed and burned for centuries. A fire in 1978 caused significant damage, where many frescoes darkened and major characters couldn’t be recognized. The restoration and retouching were performed in 1994. In this monastery there are relics of Venerable Sinajit Martirij. According to popular belief, the monastery was built

by Knez Lazar and its construction is linked to the folk song "God does not owe anything to anyone." The monastery has two wells with mineral water named Redusa and Jerinac. In the last century, the wells were often visited and greatly appreciated. In the middle Ages, the monastery is not mentioned in any of the source, and it is not even listed in the Branicevo list in 1476. So there is a thought that at that time this Monastery existed as a parish church in the village of the same name. [7]

Sestroljin Monastery is located in the Poljana Village, on the main road Pozarevac - Svilajnac. It belongs to Branicevo diocese of the SPC. According to the legend, it was built in the second half of the XIV century while ruled by Knez Lazar. Near the Monastery is a source of healing water. The origins of this monastery are related to this folk song "God does not owe anything to anyone," according to which Jelica was the sister of the local landowner Pavle and Radul. Pavle's wife in a jealousy attack killed her child and accused Jelica for it. It is then believed that the brothers, as a punishment, tore sister on four horses, which were then released to the four corners of the world. According to the legend, the church appears on the place where her body was dropped. [7]

Another one of the monasteries that are related to the cult of sister Jelica is ***Zaova Monastery***, which according to the legend was erected on Jelica's grave. From the sixteenth to the nineteenth century the church was destroyed several times and then rebuilt. In 1849 murals and frescoes were re-done and as such have been preserved to this day. Upon this restoration, the Zaova church that is dedicated to the archangels Mihajlo and Gavrilo, became a monastery that is still active. Inside the monastery is the tomb which is assumed to be Jelica's, above which a fresco is showing the laceration with her four white horses. This grave every year was visited by a few thousand people, most of them on St. Ilija's day, on 2nd August, because it is considered that Jelica was killed on this day. According to the legend, as Jelica was torn "on all four sides", the places where parts of her body crashed, miraculous sources that exist today appeared. It is believed that near the Zaova Monastery eyes of Jelica plunged, so now the monastery become a place that is dedicated to St. Petka protector of blind and visually impaired people. [9]

On the Pozarevac - Petrovac na Mlavi route is the ***Bradaca Monastery***, surrounded by dense beech and oak trees. [10] The church is dedicated to St. Vavedenje originating from XIV century. But unfortunately there is no information about the founder. The earliest written record dates from the sixteenth century when the monastery was still active. With the end of the XVII century and until the XIX century monastery is not mentioned in any written documents, until 1990 when major renovation were undertaken. [11] It was built in the style of the Moravian school in 1990 and after the consecration its restoration began. Today the monastery is active, looked after by male and cared monks. 7th April is celebration as a glory day of the monastery. Building of its male lodging started in early 2007. However, although much work has progressed, lacks of the funds are preventing completion of this work. [12]

Near Golubac (9 miles) in a picturesque area, is the ***Tuman Monastery***. The temple is dedicated to Sv. Archangel Gavrilo, and its founder is considered to be Milos Obilic, although there is no written evidence to confirm this. As for the name of the monastery, there are two versions of how the monastery got its name. According to the first, Milos began building

monasteries before the Battle of Kosovo, and when he reached to the point to fit the windows, he received a message from Knez Lazar to stop all the work and to go to Kosovo. According to another legend, Milos is while hunting accidentally wounded ascetic Zosima Sinaite. While Milos carried him on his back towards its castle to nurse him, ascetic saw that his end is near and he said to Milos "Leave me here to die", and Milos in penance for the harm he caused began to build the monastery named Tuman. [7] In its long history, the monastery was destroyed several times and then rebuilt. In 1924 the church was restored the last time. Only in 1991 iconostasis was created from masonry and then the church become fresco-literal. In 1936 while making repairs to the monastery, relics of St.Zosima Sinaite were discovered under the stone plate which was used as a worship stone for centuries by fateful followers. Although the relics were in the ground and in the humidity for more than five centuries, they are not rotten, but they retain its strength and weight. The relics were placed in a smallish box and exposed in front of the church altar, where they still are. In 1966 monastery became the female one and remains such to this day. [13]

Gornjak Monastery is located southeast of Pozarevac, under the Jezevac Mountains, near the Mlava River. Abbey was originally named Zdrelo, by the name of medieval town whose ruins can still be seen near monastery. This city played an important military, economic and political role in the life of Serbia in the XIII century. There is no written evidence when the monastery began to be called Gornjak, but it is believed that the name comes from one of the legends. According to the first, it is named after the wind "Gornjak" blowing through the Valley of Mlava River, and the second, that the name comes from the "upper town" because it was close to fortification of Jezvica Mountain. [14] The monastery was founded by Knez Lazar, and it was built between the 1376 and 1380 in gratitude to Knez Lazar's ascetic Gregory Sinajitu. Like other monasteries from this period, Gornjak was repeatedly burned, destroyed and rebuilt. It is dominated by The Church of Vavedenje, which occupies a central place in a small churchyard, although is resting against the mountain walls. [15] In the niche of the north wall, there is a coffin with the relics of St.Gregory Sinajita. Gornjak Monastery is predominantly known by an indefinite secret held from the time when it was build. Every year on St. George day, water starts to drip to one small bay out of the cracks in the rock located behind the monastery, where people collect water by spoons. It is believed that this dripped water can cure eye problems. No one can answer the question why the water from this "source" appears only once a year, on St. George's day, at a certain time, only when the day transforms to night. Some believe that these are the tears of ascetic Gregory, who still helps his people. [16]Next to the monastery Gornjak, near Petrovac on Mlava, may be less well known monasteries St. Petka, St. Trojica, Reskovic and Vitovnica. [17]

On the right bank of Velika Morava river near the Glozane Village, near the *Miljkovo Monastery* is the ***Dobres Monastery*** whose time of construction or patron is not known exactly, but is assumed to be built in the Middle Ages during the reign of Knez Lazar. Throughout history, like the majority of Serbian holy sites, it was looted and burned by the Turkish conquerors and others, while aiming for its final restoration that began in 2003. It is still an active nunnery. [18]

Tomic Monastery is located on the right bank of the Morava, near Svilajnac town, in the village called Vojska. The monastery is dedicated to St.Apostle Thomas. Name of the

monastery, "Tomic", refers to the diminutive name of the saint, not the name of its founder as many believe. When it comes to the time of construction of monasteries and its founder, there is no written information about it, but it is believed that the monastery was built during the reign of Despot Stefan High. [19]In Table 1 monasteries discussed above, and other monasteries in Branicevo diocese can be seen.

Table 1. Monasteries Branicevo's diocese

Monastery Bradaca with temple of Blagovesti Presvete Bogorodice - Kula	Monastery Ravanica with temple of Vaznesenje Gospodnje - Senje
Monastery Vitovnica with temple of Uspenje Presvete Bogorodice - Melnica	Monastery Rukumija with temple of St.Otac Nikolaj - Kostolac
Monastery Gornjak with temple of Vavedenje Presvete Bogorodice - Krepoljin	Monastery Sisojevac with temple of Hristovo Preobrazenje - Senjski Rudnik
Monastery Zaova with temple of St. Arhangel Mihailo i Gavrilo - Veliko Selo	Monastery Trska Crkva with temple of Rodjenje Bogorodice - Vukovac
Monastery Zlatenac with temple of St. Vraci Kozma i Damjan - Svilajnac	Monastery Tomic with temple of St.Apostol Toma -Vojska
Monastery Koporin with temple of St. Arhidjakon Stefan - Velika Plana	Monastery Dobres with temple of St.Nikolaj
Monastery Manasija with temple of St.Trojica - Despotovac	Monastery Tuman with temple of St.Arhangel Gavrilo - Golubac
Monastery Miljkovo with temple of Vavedenje Presvete Bogorodice - Svilajnac	Monastery Reskovica with temple of St.Apostoli – Zdrelo - Setonje
Monastery Nimnik with temple of St.Otac Nikolaj - Mijailovac	Monastery St.Trojica – Zdrelo - Setonje
Monastery Pokajnica with temple of St.Otac Nikolaj - Velika Plana	Monastery St.Petka with temple of Prepodobna Majka Paraskeva- Donja Mutnica
Monastery Radosin with temple of Uspenje Presvete Bogorodice - Radosin	

Source: [17]

4. MONASTERIES TIMOCKA'S DIOCESE

Timocka diocese covers the eastern Serbia, near the border with Romania and Bulgaria. It is located around large cities Kladovo, Negotin, Zajecar, Knjazevac etc.

Not far from Negotin (4 miles on the road Negotin - Zajecar), is the ***Monastery Bukovo*** dedicated to St. Father Nicholas the Wonderworker. The monastery is named after either by beech woods that surround it, or by the rapid bird, which once lived in those areas. Although there are no written records of the founder of the monastery, it is believed that it is the foundation of the Serbian King Milutin from the end of XIII century, who raised the monastery after victory over the Bulgarian Emperor Sisman. According to another tradition, it is believed that the founder of the Monastery Bukovo is St. Tismanski Nicodemus, who lived in Timok in the fifteenth century and who is known for construction of many churches, while the third story claims that monastery was founded by some wealthy people of eastern Serbia and that monastery originates from the fifteenth century. [20]

North of the Bukovo Monastery, a ***Vratna Monastery*** exists. This monastery is hidden between the high rocky Miroc Mountain, on the banks of the Miroc River, and at the foot of Vratnjanska Kapija Mountain. [21] According to tradition the monastery was built by Archbishop Nicodemus from Prilep in the XIV century, during the reign of the Serbian King Milutin Nemanjic. The monastery church was originally dedicated to St. Apostles, and later was given Lord's Ascension (Spasovdan). Most of the icons in the monastery is of Russian origin, and deserve the attention of the icon named Royal Doors of the XIX century. The

monastery was restored in 1415 and then was abandoned in the second half of the XVIII century. Later it was repeatedly rebuilt and burned, and the last renovation of the monastery occurred in 1937. [22]

The monastery is named after the huge, up to thirty feet high, doors or gates in the VratnaRiver, that river 'chiseled' from rocks for hundreds of thousands of years. These are actually the remains of the vaults of the former cave through which the river flowed. The gate has a total of three doors - first door is called the Great Prerast, second Small Prerast and third Dry Prerast. The entire complex consists of door, village and monastery gate, and is surrounded by rivers and forests and is one of the most interesting tourist destinations of Negotin Frontier. [23] Vratna Monastery is an active nunnery, run by a female monks.

In the MilosevoVillage, near town called Negotin , ***Koroglas Monastery*** is situated, which is now deserted and in ruins. Although there is no written record of the founder of the monastery, it is believed that it was built by King Milutin at the beginning of XIV century. [24] According to the tradition, the monastery was built on the place where the famous Serbian hero Marko Kraljevic was buried. Although the monastery is in ruins, the people traditionally gather on the Ascension and St. George Day. [25]

Suvodol Monastery is located in the Selacka Village, in the Zajecar County, at the foot of the Manastirska Glama Mountain. It is part of the Nature Park called "Stara Planina". There are no written records where the name Suvodol came from. The fact is that the given name is contradictory to the ground that was build on, as the soil is very water rich. [26] This monastery is also known as the Monastery of the Virgin because it is dedicated to the birth of the Holy Mary. Suvodol is one of the oldest buildings in the area and is considered to be built in the XI century at the time of the Byzantine Empire won Vidin Region (1004-1008). Shortly after that it was destroyed by the Cumans and other wandering tribes. [27] During the reign of King Milutin it was re-built, while during Lazar reign it gained its final appearance. In 1869 the monastery was destroyed and rebuilt again when the relics of St. Healer Panteleimon were built in an altar, and it is therefore believed that water from the monastery tap has medicinal properties (it is believed to cure vision problems, headache, fears, tuberculosis, epilepsy, etc.). [28] By 1946 Suvodol was a male monastery, but after the Second World War it was deprived of all belongings, and all monks have abandoned it. [29] It was restored by nuns coming from Bosnia and Srem Region Monastery and nowadays it has been a monastery where only a couple of nuns lives in. [30] In Table 2 are listed monasteries from Timocka's Diocese:

Table 2. Monasteries Timocka's diocese

Monastery Bukovo with church St.Otac Nikolaj - Negotin
Monastery Manastirica with church Silazak Svetog Duha -Kladovo
Monastery Suvodol with church Rođenje Prsvete Bogorodice -Selacka - Mali Izvor
Monastery Vratna with church Vaznesenje Gospodnje -Jabukovac
Monastery Sv.Trojica with church Silazak Svetog Duha - Donja Kamenica
Monastery Krepicevac with church Uspenje Presvete Bogorodice - Zajecar
Monastery Jermencic with church St.Arhangel Gavrilo -Sokobanja
Monastery Lozica
Monastery St. Petar i Pavle-Grliste

Sources: [31] i [32]

5. MONASTERIES FROM NIS'S DIOCESE

Diocese of Nis is located at the southeast of Serbia and extends to the border with Bulgaria. In 2010 its territory was reduced by forming the Diocese of Krusevac, which was created from parts of Branicevo, Nis, Sumadija Region and Zicha. [33]Monasteries form Diocese of Nis are shown in Table 3.

Table 3. Monasteries from Nis's diocese

Monastery Ajdanovac with church St.Velikomucenik Georgije -Velika Plana	Monastery St. Stefan- Lipovac
Monastery Presveta Bogorodica-Visocka Rzana	Monastery Pirkovac-Pirkovac
Monastery St. Jovan Krstitelj - Gornji Matejevac	Monastery St. Jovan Bogoslov- Poganovo
Monastery St. Dimitrije - Divljana	Monastery St. Roman- Djunis
Monastery Presveta Bogorodica- Djunis	Monastery Presveta Bogorodica-Sicevo
Monastery St.Petka," Iverica"- Sicevo	Monastery St. Mucenici Kirik i Julita - Smilovci
Temle of St. Petka Paraskeva	Monastery Sukovo-Sukovo
Monastery Presveta Bogorodica- Jasunja	Monastery St. Velikomucenika Georgije - Temska

Source: [34]

From these monasteries going from Nis to the Bulgarian border distinguishes the following monasteries: the monastery of St. Demetrius in Divljan Village, Temska Monastery and Poganovo Monastery.

Monastery Divljan is dedicated to St. Demetrius Peacemaker and is located near town called Bela Palanka. Its named by DivljanaVillage and it is considered that its name comes from the Latin word DIVUS meaning God. [35] " A number of ancient monuments can be seen in the monastery , two capital ones, one with a height of 64 cm, 53 cm in diameter in the lower part, and 72 cm in the top , with an early Christian cross in the ring at the front and a stylized letter "omega" in all vertical edges."[36] The first written records of the existence of the monastery indicate that the monastery existed in the IV century and that it was founded by St. Nikita Remzijanski the Bishop, who is remembered as a great educator and a fighter against heresies. In some written documents it can be found that his relics are preserved within the monastery. Abbey has been repeatedly destroyed throughout its history and rebuilt. Some data suggest that it was "revived" by first Slavs that took Christianity, when the monastery became the center of spiritual life in this part of Serbia. Mrnjavcevic brothers restore the monastery, but it gets destroyed again later on. The present appearance of the church gets its final appearance in 1908. Nikolai Velimirovic brings to the monastery relics of St. Kirik and Julita, which are kept with great respect. "Monastery library was once the richest in the Diocese of Nis, but it was looted by Bulgarians, together with all other valuables, in 1914". [37]

Monastery Temska with its St. Georgije Marty Church is located at 15 km away from Pirot. The name originates from the old city of Temac that existed near the monastery. It is believed to be built up by the Dejanovic brothers, nephews of the Emperor Dusan in the XIV century, on the foundations of the original church dated from the XI century. Simplified architecture of the monastery belongs to the Moravian style. [38] It is a small monastery, built from little white stones and crushed stone, and covered with stone slabs. "The special architectural value of the whole Temska Monastery is represented by a monument from the 18th century, that

does not exist in any other Serbian monastery and it’s known for its authentic construction style for the region of southeast Serbia.In a period of 17 to 19 century, the monastery of St. George Temska provided a significant spiritual and cultural center for the southeast Serbia, where special quarters were used for an educational purpose. This Monastery worked as the only educational institution in the region. In the monastery of St. George in Temska by traditional recipes, ointments were prepared from a plants picked on Stara Planina Mountain that help in the treatment of certain skin disorders - eczema, psoriasis, dermatitis, neurodermatita, atopic dermatitis, allergic skin acne, sunburn, insect bites, live wounds, hemorrhoids , veins, alopecia, inflammation of the sinuses and ears."[39]

Poganovo Monastery is located 10 km from the highway Sofia-Nis, in the valley of the river Jerma. [40] The church, dedicated to St.John the Divine, was built in the 1395, by a Serbian nobleman Constantine Dejanovic, nephew of the Emperor. Monastery was painted towards the end of the fifteenth century by artists from Northern Greece. Due to its geographical location, which was inaccessible for a long time, the monastery was relatively well resisted various conquerors. The monastery is famous for keeping "The double image" or two-sided icon, which is considered the most beautiful icon of the late fifteenth century. The icon is now in the Museum of the icons in Sofia. Beside it, the Bulgarians during the First World War took a beautiful iconostasis from the XVII century. [41] "Monastery of St. John the Divine is under state protection since 1949, and is also on the UNESCO World Heritage since 1979 as a cultural heritage of great importance."[40]

In addition to the rich heritage of the monastery in this part of Serbia, as a place worth visiting stands the Church of St.Apostles Peter and Paul in Rsovci Village, 22 km away from Pirot. It is believed that this church was built by the ascetics of Sinai in the XIII century inside the cave of the Kamik Hill, on the right bank of the Visocica River, in the Rsovci Village. It is also known as the cave church. Otherwise, this church is distinguished by the fact that it contains a fresco on which Jesus was young and bald. Until ten years ago, the church was abandoned, but with the help of church authorities and experts, as well as local residents, tower was erected and entrance to the cave was secured. [42]

5. CONCLUSION

Analysing eastern Serbia, one comes to the conclusion that its rich history has left traces in most churches and monasteries in the area. Besides Ravanica and Manasija, which are not mentioned here, many other monasteries with no less interesting than the two mentioned are reviewed.

As people of the modern era show a great interest in getting to know how their cultural heritage develops, there is a need to preserve valuable historical monuments so that future generations can be educated. Orthodox monasteries are known for their attractiveness, precisely because they are commonly found in the natural environment, as well as by products that novices can offer to tourists. Initial thoughts are focused on local honey, brandy, cheese, wine and so on, as well as on souvenirs, rosaries, icons, engravings, etc. Because of this it is considered that the development of religious tourism should be supported by the Government,

by supporting religious tourism programs and educating members of the community, especially the younger generation, with a national treasure.

On the other hand, it is necessary to get a contribution from the Church, through the organization of specific seminars and theological debates that will combine Orthodox theology and tourism. It is also important to organize the service in the church to deal with the recording and analysis of guests because the determination of the results will relate to the attractiveness of a given place for tourists. Up to now, almost none of the Orthodox facility has kept track of the number of visitors, which is one of the ways in which better preservation of religious tourism could be achieved.

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SUSTAINABLE SPA TOURISM IN SERBIA

ODRŽIVI BANJSKI TURIZAM SRBIJE

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Abstract: *At the beginning of the new century, tourism has become one of the world's largest industry, thanks to globalization in all socio-economic parts of humanity. It can be said that tourism becomes important part in the economic development of each country. However, the development of tourism has contributed to some increase of environmental pollution. For this reason, sustainable development, becomes important concept of sustainable tourism. Since the Serbian spa tourism has a great potential for economic development, the paper emphasis on the sustainability of spa tourism, and the importance of development of Serbian spa tourism.SWOT analysis are highlighted opportunities, weaknesses, strengths and threats in the Serbian spa tourism and provide basic strategic directions of further development.*
Key words: *Sustainable development, sustainable tourism, Serbian spa tourism, SWOT analysis.*

Abstract: *Turizam je početkom novog veka postao jedna od najvećih svetskih industrija, zahvaljujuću globalizaciji u svim društveno-privrednim sferama. Može se reći da turizam dobija akcenat u privrednom razvoju svake zemlje. Međutim, razvoj turizma je doprineo i određenom povećanju zagađenja prirodne sredine. Održivi razvoj u turizmu, iz tog razloga postaje važan koncept održivog turizma. Kako u Srbiji banjski turizam predstavlja veliki potencijal za razvoj privrede, u radu je akcenat stavljen na održivost banjskog turizma, kao i na značaj razvoja banjskog turizma za Srbiju. SWOT analizom su istaknute šanse, slabosti, snage i pretnje u banjskom turizmu Srbije i dati osnovni strategijski pravci daljeg razvoja.*
Klučne reči: *Održivi razvoj, održivi turizam, banjski turizam Srbije, SWOT analiza.*

1. INTRODUCTION

The basic concept of sustainable development could be expresed by the most freqently quoted definition that originates from the „Our Common Future“, also known as the Bruntland Report :"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs [1]." Each generation must solve their tasks and also must not leave them to future generations [2]. National strategy for sustainable development of each country aims to promote sustainable development as a comprehensive process that combines economic, social and environmental principles of a modern society at all levels. National Strategy for Sustainable Development of Serbia is task-oriented, long-term, sustainable and synergetic process that affects all aspects of life. Sustainable development includes models which are able to satisfy the socio-economic needs and interests of citizens, and at the same time removes or significantly reduces the impacts that threaten or harm the environment and natural resources. Permanent social growth contributes the economic efficiency, technological progress, the development of clean technologies, and on the long term it contributes the innovation of the whole society, encourages corporate social responsibility, reduces poverty, promotes better use of resources, improves health conditions and quality of life, leads to the reduction of pollution to a level that can withstand environmental factors and promotes biodiversity. Sustainable development coordinates various aspects of development and conflicting motives, that are included in the programs of all sectors of society, at the national level. The aim of sustainability is to balance the three key factors, or three pillars of sustainable development: sustainable development of

the economy and technology, sustainable development of society based on social balance and environmental protection and rational management of natural resources [3]. At the same time, the aim of the strategy is to merge the three pillars of the whole, that will be supported by appropriate institutions.

2. VISION OF SERBIAN NATIONAL STRATEGY FOR SUSTAINABLE DEVELOPMENT

The Vision, as a major component of management and governance at all levels and in all processes, is a desired image of the future, so vision of sustainable development in Serbia could be characterized as the image of a new and modern country. According to the Vison of National Strategy for Sustainable Development, Serbia in 2017 is institutionally and economically developed, in accordance with European Union standards, with efficient use of natural resources, with economy based on knowledge, with educated people, with greater efficiency and productivity, with a preserved environment, historical and cultural heritage, the country that provides equal opportunities for its all citizens and the country with compatible both private and public sector. Based on the analysis of the Serbian potential, the desired future could be achieved by achieving fundamental short-term goals, that are based on the needs of citizens and complied with their desire for a better life. Vision of sustainability identified following national priorities: candidacy and cembership in the European Union treaties, which require Serbia to fulfill a number of complex and inter-related conditions (Serbian compliance with the EU acquis and commitments arising from such membership); development of a competitive market economy and balanced economic growth (fostering innovation, creating links between science, technology and entrepreneurship, increase the capacity for research and development, including new information and communication technologies); ensuring security of energy supply could be achieved by increasing the efficiency of energy companies and energy economic efficiency; educated people, creating more jobs (attracting professionals, improving the quality of labor, greater investment in human resources, to find ways to invest in public health, especially in primary care and prevention, balanced regional development and infrastructure investment (and enhancing the attractiveness of the country region of an adequate level of services); protection and improvement of environment and rational use of natural resources. Of these social, economic and environmental objectives, it is necessary to put emphasis on the natural environment, improvement of the environment and rational use of natural resources. Thus, although the last mentioned, the goal of sustainability takes first place in the protection and enhancement of the environment, especially as an important precondition for sustainable development, becausec the healthy environment is the condition of suistanable development. In addition to reducing pollution and use of natural resources so they remain available for future generations, to achieve this goal it is necessary to achieve the following conditions [3]:

1. Establishment of the protection and sustainable use of natural resources
2. Strengthening of interaction and mutual achievement of significant environmental effects of economic growth and investment

3. reduction of environmental pollution and the development of clean technologies;

4. Reduction of the high energy intensity of the economy of the Republic of Serbia and the efficient use of fossil fuels;
5. Encouraging the use of renewable energy sources;
6. Planning sustainable production and consumption, and reduction of waste per unit of prod.;
7 . Protection and Biodiversity Conservation.

Conservation of natural resources and the environment in Serbia in a sustainable manner, is possible if special attention is paid to natural resources such as: air, water, land, biodiversity, forests, mineral resources, renewable energy sources. Renewable energy sources include geothermal sources, and given tha fact that Serbia has a lot of these sources, in many of them are located spas. Spas offers a special form of tourism, that includes economic, social (health), and a natural component of the economy of modern country.

3. SUSTAINABLE TOURISM IN SERBIA

Spa resorts are places affluent in mineral water, mud, air, or other characteristics that help or facilitate the discomfort, or otherwise help the healing process. Although some spas have opulent mud treatment, there are often sources of geothermal and mineral water, while some of the mountainous regions are abounding in clean and fresh air, and are often referred to as "air baths." There are over 1000 mineral water springs in Serbiaand 49 active natural spas and resorts, so it could be stated that Serbia lies on thermal mineral waters. In reference to sustainable tourism, it can be argued that it is an industry that has a minimal impact on the environment, productive, leading to job creation and also to the protection of local ecosystems [4]. Given the fact that it has friendly relations between the natural and cultural heritage, this type of tourism can also be called responsible tourism. Interpretations by the World Sustainable Tourism Organization, sustainable tourism recognizes and meets the needs of carriers of tourist services, ie. tourists, as well as carriers and offers provided,and it achieves these goals at the same or higher level in the future. Figure1 presents a model of sustainable tourism [4].

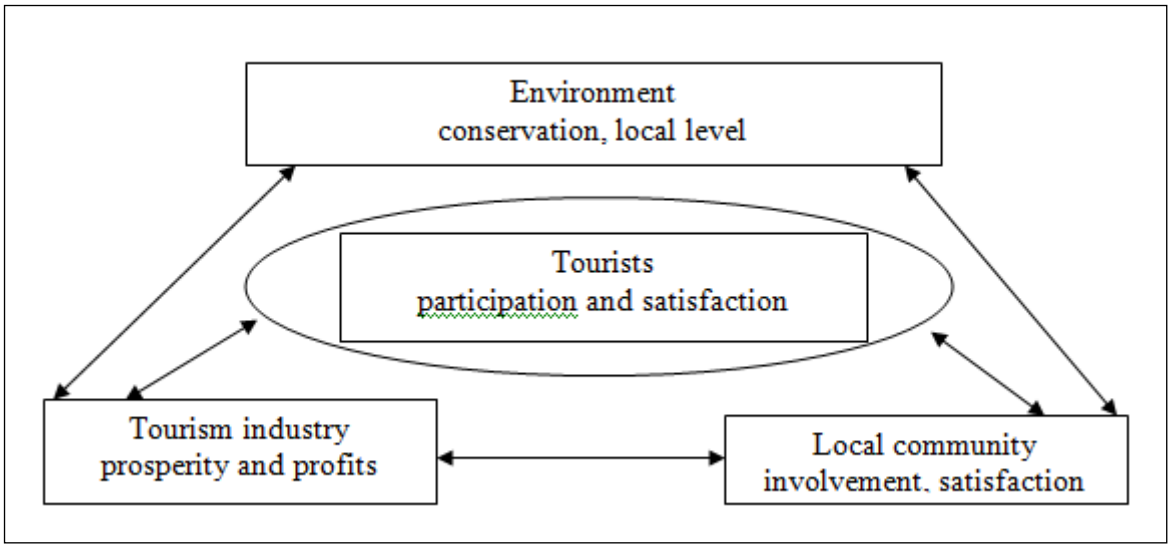

Figure 1. Model of sustainable tourism
Source:[4]

The aim of sustainable tourism is sustainable and coordinated development, that pays attention to the five components: environmental, economic profit achievement, fostering cultural characteristics of the local population, optimally meeting the needs of tourism promotion and social integrity. Aims to be achived are at the same time and conditions for their realization. It should not be on account of the economic component, forget about the environment, and the lives of the local population, because this orientation that would lead to economic performance, were profitable in the short time, that is certainly not a condition of sustainability, given that sustainable development means and development on long time. Traces of the Roman culture confirm they paid attention to healing waters on whose wells they built baths and facilities for treatment, rest and pleasure [5]. The remnants of the Roman baths were found in the following spas: Vrnjacka Banja, Sokobanja, Niska Banja, Gamzigradska Banja, as well as in many other spas [6].

4. IMPORTANCE OF THE SERBIAN SPAS IN SERBIAN TOURISM

Although the territory of Serbia is extremely rich in waters (none of the European countries has so many thermo-mineral wells as Serbia does), only about 30% of this underground watery potential have been used [7]. Since the spa tourism in Serbia is one of the segments of the Serbian economy, which is expected of much more in future, it is, therefore, necessary to use it up as its developmental chance as much as possible [8]. Serbia has great chances to get profit from the spa tourism. While researching possibilities for development of the spa tourism in Serbia and working out the strategy of sustainable managing in spa torism, we used the data of the National Statistical Office of the Republic of Serbia on the number of both domestic and foreign tourists. We did a comparative analysis of the data on the number of visits and overnight stays in different tourist destinations in different periods of the year. Using the method of a questionnaire, we investigated the attitude of the citizens to tourism, and if visitors are satisfied with services in spas, primarily with medicinal services (measures of prevention, treatment and rehabilitation), as well as with offered services and

accommodation facilities (hotels, suites, local hospitals and quarters for the night). Both domestic and foreign tourists were questioned. Obtained results were used for working out the SWOT analysis. The method of the SWOT analysis defined both crucial factors having influence on tourism development and the strategy of management over sustainable tourism development of Serbian Spa. This method determined also specific aims that should be achieved in managing sustainable tourism development in this area

Table 1. Realized overnight stays per types of tourist destinations of Serbia

	Total	% 2011/10.	Dom. g.	% 2011/10.	For. g.	% 2011/10.	For.g %2012/11
Srebia	**6,644,738**	**+ 4 %**	**5,001,684**	**+ 1 %**	**1,643,054**	**+ 13 %**	**+9%**
Beograd	1,149,029	+ 2 %	301,114	– 11 %	847,915	+ 7 %	+8%
Novi Sad	213,549	+ 27 %	70,926	+ 4 %	142,623	+ 42 %	+1%
Spa resorsts	**2,308,435**	**+ 4 %**	**2,176,622**	**+ 3 %**	**131,813**	**+ 26 %**	**+2%**
Mountain res.	1,590,016	+ 8 %	1,442,213	+ 8 %	147,803	+ 15 %	+5%
Other tour. dest.	1,172,675	– 5 %	847,263	– 11 %	325,412	+ 16 %	+21%
Other dest.	211,034	+ 2 %	163,546	+ 3 %	47,488	– 2 %	+6%

Source: [8]

Table 2.The number of overnight stays by domestic tourists in researched tourist dest.

Selected destinations	Domestic t.overnights stays	% 2011/2010.	Domestic t. overnights stays	%2012/2011
Vrnjačka Banja Spa	528,963	+ 3 %	454,966	-14%
Mt.Zlatibor	410,833	+ 17 %	401,703	-2%
Sokobanja Spa	321,500	+ 11 %	303.499	-6%
Belgrade	301,114	– 11 %	326,483	+8%
Mt.Kopaonik	241,557	+ 15 %	261,477	+8%
Niska Banja Spa	194,985	-7 %	190,152	-2%
Banja Koviljaca Spa	192,370	+ 15 %	150,371	-22%
Mt.Tara	186,293	+ 27 %	214,333	+15%
Mt.Divcibare	124,131	+ 9 %	112,844	-9%

Source: [8]

Considering the number of overnight stays of domestic and foreign tourists in the year 2011, it can be observed from the Table 1[8] that there were total of 6,644,738 overnight stays, out of which domestic tourists stayed for 5,001,684 nights (1 % more), amounting 75% of the total number of overnight stays, while 1,643,054 (13 % more), making 25 % of the total number of overnight stays, relate to tourists from abroad. Expressed by the number of overnights stays,

domestic guests stayed most in the spas (44 %), then in mountain resorts (29 %). Tourists from abroad stayed most in Belgrade (52 %), while 20% of visits were to other places in Serbia.Regarding the number of overnight stays in the year 2011, domestic tourists stayed most in Vrnjacka Banja Spa (528,963, which is 3 % more than in 2010), then on Mt. Zlatibor, Soko Banja Spa, Belgrade, Mt. Kopaonik, etc. (table 2) [8]. Regarding the spas in Serbia in 2012., the data on visits to spas in Serbia are shown in the Table 3[9].The composition of tourists staying in spas in 2010 and 2011 years show that there were more domestic guests in relation to the number of tourists from abroad; a positive trend of foreign tourists was recorded in 2012, but also negative trend in stays of domestic guests in spas.

Table 3.Visits to spas in 2012.

Selected destination	Arrivals	Overnights stays
Vrnjacka banja spa	125,658	456,236
Sokobanja spa	46,960	290,954
Niska banja spa	15,949	167,858
Bukovicka Banja Spa	21,507	50,824
Mataruška spa	5,514	54,187
Koviljaca spa	15,053	142,428
Prolom spa	15,153	72,323
Gornja Trepca spa	10,121	97,696
Vranjska spa	4,276	30,817

Source: [9]

4.1 CHARACTERISTICS OF SERBIAN SPAS

On various regional health, wellness and spa conferences of tourism, we can hear the notes and warnings of health, economic and environmental experts. They are saying that it is necessary quickly and efficiently adapting of Serbian spa tourism on changes that are coming from the environment and that are turbulent. As visitors come to the spas with health problems, it is direction that should be developed health spa tourism. However, a significant number of visitors are seeking rest and relaxation from everyday stressin recent years in the Serbian spas. How much the spas are really important and necessary in the opinions of patients and ordinary visitors, it can be seen in the following items: disease prevention, treatment, maintenance of mental and physical fitness, "beauty and health"; sports activities; walks and collection of medicinal plants; conferences, seminars, sports camps and preparation, healthy food, meeting the specific culture of the region. Tha fact is that the Serbian spas are chosen destination of people who want a break from stressful lifestyle,in recent years. So, it should be offer to them appropriate programs (wellness, spa programs, etc..), in order to attracting more visitors, and on the way to earning funds, for improving the operations of these businesses. Although Serbian spas have professional medical staff,it is necessary to develop Wellness Tourism (includes disease prevention, relaxation, fitness, relaxation), in terms of providing medical services to attracting foreign tourists. The term spa is taken from the latin phrase "Salus per Aquam", that means „water to health“, while the word wellness is an abbreviation of English well being, that means „a good feel“. Demand for Spa and Wellness programs in the world is rapidly growing up.Spa centers that provide this

type of services, offered everything necessary to modern man: facial, body and soul tretmans, which aims are to relax and to enjoy, as well as anti-stress programs and good health. Price of tha spa products depends on this type of services [8]. Spas and climate are irreplaceable part of the health system, cultural heritage and there are important economic factors in Europe. If the Serbia wants to be closer to European standards, it must take into account the desires and expectations of international guests. If we consider the fact that according to the number of visitors spas, domestic tourists are dominant, the question is how to interest foreign tourists for visiting Serbian spas. The answer should be found in the results of the SWOT analysis, but also in able that Serbia can offer pristine nature, diverse cultural and historical heritage, and also a part of Europe to guests from abroad, in addition of modern Spa and Wellness programs. The essence of the strategy of European spas, lies in activating the self-consciousness of responsibility for guests own health and in making bids oriented towards users. Because of this reson, it is founded the Serbian Spas and Resorts Association, in 1970 with headquarters in Vrnjacka banja spa.

5. SWOT ANALYSIS AND SUSTAINABLE DEVELOPMENT STRATEGY OF SERBIAN SPAS

If we take into account the fact that spas of Serbia should be represent Serbian spa industry, in achieving of this goal it should be undertaking the following activities [10]:

1. SWOT analysis (strenghts,weaknesses, opportunities and threats of some business subject)
2. Iintroducing new programs, that will be compliance with environmental
3. Identifying development objectives in terms of their compliance with sustainable tourism
4. Establishing Partnership
5. Improving medical quality
6. Emphasizing the natural resource of authentic treatments
7. Using postulate: spa as a business!
8. Treating visitors as guests and not as patients
9. Buildimg infrastructure
10. Allowing short break packages

SWOT analysis, as the first step in promoting of spa destination and in achieving the targets of spa tourism goals, is shown in table 4 [11].

Table 4. SWOT analysis of Serbian spas

S	**W**
- A favorable geographic location - "New" destination in the international tourism market - Preserved natural resources (national parks, protected areas) - Hospitality population and a positive attitude towards population tourists - Medical and health factors - Highly educated professionals	- Poor brand of tourism products and regions - Lack of product differentiation from the competition - Lack of tourist signs - Poor infrastructure - Obsolete medical equipment - Lack of strategy - lack of education

- Environment and Food	- Lack of finance for development - Poor research in the field of Marketing
O - Approaching and entering Serbia's EU membership - Improving the image of Serbia as a tourist destination - Attracting foreign investment - Positive developments on the demand side of tourism - Regional cooperation - High quality product - Location of spas and eco-tourism - A good organization and support of the Serbian Spa and Resort Association - Support from relevant ministries	**T** - The unstable political and economic situation - Lack of support for tourism development - insufficiently attractive destination for investments in tourism - Disregard settings "Tourism Marketing Strategy - High / Low prices - Competition

Source:[11]

SWOT analysis shows the strengths, weaknesses, opportunities and threats in the environment of Serbian spas. The strenghtsof Serbian spa tourism include: tradition, a number of medical and health factors, highly educated personnel, the rich cultural and historical heritage, geographic location, as well as a healthy environment and healthy food. Opportunities for the development of Serbian spas are: high-quality product in terms of a combination spa and eco-tourism, opening of a wellness hotel, good organization and adequate support from the Serbian Spa and Resort Association, as well as adequate support from the relevant ministries.Weaknesses of Serbian spas are: poor infrastructure, obsolete medical equipment, lack of education and a good strategy, and finance for development, then poor marketing research.

However, with the support and help of the state and also Serbian spas top management, it is possible to overcome these weaknesses,.Based on the factors above SWOT analysis, it could be conceived program orientation to the strategy of development spa tourism, that includes the following activities [11]:

- Develope the strategy with short-term and long-term plans in collaboration with the Ministries
- Support the development of spa tourism
- Determine to which market Serbia should be turned
- Examine and accept the principles of wellness
- support private initiatives in the Wellness and partnerships
- Conduct education and training Wellbeing Spa-menagament
- Development of branding, marketing and sales
- Apply experience from European spas
- Common Organization and kvlitetan in the domestic and foreign markets

The task of promotive and development strategy of Serbian spas and places with good climate is to create consciousness about the tourist product of Serbia on the world market, creating a recognizable image, providing, thus better positioning of Serbia [12]. Serbia has to turn to quickly development and commercialization of spa products (*"medical spa"* and *"mineral springs spa"*- this segment of products, in relation to the product of the Serbian spas, requires relatively less investment and has the potential of relatively rapid international positioning) [13].

6. CONCLUSION

The most significant resources for development of tourism in Serbia, especially spa tourism, are undoubtedly thermo-mineral, mineral and thermal waters. The diversity of their physical and chemical composition, temperatures, abundance of water, and alike makes this area very attractive. Regarding basic natural values and their dominant functional characteristics, the spas in Serbia offer the image of high-functional health-care and recreational tourist centers. The answer to the basic question, how to minimize negative effects of tourism development in Serbia, with keeping positive ones, is to develop sustainable tourism. Nowadays, sustainable development is one of the most acceptable, however, most controversial approach to tourism management. Therefore, it can be considered as an ultimate aim that cannot be completely achieved in practice [14]. It is, however, undoubtedly the aim that has to be strived for in future.Taking into consideration the results of the SWOT analysis, it can be concluded that the aim that Serbia is to strive for and which should have maximum support by the state authorities is sustainable or harmonized development of tourism based on integral and complex approach which emphasizes five components: the environment preservation, affirmation of social integrity, cherishing cultural characteristics of the local population, satisfying as better as possible the needs of tourists and realization of economic profit.

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MOUNTAIN ECOSYSTEMS AND THE TOURISM

PLANINSKI EKOSISTEMI I TURIZAM

Tamara Jovanović

Abstract: *Mountain areas are the second, after coasts and islands, as popular turistic destinations. Tourists are attracted to mountain destinations for many reasons, including the climate, unique landscapes and wildlife, scenic beauty, local culture, biodiversity, history and heritage and opportunity to experience snow and participate in snow-based or nature-related activities and sports. On the other hand, mountains are the important source of water, hydroelectricity, timber and mineral products. While modern forms of transportation have made even remote moutain areas accessible to increasing number of visitors, moutain tourism tends to be very unevenly distributed with a small proportion of locations. At the same time, mountains are struggling with environmental degradation because of the non-sustainable tourism.*
Key words*: Mountain areas, landscapes, wildlife, supplies of water, modern transport, tourists, snow sports, environmental degradation, non-sustainable tourism.*

Apstrakt: *Planinska područja zauzimaju drugo mesto, pored obala i ostrva, kao popularne turističke destinacije. Turisti odlaze na planine iz više razloga, uključujući i klimu, jedinstvene predele i divljinu, spektakularnu lepotu, lokalnu kulturu, biodiverzitet, predanje i nasledstvo, kao i priliku da iskuse sneg i učestvuju u sportovima na snegu i aktivnostima u prirodi. Sa druge strane, planine su znacajan izvor vode, hidroenergije, drveta i minerala. S obzirom da su moderna prevozna sredstva približila velikom broju turista i najdalju planinu, planinski turizam preti da postane veoma neravnomerno raspoređen zbog male proporcije lokacija. U isto vreme, planine se bore sa degradacijom životne sredine usled neodrživog turizma.*
Ključne reči: *Planinska područja, predeli, divljina , biodiverzitet, zalihe vode, moderna prevozna sredstva, turisti, sportovi na snegu, degradacija životne sredine, neodrživi turizam.*

1. MOUNTAINS, GLOBALLY IMPORTANT ECOSYSTEMS

Mountains have been a source of wonder and inspiration for human societies and cultures since time immemorial. Our fascination for these unique wild areas has been partly based on their remoteness and inaccessibility. Yet, today, the elements that attract people to mountains – clean air, diverse landscapes, rich biodiversity and unique cultures – are under threat, partly because of poorly managed and non-sustainable tourism. Tourism is the fastest growing industry in the world, and mountains, with their unique flora and fauna, great variety of cultures, are important elements for the tourism industry. Travel to mountain areas, which already attracts up to 20 percent of annual global tourism, is increasing rapidly [1].

Mountain ecosystems are found throughout the world, from the equator almost to the poles, occupying approximately one-fifth of its land surface. Beyond their common characteristics of having high relative relief and steep slopes, rapid changes in altitude, climate, vegetation and soil over very short distances, unpredictable weather and frequent rainfall, mountains are remarkably diverse. They are found on every continent, and at every altitude, from close to sea to the highest place on the earth-the summit of Mount Everest, on the border between Nepal and the Tibet Autonomous Region of China. The biodiversity of mountain ecosystems, the uniqueness of many of their landscapes and animal and plant species represent important conservation values. Mountains also supply important resources and benefits to human society. They are the source of about 80 percent of global fresh water supplies and provide significant food, hydroelectricity, timber and mineral products to more than half of world's

population. About 12 percent of the world human population lives in the mountains, with another 14 percent living next to or very near mountain areas and dependent on their resources. Most mountain communities are rural and most live in poverty. These communities often have little or no political power and are dependent on economies based largely on agriculture. Mountain ecosystems hold important social, cultural, environmental and economical significance for the health and livelihood of these communities. They include several thousand different ethnic groups, and the uniqueness and diversity of these cultures is particularly attractive to many tourists. Well-managed tourism can be an ally in preserving local culture and values, while at the same time improving the social conditions of the poor people [1].

An estimated one-tenth of the human population derives their water life-support directly from mountains. Yet, mountains are important not only for their inhabitants, but for millions of people living in lowlands. At the global scale, mountains greatest value may be as sources of all the world major rivers, and many smaller ones [2]. Mountains play a critical role in the water in the water cycle. When the precipitation falls as snow, it is stored until it melts in the spring and summer, providing essential water for settlements, agriculture and industries-often during the period of lowest rainfall. In semi-arid and arid regions, over 90 percent of river flow comes from the mountains. Even in temperate Europe, the Alps, that occupies only 11 percent of the area of the Rhine river basin, supply 31 percent of the annual flow, and in summer more than 50 percent.

Mountain water is also a source of hydroelectric power, which provides a critical source of energy. That energy assures economical development to that region.

The wood in mountains has also many uses, including timber and wood products both for local use and, where road, rail or water network permit, for export.

Mountain ecosystems are globally important as centers of biological diversity. The greatest diversity of different plant species occurs in mountains. Many of these areas with the greatest biological diversity are designated as national parks or other types of protected area. It is not only the diversity of natural species that is of value to humankind, as source of wild foods such as mushrooms and many other non-timber forest products. Mountains are also important as centers of crop industry. The maintenance and expansion of mountain populations in many parts of the world have been made possible by the introduction of potatoes and maize.

The economic relationships of mountain communities are also undergoing transformation. Even the most remote mountain community has always been linked to regional or global markets for essential commodities. Quite recently, the economies of most mountain societies have been connected to outside economies, which opened a door to the increase in accessibility owing to the construction of new road networks and the rapid expansion of air transport. The tourists from all over the world – the latest followers of a trend that began in the early nineteenth century with the discovery of the Swiss Alps by English travelers, are visiting these beautiful mountains due to these connections. In an increasingly urbanized world, the importance of mountain regions as global centers of tourism continues to grow. The reasons for travel are highly diverse. Yet, tourism is a fickle industry which depends on

the people. Many people will always want to visit mountains to test their physical endurance, escape from the pressures of everyday life, or visit sacred sites and places of inspiration, but the vagaries of tourism are as dynamic as the physical environment to which long-established mountain communities have learned to adapt. In a world increasingly influenced by global forces, highland people need to find new ways to survive and prosper. This is sustainable development, which is vital not only for mountain people, but to the billions living downstream linked through the global transportation network.

The global importance of mountains has only recently been widely recognized. The scientists in the world have been active in mountain regions for over two centuries and the decision made by these scientists was the inclusion which placed mountains on an equal footing with global problems like climate change, tropical deforestation, desertification and similar issues in the global debate on environment and development. Nowadays, the priceless beauty of the mountains such as untouched nature, rare flora and fauna, clean water, fresh air, fascinating fast rivers, are under threat. The natural beauties determinate mountain tourism and the more attractive and conserved is the environment, the more we have possibilities for mountain tourism [3].

2. THE IMPACT OF TOURISM IN MOUNTAIN ECOSYSTEMS

In the early stages of development, tourism has not had a significant impact on the environment of mountain areas. However, the expansive development of mountain tourism in the second half of the 20^{th} century, due to excessive development of the tourist destinations, had a negative impact on the landscape and the environment. Degradation of mountain tourism is caused by uncontrolled industrial development and urbanization. Tourism has a range of impacts on mountain ecosystems, communities and economies. While many of the impacts described below are negative, tourism can also generate positive impacts as it can serve as a supportive force for peace, foster pride in cultural traditions, help avoid urban relocation by creating local jobs, increase visitor awareness and appreciation of natural, cultural and historical values and assets.

Environmental impacts: Mountain landscapes are particularly fragile and susceptible to change and degradation. Landslides, avalanches, lava flows, earthquakes, torrents and rock falls can alter the landscape unexpectedly. Mountain ecosystems include a wide range of small and unique habitats, with flora and fauna that may have very short growing and reproductive seasons, and may be particularly sensitive to disturbance by human activity. Tourism activities often involve the development and intense use of tracks, paths and sports slopes by vehicles, non-motorized transport and pedestrian traffic. Visitor presence is also usually concentrated in small areas, contributing to increased noise and waste. The negative environmental effects of poorly managed tourism activities can include vegetation clearing and soil erosion, removal of scarce habitat, altering of critical landscapes and water flows, water and air pollution, and wildlife relocation or behavioral changes. The introduction of exotic and invasive species and diseases can also have a significant negative impact on local plant and animal species.

In the beginning, small number if tourists came to the mountain areas using old and available roads, existing infrastructure, individual objects for accommodation, the small areas of ski runs etc., did not affected significately on the changes in the environment. But later, with the development of industry and urbanization comes the range of negative environmental impacts. Scope and type of tourism impact on the environment depend on various factors [4]:

- the natural specificities and the capacity of the area in regard to the constructed capacities and infrastructure within the limits of that area;
- the type and degree of attractiveness of the tourist values;
- the number of visitors, the frequency of their travels and the length of their stay;
- the type of transport which the tourists and the excursionists use;
- the quality of the tourism managing within the limits of the particular area;
- the behaviour of tourists and visitors, that is, the level of their conception of need for the environmental protection;
- the dependence of local economy on tourism and the awareness of relation between the environmental quality and the economical sustainability of tourist development.

The mountain tourism most frequently attacks naturally most attractive areas, and because of the nature of activity, which participates in the satisfaction of tourist needs, it requires particular interventions in the nature, which are from the point of view of the environment protection often hard to accept or totally unacceptable. The tourism influences on the environment and ecological damages which can this activity produce, have multilayer and accumulative character, so it is necessary to determinate them during the whole cycle of the tourist travel: from the collection of information about possible tourist destinations, the choice of type and way of transport, going to the tourist destination, the stay in chosen area or areas, to the homecoming [5]. In the phase of journey to the tourist destination the different types of vehicles are used, which produce the series of ecological problems and risks – from the energy consumption for the vehicle driving, the air and soil pollution, the noise production, to the traffic jams, especially at the time of the most intensive tourist goings. The stay and activities, which tourists are practicing in the tourist destinations, generate a series of significant negative impacts on the environment. Negative impacts of mountain tourism on the environment, observed through the tourism connection to other branches, which act together and have stronger negative impacts, are numerous and diverse. They can be categorized in the following way:

- the occupation (often excessively and inadequately) and the land degradation;
- the degradation of landscapes and the attenuation of aesthetic environmental values;
- the air, water and soil pollution;
- the noise and vibration high production;
- the endangerment of biodiversity;
- the excessive energy consumption;
- the waste;
- the vandalism of tourists in the mountain areas;
- the climate changes.

Socio-cultural impacts: Mountain communities can also be very fragile to impacts and changes from tourism activities. The negative social impacts of poorly managed tourism can include disturbances from high levels and concentrations of visitor noise and activity, and reduced availability of resources such as firewood, fish and fresh water. In addition, exposure to and adoption of foreign traditions, lifestyle and products can pose a threat to the unique culture, traditions, knowledge and livelihoods of mountain populations, particularly in remote and indigenous communities.

Economic impacts: While tourism can provide significant local employment, if not properly managed, this employment can be short-term and seasonal, providing little skill-building or training to local people. Working conditions can be poor, and earnings can easily leak out of local economies to externally owned companies. However, well-managed tourism can play an important role in attracting income and supporting poverty alleviation. It can also improve infrastructure, provide community services and help diversify local economies. Employment and income can, in turn, improve the self-sufficiency and sustainability of mountain communities [1].

Even though the mountain tourism occupies and consumes the large areas of conserved nature, it can not be declared that mountain tourism has only negative impacts on the environment. Tourist courses represent the instrument of cultural and educational elevation based on ample and direct meeting with the objects and phenomenon in that space. That particularly includes conserved natural resources (national parks, parks of nature, landscapes of significant distinction, reservations and monuments of nature) which are propagated through different forms of tourist activities like complex and attractive tourist values. In that way, people are getting to know the significant natural values, but also learn about keeping, protection and improvement of the environment.

Tourist branch which makes the significant profit, not only because of the legal duty or the consciousness of tourist workers, but also because of the feedback effect – increasing number of tourists and the increase of tourism incomes, the part of that money serves for the protection and improvement of the environment in tourist destinations and further. For example, the organization of one particular tourist area often requires the afforestation, which improves the quality of that region. Also, the smaller artificial accumulations are made over the mountain riversto increase the quality of the tourist offer, which can have a positive effect on the water regulation, the erosion regime etc. [6].

Besides, mountain tourism is the specific branch that can use the elements of one particular area, that is, the natural characteristics of that area, which have for many other branches marginal significance or they are completely useless – the steep mountain slopes covered with snow are one of the essential conditions for the development of ski centres.

3. CONCLUSION

Mountains and highlands have always played an important role in the history of humankind. They are an important source of water, energy and biological diversity. Furthermore, they are a source of such key resources as minerals, forest and agricultural products, and of recreation.

As a major ecosystem representing the complex and interrelated ecology of our planet, mountain environment is essential to the survival of the global ecosystem. Yet, for the most part, it has been viewed as peripheral to the rest of the global ecosystem, with an associated paucity of attention to their sustainable development. The fragile natural resources of the mountains have been mined rather than managed for the benefit of the low-lying areas and the one-tenth of the population that derives its sustenance directly from mountains has tended to be among the world's poorest [3].

Because of intensive tourism development, in which a critical role plays the development of motor vehicle industry and the construction of roads, contribute to significant accession of mountain areas accessibility. Also, because of the winter sports popularity, man is putting huge pressure on the mountain areas. The consequence is that the differences between the nature and the environment in tourist's homecountry and in the tourist destinations are every day smaller because of landscape degradation and attenuation of their aesthetic values. Earth's natural heritage must be maintained for the benefits of the future generations. Our mission is to conserve Earth's living natural heritage, the global biodiversity, and to demonstrate that human societies are able to live harmoniously with nature.

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TOURISM DESTINATION MANAGEMENT

UPRAVLJANJE TURISTIČKOM DESTINACIJOM

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Abstract: *Organizations in the tourism sector, and above all tourism organizations and destination management organizations, as well as SMEs are not fully aware of their role in the creation and management of local supply, of their impact on the image of a tourism destination and the consumer experience. Furthermore, they are not aware that they are a part of the system,nor of the importancewhich their interactionshave in organizingthe supply (product), and then in determining destination competitiveness in the market. This paper examines the main actors in the process of tourism destination management, which is defined by the Law on Tourism and that recognizes tourism organizations as institutions in charge of the improvement and promotion of tourism.*
Keywords: *Tourism destination, destination management organizations, tourism organizations.*

Apstrakt: *Organizacije u oblasti turizma, a iznad svega Turističke organizacije i Destinacijske menadžment organizacije kao i mala i srednja preduzeća, nisu u potpunosti svesne svoje uloge u stvaranju i upravljanju lokalnom ponudom, svog uticaja na imidž turističke destinacije i na iskustvo potrošača. Šta više, one nisu svesne da su deo sistema, ni značaja koje njihove interakcije imaju u organizovanju ponude (proizvoda) a potom i u određivanju konkurentnosti destinacije na tržištu Ovaj rad razmatra glavne nosioce u procesu upravljanja turističkom destinacijom, koji je definisan Zakonom o turizmu i koji prepoznaje Turističke organizacije kao institucije za poslove unapređenja i promocije turizma.*
Ključne reči: *Turistička destinacija, organizacije za upravljanje destinacijom, Turističke organizacije*

1. INTRODUCTION

Tourism, as a social and economic phenomenon, is in the process of constant and intense changing. Directing large numbers of people towards tourist destinations has led to certain environmental, cultural and social consequences, which caused the need for reviewing the fundamentals of what is now understood by the term tourism.

Tourism is a service industry, which sells travel experience. It is comprised of numerous components providing a complete experience. An important part of the travel experience make those elements that economists often referred to as free public goods – naturallandscapes, sights and beauties (beaches, parks, access road or hiking trails). However, these services and goods cost the local community. This makes tourism a special service industry, since for it to function, not only the partnership between hosts and touristsis required, but it often depends on a symbiotic relationship between the public and private sectors.

The term *tourist destination* comes from Latin (*destinatio*) and is used to signify the determination, commitment, purpose and ultimate objective. More recent explanations of this term in English (from which it has been taken to all other languages) signify the destination as "a place to which one is journeying or to which something is sent, end of journey". The desire for tourist movement towards places (destinations) is in the quintessence of tourism, which due to their specific characteristics attract demand – tourists. Destinations attract attention,

because they stimulate and motivate the movement of tourists and represent areas in whichmost of the tourism products are being created. Accordingly, the greater part of the total tourism industry is located in destinations and most of positive and negative effects of tourism developmentis manifested in them.

Steady development of tourismin the previous two decades, both in terms of the demand and of the supply,haslaid the question of the destination management. As stated by Gunn(1988, p. 11):“tourism distributes markets to products (travel destinations) rather than the opposite. This difference means that the product areas, the places to which we travel, are more difficult to plan, design and manage”.

Given these elements, marketing and destination management represent key strategies for both mature and emerging destinations, in order to satisfy an ever-demanding consumer, ensuring sustainable development and positive impacts, and then gaining, holding or winning back a strong position on the global tourism market.

Understanding this approach and the opportunities it offers becomes a priority for public/private organizations and tourism suppliers at national, regional and local levels. However, in spite of the popularity that these concepts and instruments currently enjoy in academic circles, their diffusion, understanding and use among tourism operators is still low, relative to the benefits that they could provide to each individual enterprise and the destination as a whole.

Organizations in the field of tourism and, above all, tourism organizations and destination management organizations, as well as SMEs, are not completely aware of their role in the creation and management of local supply, of their influence on the destination image and the customers’ experience. Furthermore, there is limited consciousness on the fact that they are a part of the system, nor on the importance their interactions have in organizing the supply (product) and then determining the destination competitiveness on the market (Manente, Cerato, 2000). This paper contributes to the field, by considering main actors and main issues in the process of tourist destination management.

2. THE CONCEPT OF TOURIST DESTINATION

The approach to the topic of destination management and destination marketing requires, first of all,the definition of the concept of destination. According to Webster's dictionary, the term“destination”is used to signify“a place which is set for the end of a journey”, i.e. geographical area (a location, a resort, a region, a country, etc.), where the traveller intends to spend time away from home.

For economic and marketing sciences, a tourist destination is much more than a mere geographical place. It is an amalgamation of products, services, natural resources, artificial elements and information that is able to attract a number of visitors into a place (Leiper, 1995; Bieger, 1998). As stated in Keller (2000):“tourists perceive a destination or the service offered in the context of a destination, as a whole. The package of services is often impossible to separate from the geographical place. Destination and product are thus identical”.

The shift from the destination as a "tourist place" to the destination as a "tourism product" or, better yet, a system of products, depends on the perception ofthe directly and indirectly stakeholders involved. Actual and potential tourists, public administration, local private travel businesses, non-local travel businesses and the host community usually have diverging objectives and needs.

From the point of view of tourism demand, tourists can mature different ideas of the destination and of the benefits they can receive, according to their culture, system of values and socio-economic status. The assembling of different tourism components is made according to tourists' preferences, motivations and expectations (Gunn, 1988; Hu and Ritchie, 1993). Consequently, a tourist destination can be defined as a"collection of experiences gained by the traveller" (Gunn, 1972, p. 11). It can be seen as a packaging of products and services partly created by public and private operators.The core is not the single attraction in itself, but a combination of factors made through the tourist's consumption experience (Leiper, 1990).

The overall travel experience to a destination also involves the activity of many tourism businesses, public organizations, intermediaries, etc., and the development of actions and programmes directed towards specific functions.From the supply side, the destination can be defined according to two different perspectives:

- As a tourist place, i.e. the place where tourist activities have been developed and then tourist products are produced and consumed;
- As a tourist product and then as a specific supply involving a set of resources, activities and actors of a territory, as well as the local community.

All these issues seem to lead to the conclusion that destination is a fuzzy approach which cannot be defined *a priori* once and for all.This is why understanding tourism destination and then analysis, planning, management and control of destination development require a systematic and interdisciplinary approach.

Within this context, destination management also contains managerial/administrative and functional competencies (planning, organization and control of business activities), which should in principle be in the competence of the public sector. The main objective is to manage and support the integration of different resources, activities and stakeholders through appropriate policies and activities. Thus, a unique system of tourism products could be created that meet the needs of different categories of consumers and ensure sustainable growth by combining the achievement of private profits and overall economic development with safeguarding the identity and the quality of life of the local community (Manente and Cerato, 2000).

Destination, understood in this way, is, in this sense, an appropriate spatial level that provides the required new dimension of the supply and of the tourist product. Tourism destinations can vary from purpose-built places of rest in which all functions are focused towards tourism as the dominant activity,to cities and countries as a whole, where tourism is of lesser importance.

Concepts of tourism destination ranged from the destination signigying a tourist resort to the contemporary approach basedon a collaboration between a number of stakeholders (local population, economy, public sector, etc.), managing the tourist demand, and finally, the development of policies aimed at managing a tourism destination.

Concepts of tourism destination have changed from those restricted to the administrative boundaries to the concept based on the characteristics and actions of demand as the main determinants of the scope and structure of a tourism destination. Essential boundaries of a tourism destination are determined by the market, i.e. the requirements of tourism demand, to which the formation of the tourism destination product is being adapted. The specificity of changes in tourism demand requires adapting the behaviour of destinations towards mutual cooperation and partnership relations whenever it is in the common interest,i.e. in the interest of meeting the needs of tourism demand (examples of cross-border tourism cooperation between organizations from Serbia and Bulgaria, regarding Stara Planina).

3. ELEMENTS OF TOURISM DESTINATION

There is no common understanding on the structure of tourism destination, i.e. on the basic elements that make up a tourist destination. The starting point for such consideration should be the needs of tourists to be met in the destination and creation of an appropriate set of tangible and intangible components through which adequate fulfilment of the visitors' needs in the destination can be provided.
Having in mind the marketing approach to business operations in a tourist destination, it is considered that a tourist destination consists of the following elements: the basic attractiveness, of the built environment which provides a spatial identity, supporting services and atmosphere or ambiance, i.e. socio-cultural dimensions of destinations that are presented in more detail in the following table:

O. Bakić offered an approach to the classification of the elements of tourism destination, related to the application of the marketing concept:

- Attractiveness – impliesa mix of different elements of the natural attractiveness (climate, flora, fauna, geographic position, etc.) and social attractiveness (cultural and historical heritage, anthropogenic factors, such as folk dances, folk music, gastronomy, etc.),
- Accessibility –implies both geographic and economic distance. The former refers to the distance/proximity relative to the emissive market measured in kilometres or length of the trip, while the latter refers to the costs borne by the demand to reach the destination. Accessibility, in this case, also signifies the overall development of transport infrastructure between the emissive market and the destination, as well as the quality and quantity of traffic in the destination itself,
- Staying conditions – all the elements that make up tourism supply and are not included in the previously mentioned (a variety of services of accommodation, food, entertainment, amusement, recreation, etc.).

4. TOURISM DESTINATION MANAGEMENT ORGANIZATIONS

Tourism destination management organizations (DMO) –tourism organizations are responsible for the overall management (planning, organization, control and management/leadership of an area), and for taking actions to achieve the defined objectives. They represent the latest concept of organizational functioning of destination management and include stakeholders from the public and private sectors that operate on the model of partnership in terms of representation, as well as in terms of funding. The key advantages of a destination management organization observed in this way concern the credibility in the capacity of a strategic leader in marketing and development of tourism destination, as well as the ability to support a partnership with the economy and services and public sector agencies, for the purpose of cooperation with the aim of defining and achieving a collective vision of the destination.

The objectives of tourism destination management / DMO:

- Contribution to long-term prosperity and development of local communities (employment, income ...)
- Ensuring satisfactory visitor experience (ideally, the expectations of visitors are exceeded)
- Improving the profitability of the business sector (which is most often a driver of tourism economy in a destination)
- Optimizing the economic, social and environmental impacts by ensuring responsible and sustainable balance between the realization of economic, socio-cultural and natural effects.

Tourism organizations are those organizations that network various public and private interests for the benefit of strengthening and promotion of tourism of places, regions, countries,i.e. destinations.

Legal forms of tourism organizations should meet the following basic criteria:

- independence from political influence, particularly from short-term political decisions and way of thinking
- interconnection with key holders of supply and the public
- efficiency in decision-making – capable management
- maximally transparent financing structure
- merging into a common system of local, sub-regional, regional and national tourism organizations
- linking with associations (profit and non-profit)

The most common legal forms are:

- Tourism organization integrated into administration
- public-legal (para-state) organization – independent in the decision-making process within the defined budget
- private-legal organization (association, joint stock companies, foundations, companies)

Besides tourism destination management organizations (DMOs) – tourism organizations, there are also management companies in the tourist destination (Destination Management Company – DMC) or ground handlers. These companies are involved in providing local services to travellers on behalf of tourism companies, usually tour operators. They may cover the whole range of services – providing/booking accommodation, local tours, sightseeing, local representatives, and so on. Nonetheless, it is necessary to make a clear distinction between these organizations – DMOs and DMCs, as they have somewhat similar but essentially separate roles within the tourism system of a tourism destination.

5. TOURISM ORGANIZATIONS IN SERBIA

The position of tourism organizations in Serbia is defined by the Law on Tourism adopted in 2005. According to the provisions stipulated in the Law, tourism organizations carry out tasks of improving and promoting tourism. In addition, tourism organizations have the status of legal entities, operating in accordance with the provisions of civil service regulations and are inscribed into the appropriate Register, while in terms of rights, obligations and responsibilities of the employed in tourism organizations, the regulations governing employment relations in public bodies are applied. According to the provisions of this Law, Serbia has: the National Tourism Organization (TOS), territorial tourism organizations and tourism organizations of local self-governments.

Tourism Organization of Serbia (TOS) carries out tasks of improvement and promotion of tourism and coordination of activities of tourism organizations, economic and other entities in tourism on the territory of the Republic of Serbia. The TOS's operating funds are provided from the Budget of the Republic of Serbia,from revenue generated by carrying out the tasks within the scope of its activities, from donations, contributions and sponsorships of domestic and foreign legal and physical entities and other sources in accordance with the Law.

Territorial tourism organizations are tourism organizations of autonomous provinces and regions. Tourism organization of an autonomous province and tourism organization of a region adopts annual plans and programs of promotional activities in line with the Tourism Promotion Strategy and plans and programs of TOS.

For the territory of a local self-government, the competent authority may establish a Tourism Organization of the municipality, i.e.the city, or entrust carrying out of such tasks to another legal entity. Tourism Organization of a local self-government carries out the tasks of:

- advancement and promotion of tourism of local self-government,
- coordinating activities and cooperation between economic and other entities in tourism, which directly and indirectly act on improvement and promotion of tourism,
- provides information and promotional material to promote tourism values of the local self-government (printed publications, audio and video promotional materials, websites, souvenirs, etc.) and, in cooperation with the competent authorities,provides placing tourist signs for tourist places,
- establishes tourist information centres (for reception of tourists, providing free information to tourists, collectingdata for providing information to tourists, introduces

tourists to the quality of tourism supply, introduces the competent authorities with complaints of tourists,etc.).

Tourism organizations, with the approval of their founders, for the purpose of planning, coordination and management of tourism activities can, with businesses and other legal entities and entrepreneurs who carry out activities in the field of transport, tourism, hospitality industry, trade in goods and services, culture, sports, information, conference and fair activities, establish a non-profit organization for operational, marketing and promotional activities. The scope of work and modes of financing, as well as mutual rights and obligations of the founders of a non-profit organization, are regulated by a contract.

There are plans to provide for the establishment of tourism destination management organizations through amendments to the Law on Tourism, i.e. that authorities of the autonomous provinces and local self-governments may, in accordance with the strategy and the strategic plan of tourism destination,establish together with companies, businesses and organizations companies for promotion and tourism development of a tourism destination.

6. CONCLUSIONS

An effective functioning of tourism destination is faced with overlapping of stakeholders from the public and private sectors. For it to function properly, it is necessary to first identify a complex range of public and private stakeholders, their roles and responsibilities. Secondly, projects through which competing interests can be brought together should be developed. Public and private stakeholders have different responsibilities and have different costs/benefits from the "use" of a destination. Each product of a destination combines the produced goods and services with the local natural and cultural resources that represent the reason why tourists choose the given destination instead of a competing one. Safeguarding these common goods/attractions is vital for tourism activities, but the costs caused by the application of safeguard measures, in principle, are paid by tourists and local community (e.g. through fees for use, etc.), while private entrepreneurs who have the greatest economic benefit pay only a small amount. In line with this, the public sector plays a crucial role in ensuring the optimal use of public tourism resources/services and in equitable sharing of costs and benefits among all stakeholders involved. This is important for preservation of the local environment, the quality of life of local population, the quality of tourist visits and the identity of a destination in general. Furthermore, the public sector must create conditions to overcome all constraints – cultural, legal and economic – forcooperation and creating a network of stakeholders.

The private sector, on the other hand, should contribute to safeguarding and development of a destination and, through amalgamating the demand and supply, enable that the tourist product be available in the market.

It is important to coordinate and plan joint projects around which to bring together competing interests. Nowadays, a consensus of public and private workers should be reached on the strategies of market development, destination product development, branding, promotion and distribution of products.

Creation and development of a tourist destination requires a minimum degree of cooperation between local actors, who should share common objectives regarding the growth and development of the destination. Conclusion of agreements on cooperation, even in a competitive environment, is extremely important for efficient (lower costs, increased price difference), and effective operations on the market.

The key question is: who is acting as a connecting factor in a tourist destination. Traditional public tourism organizations at the local level in many cases are not able to implement a strong coordinating action and suffer the consequences of the conflict between political objectives and market necessities. Establishing destination management organisations (DMOs), "effectively funded and with given freedom for professional operations may be the key solution to the problem".

Public organizations will be invited to intensify their coordination role at the local level. As stated in Keller (2000), "Without state support, there would be no truly efficient destination organizations. No one would have assumed a difficult task of establishing and protecting tourism brands". A public branding and product management policy contributes to reducing transaction costs and improving collaboration.

In this context, the partnership of public and private sectors and direct involvement of local communities in the process of planning and management of a destination will be the most important success factors for sustainable development.

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RECONCILIATION FINANCE WITH NATURE EVIDENCE FROM AQUAFIL GROUP[17] [18]

POMIRENJA FINANSIJA I PRIRODE ISKUSTVA GRUPACIJE AQUAFIL

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Abstract: *All investment decisions should be analysed also from the aspect of their impact on the environment. Sustainable economic growth is achievable if investment decisions take into account the effect of investment projects on the environment. This paper will provide insights into three major activities regarding sustainability activities in Aquafil Group: The development of Econyl, adoption of Life Cycle Assessment methodology and development of Environmental product declaration. All these activities have been connected to major financial decisions and investment activities. The measurable results have played an important role in keeping market position of the Group and determining its future.*
Keywords: *financial managment, investment policy, sustainable development, Environmental Management Accounting (EMA), Life Cycle Assessment (LCA), Environmental product declaration (EPD), Aquafil.*

Apstrakt: *Sve investicione odluke treba da budu analizirane i sa aspekta njihovog uticaja na životnu sredinu. Održiv ekonomski rast je ostvariv ukoliko se prilikom donošenja investicionih odluka uzimaju u obzir i efekat investicionih projekata na životnu sredinu. Ovaj rad će pružiti uvid u tri glavne aktivnosti usmerene na realizaciju koncepta održivog razvoja u grupaciji Aquafil: razvoj Econyl-a, usvajanje metodologije vrednovanja životnog ciklusa proizvoda (LCA), i razvoja deklaracije o ekološkim karakteristikama proizvoda (EPD). Sve ove aktivnosti su povezane sa najvažnijim investicionim aktivnostima. Merljivi rezultati ovh aktivnosti odigrali su važnu ulogu u održavanju tržišne pozicije Grupacije kao i u determinisanju njene budućnosti.*
Ključne reči: *finansisjki menadžment, investiciona politika, održiv razvoj, upravljačko računovodstvo životne sredine, vrednovanje životnog ciklusa proizvoda, deklaracija o ekološkim karakteristikama proizvoda, Aquafil.*

1. INTRODUCTION

For evaluation of investment opportunities cooperatives usually use the following tools:

- Payback Period
- Internal Rate of Return
- Net Present Value

Payback period is the simplest method of evaluating an investment. It measures the length of time an investment takes to pay off by dividing the cost of the investment by the annual cash flows generated by the investment. A major weakness of these methode is that it does not consider the cash flow beyond the payback period.

The internal rate of return looks at the cash flows over the life of the project. Companies invest in opportunities with rates of return higher than the interest rate paid on capital plus a

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premium for risk. Projected internal rate of return is the most commonly used method of evaluating investments because it is still relatively easy to calculate and, moreover, provides information about the long-term viability of the investment. Another benefit of the internal rate of return is that it considers the interest expense of the investment. (Kenkel et all.)

One of the most basic principles of finance is that we can make decisions by discounting future cash flows at some interest rate to arrive at present values, and by comparing these values. The net present value rule (NPV) in capital budgeting is the most obvious application of this principle, but finance theory analyzes dividend policy, capital structure, and working capital management in the same fashion. (Robinson, 185)

As Robinson observes, almost all research in finance implicitly assumes that Nature is irrelevant or does not exist. (Robinson, 185) However, in many companies today a prevailing view is that environmental considerations have to be integrated into a number of different types of decisions made by business. The above is the result not only of increased awareness of the need to preserve the environment, but rather the result of awareness that socially irresponsible behavior may result in a lower market value of shares, difficult or impossible access to funding sources (primarily various funds), reduced sales and negative repercussions on the profitability. It is therefore necessary to take into account the aspect of environmental protection when making investment and financial decisions.

Different systems have been developed, as Life Cycle Assessment (LCA), Strategic Environmental Assessment (SEA), Environmental Impact, Assessment (EIA), Environmental Risk Assessment (ERA), Cost-Benefit Analysis (CBA), Material Flow Analysis (MFA) and Ecological Footprint. (Finnveden et all, p.1) Robinson notes that Life Cycle Assessment (LCA) is the most frequently applied method, and then Total Cost Accounting, and "rubber tree accounting". (Robinson, 186)

A basic description is: start with an LCA and put a monetary figure on every impact. From an economist's point of view, TCA puts a price on externalities. (Ibidem) Life Cycle Assessment is a tool to assess the potential environmental impacts and resources used throughout a product's life cycle, i.e., from raw material acquisition, via production and use phases, to waste management (ISO, 2006a). The methodological development in LCA has been strong, and LCA is broadly applied in practice. A major distinguishing feature of LCA is that it does not use monetary measures.

Socially responsible behavior is still hard to imagine today without the establishment of Environmental Product Declarations (EPDs). Environmental product declarations (EPDs), is a way to report the environmental performance of products. There are international efforts on standardisation of EPDs. In this context, efforts for the establishment of the product oriented eco-efficiency indicators should be considered. "Eco-efficiency measures give indications both on economic and on environmental performance."(Magerholm Fet, 232) Beside eco-efficiency indicators for production sites, eco-efficiency indicators for product chains have been developed as well.

The eco-efficiency can be calculated using the following formula (1): eco-efficiency=product or service value per environmental influence. To evaluate the eco-efficiency of a product, information concerning its entire life cycle is required to allow an evaluation of its environmental and economic performance. (Magerholm Fet, 233) For a production site the value can be yearly production volume, total sale or turnover. The environmental influence can be the environmental impact within one aspect, or an aggregated value, which requires weighting between the aspects. So far measures of eco-efficiency have mainly focused on specific production sites. (Magerholm Fet, 233) The performance can be measured/calculated by economic performance indicators and environmental performance indicators (EPIs). Equation (1) can be transformed to: Eco efficiency indicator = economic performance indicator/environmental perfomance indicator (Magerholm Fet, 234)

Eco-design strategies are a specific way of reconciliating investment decision with nature, the importance of which has been increasing with time. Eco-design strategies are generally targeted at reducing the depletion of primary resources and/or other types of environmental impact. Depending on the type of product or service and its environmental bottlenecks, some eco-design strategies may be more suitable than others (Cerdan et all, 1638). Eco-design strategies can be broadly categorized in the following eight groups, according to their main goal: (1) reduction of the number of different materials and selection of the most appropriate ones; (2) reduction of environmental impact in the production phase; (3) optimization of the distribution phase; (4) reduction of environmental impact in the use phase; (5) extension of the product's useful life span; (6) simplification of product disassembly (design for disassembly); (7) design for reuse; (8) design for recycling. (Cerdan et all, 1638)

It is clear that the implementation of LCA, eco-efficiency indicators, as well as implementation of the eco-design strategies imply the encompassing and presenting the cost of sustainable development. In earlier papers, the researchers talk about "Total Cost Accounting" and "Rubber Tree Accounting". TCA means *the integration of all costs, internal and external, resulting from an entity's activities, operations, products and/or services. From an environmental perspective, full cost accounting is the integration of all internal environmental and other costs of a specified entity with information about the external costs (net of any benefits) relating to the impacts of the entity's activities, products and/or services on the environment* (Willis, A. (1997). *Counting the costs.* CA Magazine, 130(3), 49. According: Robinson, 189).

However, a special accounting has been developed in recent years – the Social and Environmental Accounting (SEA), which includes environmental financial accounting and environmental management accounting (EMA). EMA can be defined as the identification, collection, estimation, analysis, internal reporting, and use of materials and energy flow information, environmental cost information, and other cost information for both conventional and environmental decision-making within an organization. Recognizing the increasing importance of the sustainability aspect of business, the Professional Accountants in Business (PAIB) Committee of the International Federation of Accountants (IFAC) considered a plan to increase awareness amongst PAIBs on the subject of sustainability. In 2006, they have published two information papers, namely "Sustainability—the Role of the Professional

Accountant in Business" and "Professional Accountants in Business—At the Heart of Sustainability?"

2. THE AQUAFIL GROUP

The Aquafil Group is an Italian corporation founded in 1969. The company has specialised in the polymerization process of the polyamide 6, operating in three different sectors. The BCF business unit specialises in the production of yarn for carpet flooring. The NTF business unit produces yarns for the clothing industry. The EP business unit specialises in technical polymers for the production of plastic objects. A fourth business unit, Energy and Recycling (E&R), promotes the culture of sustainability, the use of renewable energy sources and the production of regenerated products. Over the years, the implementation of the strategy aimed at growth, diversification and internationalization has taken the Group to a leadership position. In the carpeting yarns sector (BCF business unit), the Group is undisputably a European leader and ranks as number two world-wide. The raw material traditionally used for the production of polyamide 6 polymers is Caprolactam.

Aquafil Group is present on three continents (Europe, Asia and North America) in seven countries (Italy, Germany, Slovenia, Croatia, USA, Thailand and China) with 13 production facilities and one engineering company based in Berlin. The Aquafil Group employs more than 2,000 people world-wide. Despite this complex macro-economic background and world crisis, turnover grew by 28% between 2009 and 2010 and in the period 2010 to 2011 it increased by another 14.6% to € 495.3 million.

3. THE SUSTAINABILITY RESULTS IN AQUAFIL GROUP

Since 2007, Aquafil has adopted the sustainability as a part of business policy. Aquafil has a medium term objective to reduce the atmospheric emissions of the greenhouse gas CO_2 per product unit by 50% by the year 2020 in form of ECOPledge. Aquafil`s strategy is based on:

- the efforts to develop activities in the direction of *closed-loop* products (based on LCA) and
- the efforts to constantly reduce the ecological footprint.

The annual Sustainability Report is an essential part of policy of informing the stakeholders. Sustainability is judged in terms of the three Ps: *Profit, Planet and People;* in other words, sustainability in terms of business earnings, environmental protection and social responsibility. Thirty-two projects for the period 2011-2012 were launched with the specific objective of improving the sustainability of the Aquafil Group. General projects (e.g. reduction of waste disposal in all facilities) and specific projects (e.g. substitution of light bulbs in a specific facility). In 2011, the Aquafil Group invested € 2.3 million in energy, the environment and safety.

Overall, the progress in the Group's performance regarding sustainability, in the observed period from 2007 to 2011 has been very positive. If we look at the balance sheet results for the 2011 period some changes could be seen. In particular, a highly focussed strategy for reducing energy and water consumption, for improving the processing of the waste produced and

reducing emissions has made it possible for the Aquafil Group to make substantial savings which have helped it to become financially sustainable:

- Overall, there was a 6% decrease in the consumption of energy resources (electricity, purchased steam and natural gas) despite the fact that the number of production facilities increased from nine to thirteen;
- Gaseous emissions were kept under close control and were reduced by 21%;
- The amount of recycled waste increased by over 30%. Waste disposed of using traditional methods was reduced overall by 5%. It should be noted that in 2010, before the substantial expansion of production structures, non-recycled waste had already been reduced by over 35%;
- Waste water was reduced by 15%.

In particular: direct emissions have declined by 15%, indirect emissions by 35% and total emissions by 29%.

Table 1: Consolidated Environmental Balance Sheet 2007-2011

		UdM	2007.	2008.	2009.	2010.	2011.	11/07
IN	Basic materials	ton / ton	0,921	0,932	0,928	0,923	0,929	1%
	Auxiliary materials	ton / ton	0,076	0,068	0,067	0,075	0,077	1%
	Electricity purchased	kwh / ton	1.860	1.809	1.740	2	1.885	1%
	Steam purchased	kwh / ton	709,6	674,2	662,5	590,1	640,2	-10%
	Natural gas purchased	kwh / ton	2.144	2.154	2.126	1.919	1.896	-12%
	Water including condensate from steam	m3 / ton	46,61	45,91	40,9	37,17	39,38	-16%
	Packaging raw materials	ton / ton	0,011	0,017	0,007	0,015	0,013	22%
	Packaging for purchased finished product	ton / ton	0,11	0,11	0,1	0,11	0,12	7%
		UdM	**2007.**	**2008.**	**2009.**	**2010.**	**2011.**	**11/07**
OUT	Packaging for finished products received	ton / ton	0,085	0,085	0,077	0,085	0,095	12%
	Waste disposed of traditionally	kg / ton	47,1	53,7	50,3	52,2	63,9	36%
	Zbrinuti otpad	kg / ton	13	9	7	8	12	-5%
	Emissions	gr / ton	574	581,3	486,1	467,7	456,2	-21%
	Greenhouse gases (direct)	ton / ton	440	426	423	382	372	-15%
	Greenhouse gases (indirect)	ton / ton	1.107	1.121	1.076	681	720	-35%
	COD (Chemical Oxygen Demand)	kg / ton	2,8	2,6	2,4	2,2	3,7	33%
	Waste water	m3 / ton	39,5	39,4	35,1	31,9	34	-14%

Source: Sustainability Report 2011 – Aquafil Spa; http://www.aquafil.com/

Three major moments should be emhasised in Aquafil`s activities reagrding sustainability: **The development of Econyl, adoption of *Life Cycle Assessment* methodology-LCA** and **development of *Environmental product declaration*-EPD**.

The Aquafil Group collects non-hazardous pre- and post-consumer waste containing polyamide 6 from sources world-wide. This has created a new flow of material to feed the regeneration plant which produces Econyl® 100% regenerated Nylon 6. The waste has thus become a new raw material for use in the production activities of the Aquafil Group. This radically changes the traditional production cycle based on the need to purchase fossil-based

raw material (Caprolactam). Since May 2011, approximately 10% of the polymers produced are regenerated, i.e. produced from regenerated raw material.

With LCA, companies gain a better grasp of exactly how beneficial each process is to the environment, while capturing the cost savings of greener efforts. There are four reasons why a company should applye the LCA methodology:

- to obtain an environmental comparison with a scientific basis between different company products;
- to identify interest areas, for example greenhouse effect contribution; to simulate the effects of changes on processes (R&D fields);
- to simplify the alignment of own processes to changes in product specifications or in legislation (Design);
- To generate detailed and reliable information on processes also with the scope to support some ecological labeling actions (Communication).

An EPD is a standardized (ISO 14025/TR) and LCA-based tool to communicate the environmental performance of a product or system, and it is applicable worldwide for all interested companies and organizations. An EPD declaration includes information about the environmental impacts associated with a product or service, such as raw material acquisition, energy use and efficiency, content of materials and chemical substances, emissions to air, soil and water and waste generation. It also includes product and company information.

Table 2: Total potential environmental impacts and Gross Energy Requirement for 1 kg Econyl® FDY Raw White and of 1 kg Econyl® Textured yarn Raw White (rounded data)

IMPACT CATEGORIES		UPSTREAM PROCESSES		CORE PROCESSES		DOWSTREAM PROCESSES		**TOTAL**	
		FDY	TXT	FDY	TXT	FDY	TXT	**FDY**	**TXT**
Global Warming Potential (GWP) from fossil fuels	g CO2 eq	1.012	1.053	5.711	5.575	708	708	**7.431**	**7.336**
Global Warming Potential (GWP) from bio3	g CO2 equiv. 4	9	15	351	638	0	0	**360**	**653**
Ozone Depletion Potential	g CFC-11 eq	0	0	0	0	0	0	**0**	**0**
Acidification Potentials	g SO2 eq	7	7	26	23	0	0	**33**	**30**
Photochemical Ozone Creation P.	g C2H4	1	1	2	2	0	0	**3**	**3**
Eutrophication Potentials	g PO4--- eq	3	2	2	3	0	0	**5**	**5**
Gross Energy Requirement	kWh							**174**	**170**

Source: according to: EPD for Aquafil Econyl –Rev. 0, July 1st 2011- http://www.aquafil.com/

4. CONCLUSION

Aquafil has given high importance to the concept of sustainable development. The company has implemented Life Cycle Assessment system, established Environmental Product Declaration and published Sustainability Report. The concept of sustainability is implemented in the vision of the company's development. That was realized taking into consideration the effect which investment projects have on nature. The main assumption for implementing this concept is monitoring costs and benefits connected with *Corporate social responsibility* (*CSR*) activities. The positive effects of implementation mentioned concepts have influence on company's profitability what was undoubtedly presented in this paper.

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EVOLUTION OF THE INSTRUMENT: PHYSICAL UNITS INPUT/OUTPUT TO THE MANAGEMENT OF NATURAL RESOURCES

EVOLUCIJA INSTRUMENTA: INPUT/AUTPUT FIZIČKIH JEDINICA U MENADŽMENTU PRIRODNIH RESURSA

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Abstract: *The lifestyle of the industrialized modern civilization, every day requires the transformation of a huge amount of material(WRI 2000). Natural resources are transformed in industrial goods and services, but at the end of the cycle returns to the environment after use in an altered form, as waste and emissions(Nebbia 1990). The society degradation and the physical resource scarcity, have made the society aware of the complexity of natural resources and of social systems, and the circular interdependencies that exist between the systems(Alier 2010). The economic system seen as a subset of the environmental system, is studied by applying the balance of matter, by calculating the physical flows of matter and energy. For the calculation of these flows were born a number of tools. This study considered the innovative instrument : the Physical Input - Output Tables (PIOTs). The following work will expose the concepts PIOTs basis of, their history, the differences between MIOTs (monetary Input - Output table) and PIOTs, and make examples of application. Finally we report the strengths and limitations, and perspectives needed to make the PIOTs interesting and convenient tool for evaluating environmental and economic policies.*
Keywords: *input-output, PIOTs, material flow, environmental accounting, management natural resources.*

Apstrakt: *Životni stil industrijalizovanih modernih civilizacija svaki dan zahteva transformaciju ogromne količine materijala (WRI 2000). Prirodni resursi se transformišu u industrijsku robu i usluge, ali na kraju ciklusa vraćaju se u prirodu nakon upotrebe u izmenjenom obliku kao otpad ili emisije (Nebbia 1990). Degradacija društva i fizička ograničenost resursa je učinila da društvo postane svesno složenosti prirodnih resursa i društvenog sistema i cikličnih međuzavisnosti koje postoje među njima (Alier 2010). Ekonomski sistem posmatran kao podset ekološkog sistema, je razmatran primenom stanja materije, proračunom fizičkog toka materije i energije. Razvijena su mnoga oruđa za proračunavanje ovih tokova. Ovaj rad razmatra inovativne instrumente: tabele fizičkog inputa-autputa (PIOT). Rad će prikazati koncept PIOT-a, istoriju, razlike između MIOT-a (tabela monetarnog inputa – autputa) i PIOT- a i primere korišćenja. Konačno, ukazano je na prednosti i ograničenja, kao i na perspektive koje PIOT čine interesantnim i pogodnim oruđem za evaluaciju ekoloških i ekonomskih politika.*
Ključne reči: *input-autput, PIOT, tok materijala, ekološko računovodstvo, menadžment prirodnih resursa*.

1. INTRODUCTION

The industrial system transforms natural resources into products and services, and at the end of its use these return to the environment in an altered form. It is Known that human activities (the withdrawal of natural resources, waste disposal, changing the landscape) interfere with the ability of the planet to support life, because resources are limited and non-renewable sources are used so fast as not to allow their regeneration (WRI 2000). To address the issue of scarcity of natural resources (and environmental), it is necessary to analyze the production cycles equating to the cycles of nature, that is to start thinking by "systems". The dualistic concept, economy environment is outdated (Kapp 1991). The economic system is inserted in the social system which in turn is placed in the natural environment, everything is a

complex system in which interactions are generated, the exchange of matter, energy and information. How can you protect the natural capital? Decoupling economic growth from physical growth industry (Alier, 2010), thereby effecting a dematerialization of the economy. This is a message sent by various international organizations such as the European Commission (2003) and OECD (2004)). It should be noted that the objective of reducing the use of natural resources is necessary but not sufficient to ensure sustainability, the question is: exactly what and where to reduce exactly. It is necessary to identify environmental indicators, which may allow a' government agency to apply a proper environmental policy and a 'Company to calculate its efficiency in the management of natural capital (ISTAT 2009). The choices of consumers, corporate planners, government of men, depend on market mechanisms, but it provides only partial information, the prices of certain resources do not reflect the total costs determined by their use and some resources do not have a price associated to their exploitation, and then there are the problems associated with public goods, they are all "hidden costs", or externalities, these are a source of market failure, and sometimes government intervention through regulation leads to subsequent failures. The only indicator GDP (gross domestic product) cannot be considered an indicator of wealth, does not consider the natural capital as a factor of production (Hawken, Lovins & Lovinzs 1999). It is concluded that change is necessary from traditional accounts, based on an analysis of financial and economic indicators , to a complete accounting that takes into account the flows of matter, in order to obtain an information tool that ensures the control of the environment variable and leads the development of environmental indicators and indices (Giljum et al. 2009) (Suh, Kagaua 2009). For the development of parallel accounts in physical units, in recent years a number of tools were born. In this paper we analyze the tool called PIOTs, tables input / output in physical units, we will see the differences between these tables in physical units and traditional tables in monetary units, and will present a special application of this tool.

2. MATERIALS AND METHODS

Basis and History

Over the years there have been a number of approaches to accounting which takes into account the flows of matter, starting from the middle of the eighteenth century (1694-1774) Francois Quesnay, in his Tableau économique described the movement of goods, with a model based on 'analogy with the blood system in humans (Quesnay 1756-1758). In 1906 W. Leontief, based on patterns of accumulation of enlarged Marx, drawn from the theories of Quesnay and the Physiocrats, developed the analytical forms of accounts, which later became the elements of modern input-output analysis in monetary units. (Leontief 1970, Leontief et al. 1977). Ayres in 1969 introduced the principle of matter-energy balance, quantifying the amount of waste and seeks to develop a "matrix of waste" (Ayres and Knesse 1969). In 1971 the statesman Nicholas Georgescu-Roegen published his essays on the bio-economic theory. The theory was incompatible with neoclassical economics by proposing new methods of study of production processes and consumer choices, systems derived from observation of nature and its laws, the study of natural cycles and the times in which they do . (Georgescu - Roegen 2003) Considering the laws of thermodynamics came to a very simplified model of the global circulation of flows between the environment and

the economic process (Figure1). The model shows that no economic system can continue to exist unless it receives energy and matter from the outside, even if we could recycle all the waste, an amount of matter has now been lost, and this prevents the stock of natural capital to remain constant . The methodology for the analysis of material flows (MFA), was born from the concept, the subject matter is transformed continuously from low entropy to high entropy matter and the process is irreversible (Ayres and Ayres 1999). Bat, the accounts obtained with the MFA instrument, do not provide information on physical flows of the economy, particularly on inter-industrial relationships, do not separate input of materials used in production processes than those delivered directly to final demand, ultimately refers to a level of analysis that could be called "macro" (IRPET 2009). Other instruments, such as PIOTs, I/O tables in physical units, refer to a "micro" level, they are able to fill gaps MFA system, and provide information about: those who transform materials, who uses them and how many resources are used in total (ISTAT 2009) (Giljum et al., 2009).

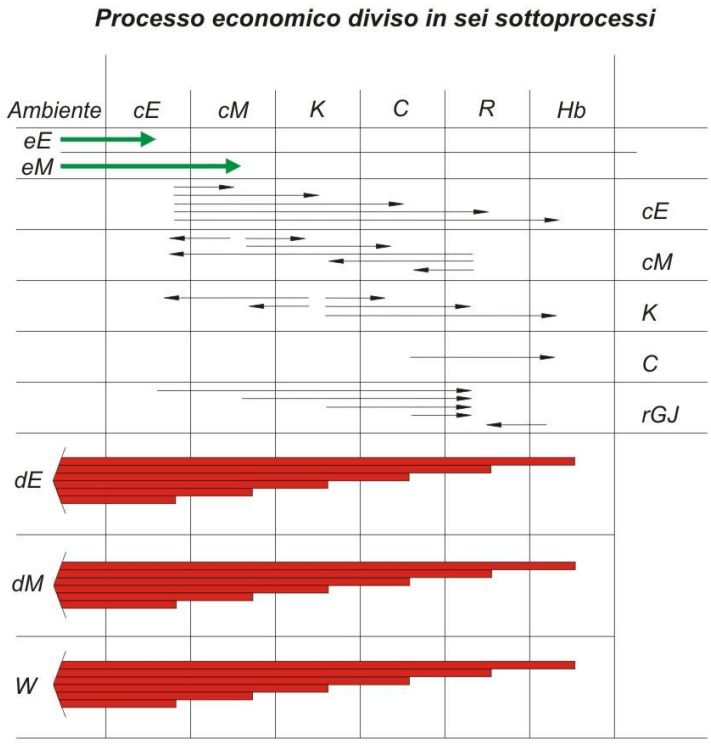

Figure 1 Diagram of the global circulation of the flows Between the environment, and it is Divided into six sub-economic process, into the primary flows, output flows end of the process. (Source: Georgescu-Roegen 1971).

Legend figure 1

INFLOW	OUTFLOW
eE = energy eM = material	dE = energy dissipated dM = material dissipated W = waste rGJ = material for reuse

Model I/O Leontief

The instrument PIOTs based on I/O model created by W. Leontief(Leontief 1936). The method is based on the use of a huge number of data and statistics. This method consists in dividing an economic system into sectors and bringing out what each sector takes from the other (input and the output that it provides). Leontief builds a two-way table (a matrix) that summarizes all economic transactions, goods and services circulating in the system in a certain period, at a given time and to a certain degree of technological development.

Matrix (*m* x *n*), where each column *n* represents the production of each sector of the economy, the line *m* instead analyzes how the result of the productive activity sector is divided between intermediate uses and final consumption. The total of each row represents the demand of each economic sector.

Hypothesis

1) **perfectly competitive market, economic balance between supply and demand:**

$$X^m + J^m = \sum_n K^{mn} + Y^m \qquad \forall m \tag{1}$$

2**) linear technology, the amount of input used in any productive activity is proportional to the volume dell'autput** X^n**:**

$$a^{mn} = \frac{K^{mn}}{X^n} \qquad \Rightarrow \qquad K^{mn} = a^{mn} X^n \tag{2}$$

X: vector of total production
J: vector of imports
Y: vector of final demand
AX: intermediate inputs required
X : vettore della produzione totale
J : vettore delle importazioni
Y : vettore della domanda finale
AX: input intermedi necessari

X^m : total field *m*

j^m : sector imports *m*

$\sum_n K^{mn}$: intermediate production demand sector *m*

Y^m : value of final demand in the sector *m*

a^{mn} : technical coefficient, the value of the product *m* inputs needed to produce one unit of output value of the *n* field.

$$X^m + J^m = \sum_n K^{mn} + Y^m \tag{3}$$

$$K^{mn} = a^{mn} X^n \tag{4}$$

$$X^m + J^m = \sum_n a^{mn} X^n + Y^m \qquad \forall m \tag{5}$$

In terms of vector:

$$\mathbf{X + J = AX + Y} \tag{6}$$

$$\mathbf{X - AX = Y - J} \tag{7}$$

$$\mathbf{X(I-A) = Y - J} \tag{8}$$

$$\mathbf{X = \left(I - A \right)^{-1} \left(Y - J \right)} \tag{9}$$

I = identity matrix

$\left(\mathbf{I - A} \right)^{-1}$ = Leontief inverse matrix, by summing the values for columns obtain the increase of production caused by a unit increase in final demand for the economic sector of the column holder.

The input-output analysis was created by inserting the economic data into matrices, instead, for the construction of PIOTs you enter data in tones because it accounts the material. In the matrix plus in input the resources of air, water, soil, and output of air pollutants, gases blamed for global warming and waste.

Differences between MIOT and PIOT

The PIOT so completely capture the flows of matter, using data from a PIOT avoids a series of errors of judgment. For example, if one considers the sector of services, flows of matter are not very high, implying environmental pressures rather low, but if we express services in monetary terms and use of tables of monetary accounts(MIOT) these do not provide the same information and could be a quantity of environmental pressures greater than necessary. In MIOT logic can be represented only products that have an environmental cost, a monetary value, that are generated in an economic area, while in a PIOT products are brought in from the outside economic system natural system (Giljum, S., Hubacek, K., 2004,2009). The extension of the PIOT respect to MIOT, is the inclusion of the 'environment as a source of raw material on the input side and residues on the output side (for residues is meant: solid waste, liquid waste and emissions into the air) (Strassert, G., 2000).

The PIOTs and MIOTs are built differently, because aggregations of sectors are not homogeneous (WRI 1997) prices vary depending on changes in consumption, the basic identity of the monetary values and physical conditions in each sector are different (Konijn, P.J.A., De Boer, S.,Van Dalen, J.,1995), this makes it impossible to have a simple correlation between MIOT and PIOT. A PIOT is not a conversion unit of MIOT, it cannot be obtained by multiplying the MIOT with a vector prices /tons of feed material for each cell. If we consider the data of Stamer(2000) for MIOT and PIOT reported the situation of Germany in 1990, the

numerical difference between the three primary, secondary and tertiary sectors is impressive and the economy is due to the inclusion in the system environment (figure No.2 and figure No.3).

The financial statements used for the construction of the tables I / O in monetary units and in physical units are different, the balance used for the construction of a MIOT is as follows:

TOTAL OUTPUT = TOTAL INPUT OF GOODS AND SERVICES + ADDED VALUE

The identity that applies to the PIOT is:

TOTAL OUTPUT = INPUT OF RAW MATERIAL + TOTAL INPUT OF GOODS AND SERVICES - WASTE AND EMISSIONS

In MIOT logic only environmental products that have cost can be represented and monetary value. The extension of the PIOT respect to MIOT is the inclusion of the 'environment as a source of raw material on the input side and residues on the output side (for residues is meant: solid waste, liquid waste and emissions into the air).

Table 1. Monetary accounts in million DM of Germany, 1990. (Giljum at al. 2004).

MIOT	PRIMARY SECTOR	SECONDARY SECTOR	TERTIARY SECTOR	FINAL DEMAND
PRIMARY SECTOR	40	89	80	12
SECONDARY SECTOR	33	654	427	1055
TERTIARY SECTOR	28	363	2327	334

Table 2. Material accounts in million Tons of Germany, 1990.(Giljum at al. 2004).

PIOT	PRIMARY SECTOR	SECONDARY SECTOR	TERTIARY SECTOR	FINAL DEMAND
PRIMARY SECTOR	2248	1442	336	84
SECONDARY SECTOR	27	1045	206	708
TERTIARY SECTOR	5	69	51	36

To provide some examples of PIOT, is the table prepared for the 'Italian by Prof. Nebbia accounting in 2000 (Nebbia 2003) figure N.4. The boxes of the first four lines (1,2,3,4) contain masses of air, water, soil and natural stocks used as input in the various sectors of economic activity, while the data of the boxes of the first four columns (1,2,3,4) indicate

the masses of the same components of the biosphere that come from the output of the various human activities and return to nature.

		Air	Water	Soil	Natural Stocks	Agriculture	Livestock	Energy, Water	Metallic ores and metals	Non metallic mineral and products	Chemical products	Metal products	Machinery	Transport equipments	Food, beverages	Textiles, Leather products	Paper Woods products	Rubber and plastics	Other manufactured products	Building and construction	Waste treatment	Trade services	Transport services	Services	Households	Stocks	Imports	Total inputs
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Air	1					186	51	208	6	10	51	15	10	12	18	3	10	10	14	10	32	13	146	10	135			950
Waters	2						180	7	5		21	7			16	8	15		10	22	4			8	51			354
Soil	3					104																						104
Natural Stocks	4							59	8	457	31	10			12				5		7							589
Agriculture	5	86		32		3	91	1							93		2				5						6	319
Livestock	6	103	12	143																	61						1	361
Energy, Water	7	279		1		3		179		3	7	24	4	6	5	1	1	1	2	3	2	7	41	2	30		26	627
Metallic ores and metals	8	2	2	2					2	2		20									8							38
Non metallic minerals and products	9	15	1	2				5		6	15	6			3				5	403	20						5	486
Chemical products	10	50	5	2		11	5	1	1	1	45	1	1	2	8	2	2	15	10	2	12	8				3	12	199
Metal products	11	48	7	9								50	10	5						20	1	1					7	158
Machinery	12	15																								10	3	28
Transport equipments	13	8	2					4													5	2				17	5	39
Food, Beverages	14	52	25	12			32								103		1		4		32	74					5	340
Textiles, Leather products	15	5	5											1		8					3	5					6	33
Paper, Wood products	16	8	2												2		10			3	4	8				10	6	53
Rubber and plastics	17	12									4			3	2			8		5	6	5				4	1	50
Othe manufactured products	18	10									5			2	5	1	1	1	2	15		5				10	15	72
Building and construction	19	35	13	5																	5	9				413	12	492
Waste treatment	20	74	35	76		10		5				15				2	4	3	5		10					69		308
Trade services	21	5				2								2	10	1	1	2	5		5	5		11	86	20		155
Transport services	22	187																										187
Services	23	21	5	2																	3							31
Households	24	209	22	11																	55					5		302
Stocks	25																				26					5		31
Imports	26						2	162	16	7	20	10	1	6	22	7	6	10	10	9	2	13				35		340
Total inputs	27	1224	136	297		319	361	627	38	486	199	158	28	39	340	33	53	50	72	492	308	155	187	31	302	601	110	6646

Figure 2 Table intersectoral in physical units of the Italian economy in 2000 (Source: Nebbia 2003).

Development application of PIOTs

Since the nineties the first studies on the flows of matter have been made in Europe by the Institute of Interdisciplinary Studies of Austrian University for Austria and the Wuppertal Institute in Germany(ISTAT 2009)(Suh 2004). Since 1990, we can see four parallel lines of research:

I. The first leads to the conceptualization of the system (Duchin 1992, 2009);

II. The second studies the development of the methodology (Konijn et al.1997; Nakamura and Kondo 2002, Hoekstra 2003, Suh 2004; Giljum and Hubacek 2004; Dietzenbacher 2005; Dietzenbacher et al 2009, Weisz and Duchin 2005);

III. The third considers various applications of PIOTs, developing a water accounting (Gascòet to 2004), waste and development of energy bills (Duchin 1990; Duchin and Lange 1994; Duchin and Lange 1998; Hubacek and Giljum 2003, Kagawa et al , 2004).

IV. The fourth series of studies has focused on the compilation of tables of national accounts in physical units.
From 1990 to today have been developed a series of tables for the various nations. The first table PIOTs for the national accounts has been calculated for Austria for the year 1983 (and Kratterl Kratena 1990; Kratena et al 1992) for Austria there is currently a highly aggregated

PIOTs (Weisz 2000). For Germany, for the year 1990, a full PIOT was published by the General Office of Statistics, with the matrix which contains 58 activities of the conventional accounts, plus an additional area for external environmental protection services (Stahmer at 1997, 1978) and for 1995 (Statistisches Bundesamt 2001) and then were further elaborated in Tables I / O (Bringezu et al 2003; Stahmer et al 2003). For Denmark was published PIOT for the year 1990 (Gravcard) and for 1999 (Pedersen). For Italy a PIOT aggregate was made by Nebbia for 1995 and for 2000 (Nebbia 2003). For Finland a PIOT has been submitted for the year 1995 (Mäenpää 2002). For the Netherlands a table I / O was published in 2003 (Hoekstra). For Japan in 2003 (Ariyoshi and Moriguchi) a PIOT has been built and currently there are others under construction at regional level. For the United Kingdom a PIOT of 76 sectors is undergoing preparation(Wiedmann)

3. RESULTS AND DISCUSSION

One limitation is the differences between the existing methods with which they were developed PIOTs of different countries. The aggregation levels are different, and sector number. A further differentiation in methodology has with the inclusion or exclusion of water and air in the tables, as these flows exceed all others by a factor of 10 and may affect the correct reading of the data. (Giljum, Hubacek 2001) (Moll, 2003 Acosta). Duplication of flows is another problem, because in many situations is counted more than once on the same subject as we find it in anthropogenic input in different processes related to each other. Turning to the merits, one of the advantages of PIOTs is to be able to integrate into a single framework the different sources of data obtained from: accounts for energy, accounts of waste, production statistics, statistics for recycling and emissions and international trade statistics (Hoekstra et al., 2006). The information given by the I/O tables allow the connection between raw materials, energy inputs, production of goods and waste and emissions throughout the economy. An analysis of these data helps to identify priority areas for making strategies of natural resource management, and compatibility between PIOT and MIOT leads to obtain a direct relationship between indicators derived from physical flows and economic indicators. The indicators derived from it are useful to monitor the processes of splitting of natural resources from economic growth and move towards a more sustainable use them.

4. CONCLUSIONS

Dematerialization of the economy and the decoupling of economic growth from environmental degradation are messages sent by various international organizations. The objective of reducing the use of natural resources is a necessary but not sufficient to ensure sustainability, the question remains as to understand what exactly reduced. It is therefore important to develop a complete set of accounts to realize a sustainable development strategy. The PIOT allows the connection between micro-and macro-level descriptions of material flows, the representation of the cycles, the identification of mechanisms and indicators of dematerialization. Above all, it is a tool that has always had the ambition to facilitate interdisciplinary research linking the different doctrines. Despite its conceptual simplicity and operational includes reports of quantities and prices, the factors and the technology of production, distribution of income, capital investments of labor and international trade. This opens the possibility of large-scale integration of different fields of science as a means of

making use of PIOT common. The problem is to compare the existing tables, because the sectors are aggregated in different ways, and dissimilar materials are included and excluded. In order to ensure the comparability of the I / O tables of different economies, is crucial international harmonization aimed at creating a system of integrated environmental and economic accounts focused on the standardization of methodological procedure for setting the physical accounts at national and supra. Resolving this issue will be a precondition for further development and applications of the most common PIOTs in the future.

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ARCHETYPE-GENERIC STRUCTURE BASIS (NO) SUSTAINABLE NATURAL RESOURCE MANAGEMENT

ARHETIPOVI-GENERIČKE STRUKTURE TEMELJ (NE)ODRŽIVOG UPRAVLJANJA PRIRODNIM RESURSIMA

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Abstract: *In a globalized world, in-depth knowledge of the invisible structure of the process-the generic structure, which allows the dynamic character of sustainable development more efficient management of complex systems taking into account natural limits. Cohesion and integrity of the archetypes of deep structures applied to the management of natural resources omogućićava their proper use and maintenance. In the paper, the identification of the generic structure based on appropriate criteria, their descriptions and suggestions for their application for sustainable management of natural resources. Also, examples are given appropriate minimum target archetypes which illustrate the importance and impact on the sustainable management of natura lresources. In the discussion of the comparative analysis and synthesis of application archetypes identified natural resource management as the foundation for sustainable management.*
Keywords: generics tructures, sustainable development, natural resources

Apstrakt: *U globalizovanom svetu, poznavanje dubinskih nevidljivih struktura procesa – generičkih struktura, koje su dinamičkog karaktera omogućava efikasnije upravljanje održivim razvojem složenih sistema uvažavajući prirodna ograničenja. Povezanost i celovitost arhetipova dubinskih struktura primenjenih na upravljanje prirodnim resursima omogućićava njihovo adekvatno korišćenje i očuvanje.U radu je izvršena identifikacija generičkih struktura na osnovu odgovarajućih kriterijuma, njihov opis i predlozi za njihovu primenu radi održivog upravljanja prirodnim resursima. Takođe, su dati odgovarjući primeri arhetipova kojima se ilustruje značaj i efekat na održivo upravljanje prirodnim resursima. U okviru diskusije je data komparativna analiza i sinteza primene identifikovanih arhetipova upravljanja prirodnim resursima kao temelj održivog upravljanja.*
Ključne reči: generičke strukture, održivi razvoj, prirodni resursi

1. INTRODUCTION

Systematic research is based on established principles of influence and knowledge of the deep structured inimačkog characters that are the outcomes of certain behaviors and consequences and the results can be positively or negatively. It is well known that the structure of the problem is generated, and to procure that the patterns of behavior, and that the problems and outcomes that is a result of the same mechanism of reverse-phase structure. The work will be carried out identification of the components of dynamic structure nevidiljivog physical shape that forms the basis for the determination of elements in which it is possible to make relationships and solutions with the aim of giving directions, maps and sustainable functioning of natural resources in order to preserve as long as possible. Depth (in)visible structures are defined archetypes that have identified a number of researchers with Peter Sengeas a leader. The goal of structural research work that lies ahead is to be verified using the generic knowledge structures defines a functionally-optimal foundation for sustainable management of natural resources, in order to present connections and interdependence of generic structures with a view to their joint action to preserve the already worn natural resources. This system achieves the goal of the research necessary to define all the generic structure to ensure sustainable management of continuous growth and successful survival of the remaining natural resources, eliminating the typical mistakes which shortens their life span.

2. IDENTIFICATION OF ARCHETYPE FOR SUSTAINABLE NATURAL RESOURCE MANAGEMENT

Based on the defined archetypes by Peter Senge, there are those who are the direct basis for sustainable management of natural resources. [1, str 100]

Archetype-Growth Restriction

Description: Nothing grows forever, and it is often not that people behave, which can be kontraproduktino. Growth limits helps to see the changes the balance between resources over time. The cause of the growth phase of the process ojačavajućeg feedback while balancing on growth process produces close to the border. The limit is associated with limited resources. If there is a rapid decline of the cause of action he would be reductive process in the opposite direction in order to reach an increasing reduction

Management principle: In the case hardening process feedback and growth, we should not be forced but should find ways to eliminate or minimize the factors that constrain it. [3, str 117]

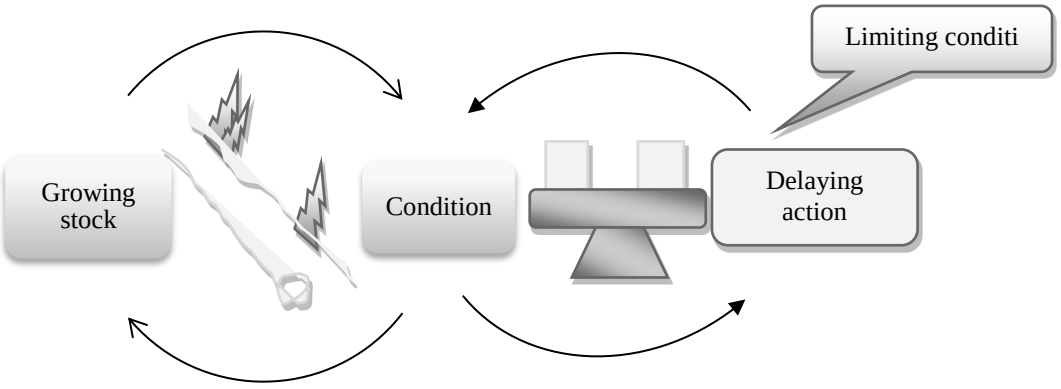

Figure 1. Archetype-Limit of growth

Archetype-Transferring cargo

Description: It happens that there are problems that cause certain symptoms to look for an appropriate commitment, because they are difficult to spot and just deal with them is expensive. In such cases it is easier to choose solutions that are seemingly very effective. However, the depth oft he problem still exists and is still getting worse, lose all ability to solve because the symptoms only appear clear and in fact are even stronger

Management principle: It is necessary to focus on solving the core problem, not the symptoms, which will become the command that is dangerous for the environment.[3, str 118-120]

A special case of this archetype is the archetype of the shifting of cargo to the one who intervenes

Description: When a problem occurs there is a possibility of foreign intervention. It is necessary to pay attention to when the problem solved by external actors. Sometimes it happens that those who intervene outside work so good without giving a chance to the internal actors learn how to solve our problem. One must not let those who intervene externally solve all problems, but during the first intervention of external actors need to "steal" the knowledge of them to solve the following problem alone.[1, str 279]

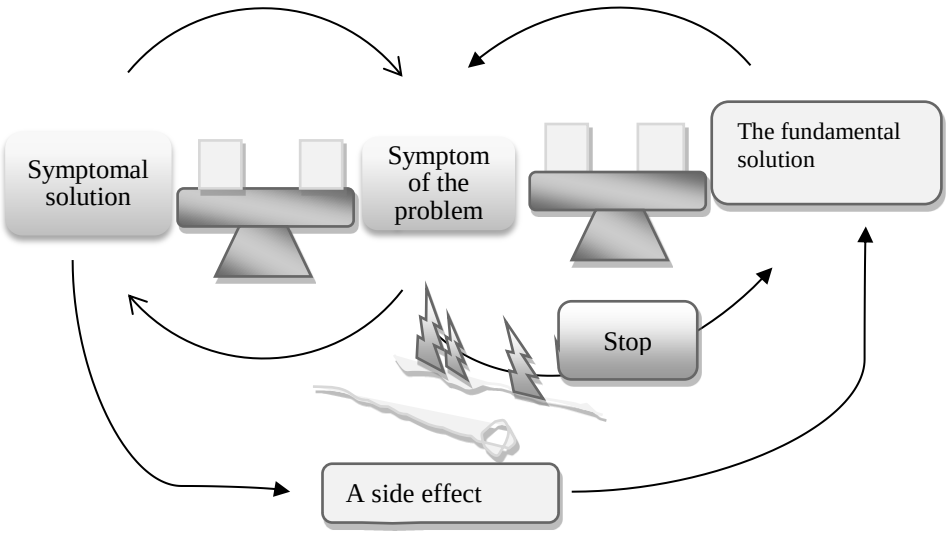

Figure 2. Archetype–Shifting the burden

Archetype-Escalation

Description: It is the relationship between present and future generations, with each generation of future stability depends on the advantages it has in relation to the current generaacije. Advancing one threatens another, where it acts aggressively to regain its lost the advantage of the threat first and then it leads to aggressive action. It is a process that is constantly moving in a circle, which produces aggressive behavior as a defensive reaction to the aggression of the other side, leading to an increase in aggression that exceeds any desire.

Management principle: It is necessary to enjoy their current generation enchanted spiral turnin the direction of taking aggressive action to peaceful future generations would not feel threatened. [3, str 122]

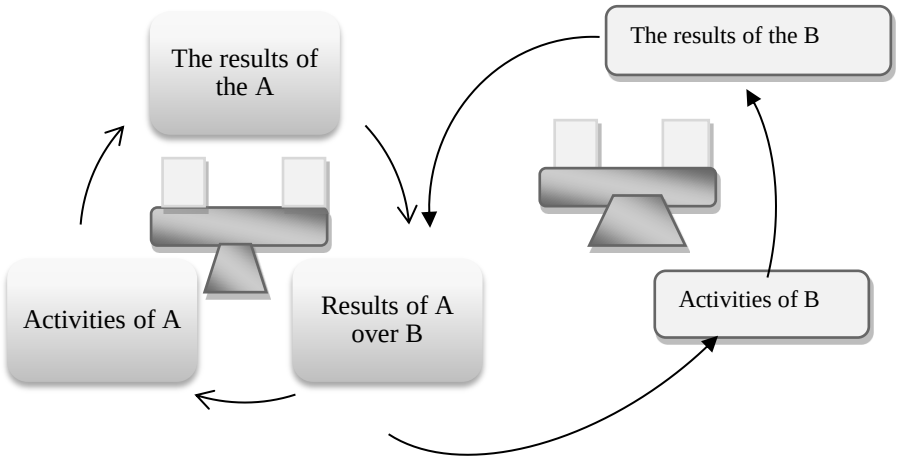

Figure 3. Archetype-Escalation

Archetype-The success to successful

Description: In every society, are going to have two activities competing for limited support or resources that would lead to success. Activity that receives more support and resources that are assigned even though it exhausts other activity, it becomes successful.

Management principle: It is necessary to find the ultimate goal of achieving a balanced both activities. Sometimes you need to stop or weaken the connection between the two activities that would not compete for the same limited support or resources, especially when immature competition leads to resource. [3, str 123]

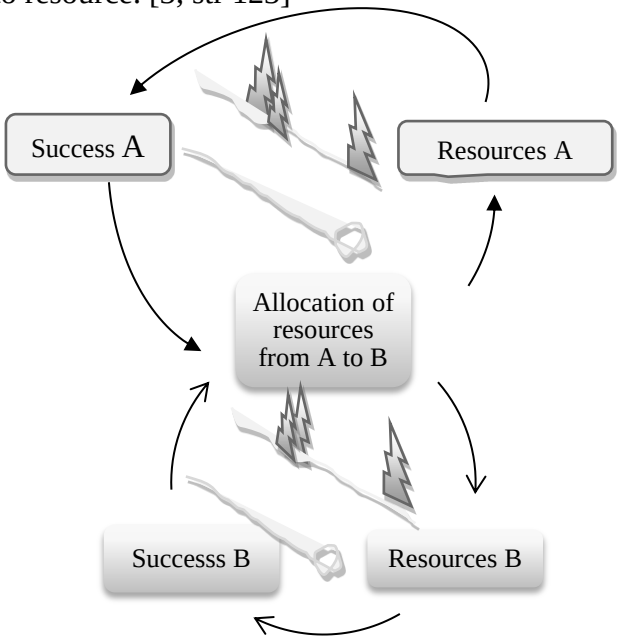

Figure 4. Archetype-The success to successful

Archetype-Tragedy of the common

Description: Individuals share common resources available, because over time due to the exhaustion of resources getting less and less, so they must step up their efforts because there is no longer enough for all.

Management principle: One must learn to manage shared resources through the mechanism of regulation that will ideally designed by the participants themselves. [3, str 124]

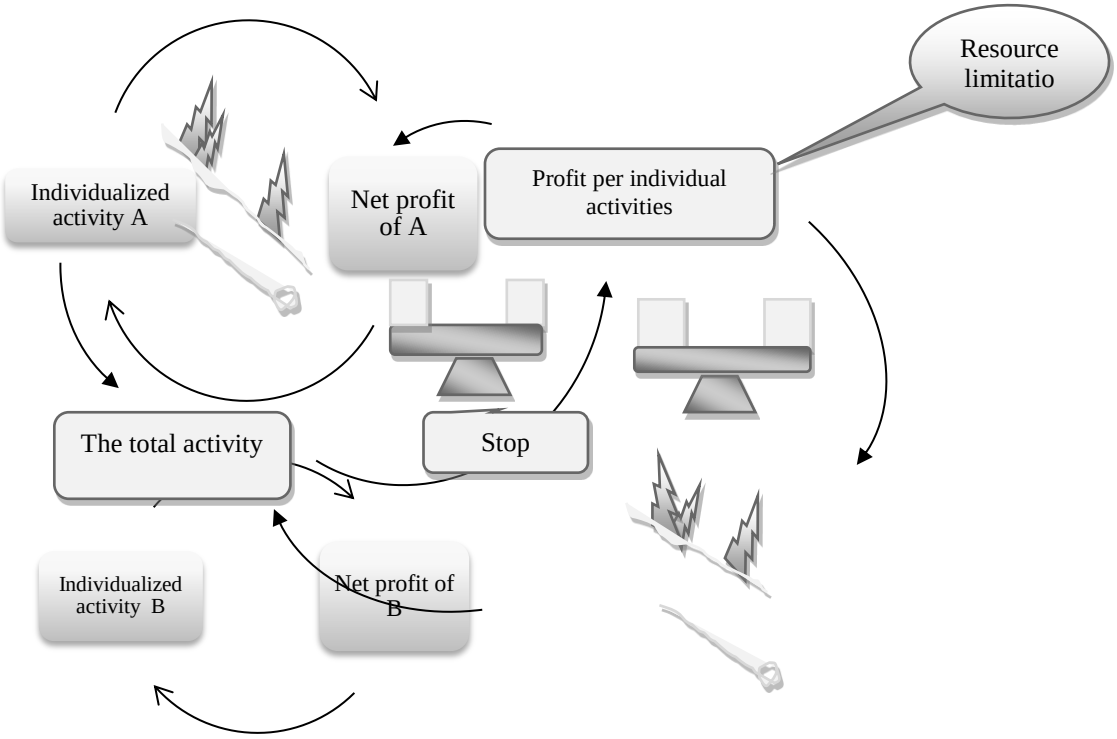

Figure 5. Archetype-Tragedy of the commons

Archetype-Unsuccessful solutions

Description: Sometimes when a problem should be solved as soon as possible to use solutions that are effective in the short term and the long term consequences of unexpected leave that require the use of the same solution.

Management principle: It is necessary to focus on long-term solutions and short-term use only when you need to buy time to work on the long term. [3, str 126]

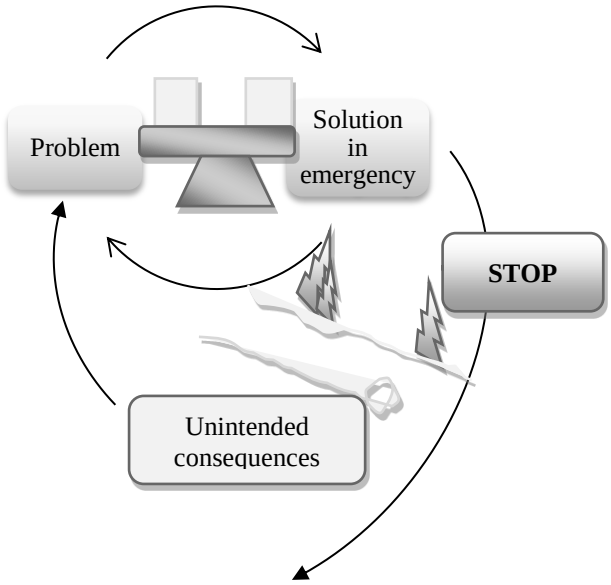

Figure 6. Archetype-Unsuccessful solutions

Archetype-Growth and under investment

Description: If you are investing in additional work to increase the capacity growth will be closer to the border, which can be eliminated or moved in the future. However, the investment would not be in correct or not to reduce the growth must be sufficiently fast and aggressive. In order to justify under investment reduces performance standards, which lower objectives leads to lower expectations that brings bad effect.

Management principle: If there is a possibility for the growth strategy is used to create demand for capacity building. In assessing the performance standards and strategies for determining the availability of appropriate facilities that serve to meet the demand should stick to his own vision.[3, str 127]

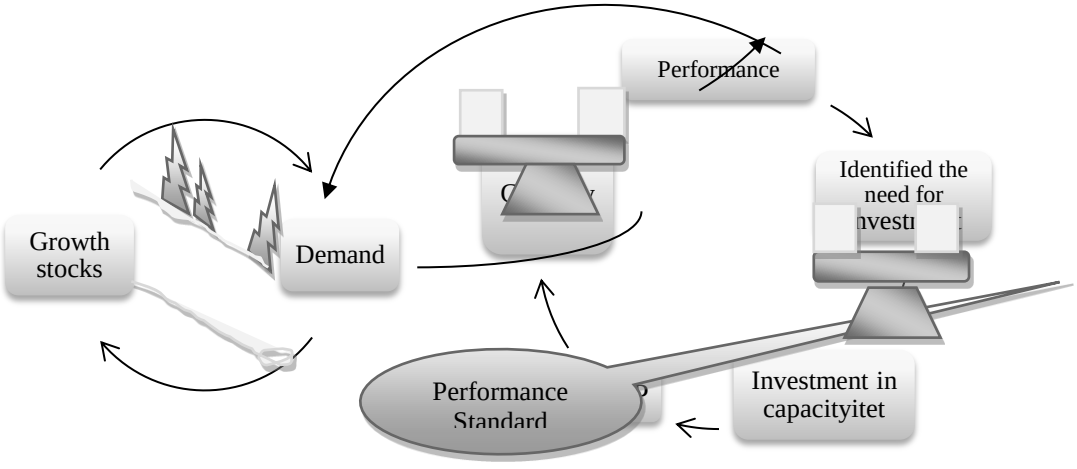

Figure 7. Archetype-Unsuccessful solutions

3. APPLICATION OF CERTAIN ARCHETYPES IN NATURAL RESOURCE MANAGEMENT

How the system archetypes as tools for the rational management of natural resources are povartne coupling elements each of which influences and changing information, such actions may lead to an increase or decrease or may be moving towards a state of equilibrium.[4] The system includes the addition of tangible and intangible, such as the source of energy that can be renewable and nonrenewable. In order to preserve non-renewable sources of energy, and maximum use of renewable energy in Serbia, it is necessary to use an adequate system of archetypes and their understanding of the first.

Serbian energy, perhaps as a unique world phenomenon, lack of money has a problem that leads to bankruptcy. There is an urgent need, providing 50 billion loan to EPS function. EPS is a loser for two decades, and ripe for bankruptcy, even though the law can not go bankrupt. And every economic activity, including the production of such an important product of any electricity, becomes meaningless if used instead of harm. It is necessary to go into the matter - why EPS catastrophic position, why not be able to meet its obligations. Paradoxically, one of the duties was to pay penalties because they do not use an approved foreign loans of 80 million euros for new meters or measurement and management of modern electronic devices. Especially because the Power Industry of Serbia, once, before the political dictatorship of public enterprises, exporting ten billion kilowatt hours a year, and now electricity imports, and exports of "rules" to earnings Stotinka million. Sin would shift the blame to the experts, especially the employees of the EPS. Despite all experts in the Electric Power Industry, and with them we should mention colleges, institutes, machine building, they created, in very unfavorable conditions, real miracles. Although decades have imsli environment for the construction of new facilities, and has not even started construction of any power plant have managed to increase production and meet the growing needs for electricity. Revitalization of abandoned and obsolete power plants even increased the production of power and. A key problem enigmas about the state of EPS in consumption. If the Serbian economy these years does not even half of what was produced in 1989, where did the growth in electricity consumption. Energy, specifically the electric power industry, it is easy to figure out where the source of trouble-loss, stopping the construction of new facilities, shortages threaten, poor public image. Coal and hydropower used to generate electricity without treatment of natural resources, whose exploitation of resources to create new value, jobs and national wealth, as in all countries of the world. In Serbia, meet the needs of their use. All natural resources, land, forests, minerals, rivers, with the knowledge, techniques and technologies used in other countries for the development, progress and a better life in our country only one of them seems to have no benefit. As if no one is thinking about what will tomorrow when coal is exhausted, remaining tailings, pollution, and the debts. A brief history of Serbian EPS is presented in order to clarify inadequate renamed, and what would provide adequate application of system archetypes or genričkih structure. It is obvious that Serbia has huge energy potential from renewable energy sources, which is not used, while non-renewable maximum benefit.

Table 1. The use of archetypes in EPS in Serbia

Inadequate implementation	The appropriate use
Limit growth	Limit growth
Shifting the burden (the one who intervenes)	Shifting the burden (the one who intervenes)
Escalation	The success of the successful ones
Unsuccessful solutions	Escalation
The success of the successful ones	The tragedyof shared resources
	Growth and under investment

The following table will be defined and identified archetypes used in EPS in Serbia, but the irrational management of natural resources, and will be analyzed in the discussion.

4. DISCUSSION OF RESULTS

Searching for solutions in the vicinity of the problem will not provide a solution. It is necessary to move upstream and into the past to uncover the roots of origin nodrživosti use of systemic archetypes in Serbia. The most effective solution is usually the hardest noticeable, with the best solution can be found in a totally unexpected source.[2, str 119-120] The following figure represents the family tree unsustainable (left side), or sustainable use (right side) of system archetypes, and their comparative analysis of the energy potential of Serbia.

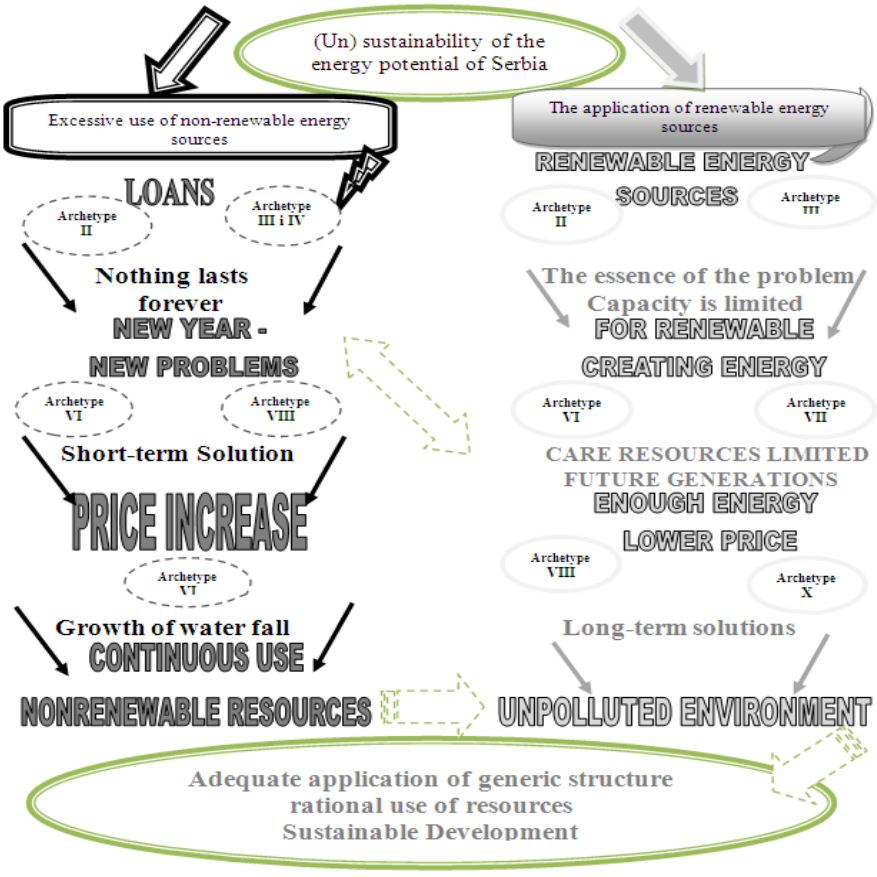

Figure8. Family tree of application archetypes for the rational use of non-renewable energy sources

5. CONCLUSION

For (un)sustainable energy usage, it's easy to grasp where the cause distress or loss, shortage threatening, poor public image, and above all, inadequate application of generic structure that would allow the rational use of non-renewable energy sources. Coal and water resources that are used to produce electricity without treatment of natural resources, whose exploitation of resources to create new value, jobs and wealth of the state, as in all countries of the world. Serbia, meet the needs of their use. All natural resources, land, forests, minerals, rivers, with the knowledge, techniques and technologies used in other countries for the development, progress and a better life only in Serbia of them as there is no benefit. As if no one thinks what will tomorrow when coal is exhausted, remain barren land, pollution and debts.

Perhaps these considerations seem pessimistic, but decades of experience points to a possible continuation of this political practice. One can, of course, accessible and optimistic. Believe that the new government, the new government or the Department of Energy radically change the situation and start the investment cycle, build new facilities, rates allow economic evaluation of energy, allow competition, and finally start with the rational usage of non-renewable energy sources and diverted to renewable energy long time ... what can enumerate all the way state and society can make a plan designed and sustainable energy development. However, it is the connection and integrity of deep archetypes related to natural resources that would enable them adequately and conservation, especially the sustainable use of different sources of energy that is the nature of things, initiator and driving force, the momentum that drives a range of economic and social activities.

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INNOVATIONS FOR THE FUTURE, SOLUTIONS TODAY IN SEARCH FOR THE SUSTAINABLE DEVELOPMENT MANAGEMENT ON NATURAL RESOURCES

INOVACIJE ZA BUDUĆNOST, REŠENJA DANAS U TRAGANJU ZA ODRŽIVIM RAZVOJEM UPRAVLJANJA PRIRODNIM RESURSIMA

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[1]Faculty of Management, Zajecar

***Apstrakt**: The global deficit of natural resources in the light of galloping consumption and disbalance able to impose creative finding solutions through innovation in the field of scientific and technological progress tomorrow and the field of socioeconomic innovation whose synthesis is expected key sustainable development of mankind.This paper provides an overview of the problems of today with comparative review of scientific and technological innovation forecasting, socio-economic trends and alternative proposals Venus Project. Synthetic and analytical discussion of innovation for the future presented in the paper, suggests solutions better management of natural resources Pourable hope of sustainable development of society at the beginning of the XXI century.*

***Keywords:** Natural resources, innovation, foresight, Venus project, future shape of economy*

***Abstrakt:**Globalni deficit prirodnih resursa u svetlu galopirajuće potrošnje i disbalansa mogućnosti nameću kreativo iznalaženje rešenja putem inovacija u polju naučno-tehnološkog progresa sutrašnjice i polju društveno-ekonomskih inovacija čijom sintezom se očekuje ključ održivog razvoja čovečanstva. U radu se daje pregled problema današnjice sa komparativnim pregledom naučno-tehnoloških predviđanja inovacija, društveno-ekonomskih tendencija i alternativnih predloga Venus projekta. Sintetičko-analitička diskusija inovacija za budućnost prikazana u radu, ukazuje na rešenja kvalitetnijeg upravljanja prirodnim resursima ulivajući nadu u održivost razvoja društva na početku XXI veka.*

***Ključne reči:** Prirodni resursi, inovacije, predviđanje, Venus-projekat, ekonomski oblici budućnosti*

1. INTRODUCTION

The challenges that face humanity today cannot be solved with the help of obsolete methods and values that are no longer relevant. Usually support a tradition that reflects the past without questioning the adequacy of the present or future. To think creatively about the future and the rethinking of our traditional ways of thinking, we must first of all be better informed. We also need to seriously understand alternatives because they contain n frames glasses future. Our life changes daily according to the development of new technologies and innovations. Science and innovation are keys to the future. Yet, if so, then why does the company plan, from cities, transportation systems, agriculture, health care, does not fully adapt them to science and scientific innovation? If science is the real advantage of hope to create the future, it is clear that much of it related to today's social and economic structure is not based on scientific grounds, because things are not working well, but the manner of the world's population and of the environment. Scientific innovation to our inevitable future and should not be used for the

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master of nature, but to help them explore the deeper our interdependence and connection with it. When we understand the unique relationship we have with the natural resources that surround us and the planet , generally, we will be able to use the full potential of science to human development. [8] A comparative overview of innovation for the future leading futurologists (Michio Kaku), alternative promoters of radical innovation (Jacque Fresco) and economic analysts (Jacques Attali) of the world is the subject of this paper.

2. INNOVATIONS FOR THE FUTURE

Analysis of current publications state of the world today and the proposals for the future of the leading authors stand out, with great precision, which provide forecasts of our future and possible alternative solutions for technological and scientific, economic and social spheres of action of mankind. Innovations they propose a conceptual solution in the range of feasible to immediately, almost utopian. But it only seems so at first glance, without knowing the necessary information and insight into the facts and assess the relevance (study) cannot be fathomed, which leads us to the future directions. Authors such as Michio Kaku, Jacque Fresco and economic theorist Jacques Attali, with great certainty, a description of how it will look closer to our future by 2050. and that the trend will become our reality.

2.1. Innovations for the Future - Dr. Michio Kaku

Dr. Michio Kaku is professor of theoretical physics at the City University of New York, co-author of the string field theory and author of several highly acclaimed scientific publications such as the *Physics of the future.* In his scientific research, the author gives us a unique and very understandable way is the inevitable impact of science on our everyday life all by 2100. And if the reader at first glance may seem like science fiction, a large number of listed innovation, and which will be specifically addressed in this paper is successfully completed, or it is in the testing procedure. Therefore, the future starts today! This author has a very interesting way represents a revolutionary development of medicine, information technology, quantum physics and space travel that will forever change the future of civilization. Physics and technology are the ones who direct much of the action, but despite that, we are seeing a large number of people in the world still turns pseudo-science, and that it actually gives them direction for the future. Speaking of pseudo-science that is poor understanding of the true nature of phenomena, we can say that this method of constantly justify, defend and repeat mistakes. Pseudo-science in exactly the opposite way from science treats nature, natural resources and the laws of nature and Michio Kaku says that for us today a very important, if not the important thing knowledge of natural law, and it is our great advantage over the minds of our time, which In past centuries, predicted innovative discoveries made to us today an indispensable part of everyday life. Predictions will always be flawed but it can be extremely authoritative if the notions of the four basic forces of nature that run the entire universe. Today we understand quite well the four forces. The first force, gravity, described by Einstein's theory of relativity, while the other three forces (electromagnetic, weak and strong nuclear forces) are described in quantum theory, with the help of which we can decipher the secrets under-atomic world. If we look at the current technological innovation can easily see where they lead science and technology over the next few decades. There will always be brand new and unexpected surprises that leave us speechless but the foundations of modern

physics, chemistry and biology are mostly already in place, so that in the near future (up to 2030) does not expect a major revision of basic knowledge. It should also add that each innovation or scientific development that Michio Kaku describes is not a work of fiction, but closely followed the known laws of physics.

The future of computers - a global network through contact lenses

Today we use the Internet for communication with computers and from mobile devices. But in the future it will be all around us - in wall screens, an e-tables, on billboards, and even the glasses and contact lenses. And amazing thing is that will be needed to connect by flicker. This innovation can be successfully used for medicinal purposes, so that the lens will show immediate results analysis in the human body. Furthermore, this innovation with the appropriate software can be used to recognize objects, and even people with certain people. People around the world will be able to simultaneously participate with you in your experience because whatever you do or watch, thousands more people will be able to see it. With the help of the "internet" lens people will be able to easily move their fingers in the air to control the image, because the computer identifies the locations of our fingers while they're moving. One of the benefits of energy lens for internet is that it consumes very little power, only a few millionths of a watt (W), and therefore are very effective in terms of energy requirements. Another advantage is that the eye and the optic nerve, in a sense, a direct extension of the human brain, information is transmitted at speeds that exceed the fastest connection and so therefore this contact lens most efficient and fastest access to the brain. [1]

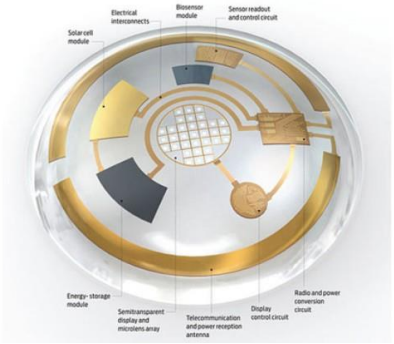

Figure 1. Appearance internet contact lens

(Source: www.google.com)

Figure 2. Application of contact lens in practice

(Source: www.google.com)

The future of transportation - a car without driver

Michio Kaku on to say that in the near future we will be able to help with, as described above, Internet contact lenses surf the Internet while traveling by car. Specifically, such a transport innovation states - the car without a driver. This car uses GPS to locate your position and have the ability to move without a driver of hundreds of kilometers. This innovation can be successfully used to it to save people's lives, such as car automatically take measures in the case, as soon as discover the possibility of an accident. For ordinary consumers, this would mean that the cars drive at the push of a button, so that the driver can work to relax, admire the scenery, watching movies or browsing the internet. However, it should be noted that the

transition to a smart car will not come immediately, a number of additional testing and training but the final version that we met will force us to ask ourselves, as we did up to now could not live without them.[1]

The future of energy - solar / hydrogen economy

"The Stone Age did not end for lack of stone. But the oil age will end long before the world runs out of an oil " **– James Canton**

Our planet is now completely reliant on fossil fuels in the form of oil, natural gas and coal. Overall, the world consumes about 14 billion watts (W) of energy, of which 33% of oil consumption, 25% is the consumption of coal, 20% gas, 7% is nuclear, 15% biomass and hydroelectricity, and only 0.5% of energy are renewable energy sources. [2] When the world right now left without fossil fuels, the global economy would be completely stopped. The situation is alarming and should wake up the consciousness of men that renewable sources of energy are our future but not obsolete forms of energy that each day leading to the increasing level of pollution. End of the Oil Age will mark the beginning of solar / hydrogen era. Solar / hydrogen energy is entirely based on renewable technologies such as solar energy, wind energy, hydroelectric energy and hydrogen. At this time, the price of electricity produced by solar cells is significantly more expensive than electricity from coal, but the price of solar / hydrogen energy continuously falling due to continuous technological progress, while the price of fossil fuels continues its slow growth. Ultimately all energy comes from the sun. Even the oil and coal, in a sense, concentrated sunlight, and an energy that fell on the plants and animals millions of years ago. Even after several decades of hard work by engineers and scientists, the efficiency of the solar cell was maintained at a very small percentage. For this reason we moved in two directions, the first is to increase the efficiency of solar cells and the other is to reduce the cost of production, installation and building solar parks. During the ambitious projects that seek to popularize the use of solar energy and whether it will be able to run through a gauntlet of environmental inspections and penetration costs, it remains to be seen. The key point is that the solar economy is going through a major change and solar energy is the most competitive form of energy versus fossil fuel energy. When it comes to energy should mention yet another innovation for the future - the use of magnetic force. Michio Kaku rightfully points out that the last century was the century of electricity, this 21 will be the age of magnetism. Without additional flux of energy, superconductors at room temperature might produce superconductors and able to raise trains or cars to float above the ground. The best-known technology that use this phenomenon is Maglev technology that is now used successfully in Japan and is known for high-speed Maglev trains (trains is hovering above the ground and moving without friction). This technology is still under development, and the major innovations in magnetism are yet to come.

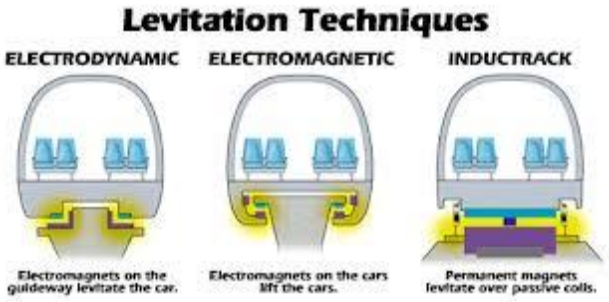

Figure 3. The techniques of magnetic levitation

(source : Www.ffden-2.phys.uaf.edu)

Nanotechnology - our chance of cure and prolonging life of the human species

The development of nanotechnology could lead to a new industrial revolution is because molecular manufacturing can create new materials that would be super strength and super lightweight with incredible magnetic and electrical properties. Nanotechnology is not just hoping for a visionary by the potentials to improve human performance, lead to the development of sustainable materials, water, energy and food as well as to protect against unknown viruses and bacteria. It is believed that with the help of nanotechnology can create anything, almost nothing. In the near future we should expect a new type of touch device that could revolutionize the field of medicine, such as nanoparticles that flow through the bloodstream. This innovation is of paramount importance for humanity at large because it can bring a revolutionary change in the treatment and even cure malignant cancers, for which the official medicine even today there is no cure. Nanoparticles are a micro devices that can deliver cancer drugs to a specific place. These nanoparticles can be compared with a "smart bomb" designed to their specific chemical cargo hits the target and thus reduce Collateral damage thereby caused. Not only nanoparticles can look for cancer cells and deliver medication but cannot destroy them on the spot. This innovation will surely prolong the life span, but will because our planet will become overpopulated and over polluted or will be for it to find a proper solution, it remains to be seen. [1]

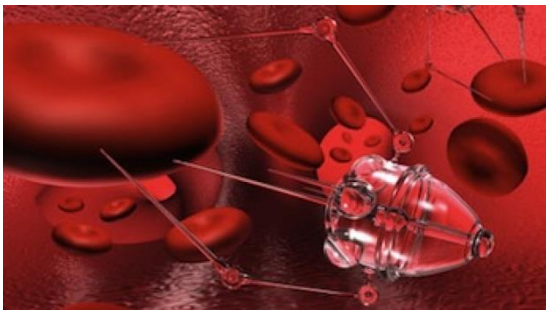

Figure 4. Showing of nanoparticles in the human bloodstream

(source: Www.google.com)

2.2. Alternative solutions - The Venus Project

"Utopia does not exist. The notion of utopia is static. There is no limit. The only limitations are those we set ourselves ... " **– Jacque Fresco**

Jacque Fresco is an industrial designer, social engineer and innovator in many areas ranging from biomedicine to totally integrated social systems. Conceptual creator and founder, renowned globally, Venus Project, which is the integration of what is best in science and technology and a clear plan for a new society that is based on the principles of humanity and concern for the environment. It is a global vision of hope for the future of human civilization in the technological age. Jacque Fresco gave the definition of an economy based on resources known as RBE. It is a system in which all goods and services are available without the use of money, credits, exchanges of goods or any other system of debt. Venus Project displays the time in the near future when money, politics, personal and national interests will be addressed. It includes all areas of education, transportation and clean energy to full urban systems. Overcrowding, lack of energy, global warming, environmental pollution, water shortage, economic crisis, the uncontrolled spread of the disease and the technological displacement of people by machines, threaten all of us. Jacques says that our social and environmental problems remain intractable as long as the prevailing monetary system and financial interests while controlling the consumption of world resources. In this case, should the Earth and all its

treasures declared the common heritage of all people. It is evident that the Earth is very rich and abundant resources. Our practice is to control the disposal of financial resources has become increasingly counterproductive to our survival. Today, we have very high technologies, but the socio-economic system has not kept pace with technological capabilities. [8] With the intelligent and humane application of science and technology, people can come together to lead and shape their future and thereby protect the environment.

The next step of evolution - Machine Intelligence

The key to achieving abundance and high standard of living for all is to automate as much as possible in the shortest possible time. Machines replacing human labor and the introduction of a resource based economy everyone would live better than the wealthiest people of today. Cybernetics, connecting computers to production, will free flow of goods and services as never seen before. Artificial intelligence is a computer program that simulates human brings making and testing hypotheses along with the correction. Artificial intelligence redesigned mechanical and electronic systems to simulate and improve human performance. Cybernetics can be seen as the only real effect of dependency and limitations of the human race when used intelligently and humanely. It allows people to have the highest conceivable standard of living. What people need to realize is that they are not afraid of technology or automated machines for their possible misuse for their own selfish interests. [4]

"Cybernetic government"

Computers will be to the extent use that life without them would be unthinkable. Jacque Fresco says that in the future we have cybernetic government, or computers connected to automated systems. Central cybernetic systems will synchronize all machinery and equipment that will be used throughout the city, nation and world. It will be something like an independent electronic nervous system that extends across all social areas. For example, these computer systems to be used in agriculture, and thus will be able to automatically monitor and maintain the level of water levels and chemical composition of the country, as well as the planting and harvesting of crops. In urban areas, these computers will automatically keep clean and recycle waste. These systems will be equipped with electronic sensors that send information from the environment. Sensors can be connected using auxiliary systems, which would be ready to help in case of failure and the failure of the primary, central computer. Only when cybernetics is an integral part of all aspects of society, computers will be able to meet all our needs. Non civilized technology will never be able to be fully effective if cybernetics becomes an integral part. [6]

Design solutions in the transport Venus Project

Jacque Fresco says some interesting and very workable solutions that will elevate our life at the higher grade level. Like the predecessor, Michio Kaku says that our inevitable future Maglev technology that catch more momentum. As a further innovation is our special type of aircraft called VTOL (Vertical Take-off and Landing) Cars of the future, according to Jacques, will be fast, economical and safe to be managed by a computerized system. Also, states and Structure of the barges or floating something like disassembled freighters.

Maglev trains

Different parts of passenger cars in this fast magnetic trains can be detached while trains pass through the station. These detachable parts transported passengers to their local destinations while other cars down in their place. This method allows the main part of the train stays on the move, which saves energy. In addition, the detachable multifunction wagons could be especially equipped to serve in numerous belting. [3]

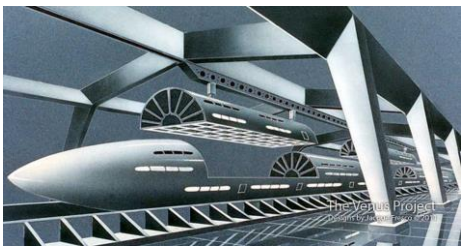

Figure 5. Maglev train with detachable parts
(source: Www.thevenusproject.com / en / technology / transportation)[9]

VTOL vehicles (vertical take-off and landing)

Such vehicles will be initially developed as emergency vehicles, when the speed and agility are very important because they will have three synchronous turbines which provide excellent maneuverability. Aircraft for vertical take-off and landing are designed to raise passenger and cargo circular vortices air columns. VPIS aircraft can fly a variety of techniques, from the propeller to the channel-guided jets. They will be designed to combine the best features of fixed wing aircraft, helicopters and flying platforms [3]

Figure 6. VTOL aircraft
(source: Www.thevenusproject.com / en / technology / transportation)[9]

Cars

A stream lined cars will provide fast transport will be saving, safe and long lasting. Some vehicles will have four-wheel drive while the other has the necessary equipment for magnetic levitation and floating in the air. Most vehicles will be equipped with voice recognition technology, which allows the vehicle with the help of voice commands. There will be a self-monitoring systems that alert when the vehicle require service. Use clean, non-polluting energy enables silent drive, and tools for the detection range, associated with automatic brake system, improves security, allowing cars to avoid collisions. [3]

Figure 7. Cars by Venus Project
(source: Www.thevenusproject.com / en /technology / transportation)[9]

Energy sources to the Venus Project

One of the most useful measure of civilization is the amount of energy available per person. Vast sources of energy will be explored and developed. They include wind, waves, tides, ocean currents, temperature differences, waterfalls, geothermal, electrostatic, hydrogen, natural gas, algae, biomass, bacteria, phase transformation and thermionic[20], as well as the potential of Fresnel lenses to concentrate the heat. [4] The Venus Project, mentions of fusion energy, and when we learn to manage it, problem energy deficit in the world will be solved forever, without any adverse effects and hazardous and toxic materials. The only rest would be pure helium ash. Great, so far unused, source of energy is the development piezoelectric materials or layered systems within the cylinder, which would activate the tides. Geothermal energy can be 500 times greater than the energy contained in the world's reserves of fossil fuels, thereby reducing the threat of global warming. Installations for the production of geothermal energy produce very little pollution compared to fossil fuels and do not emit nitrous oxide or carbon dioxide. Scientists predict that if we develop the potential of geothermal energy and use only 1% of the total available quantity of energetic deficit would ever be solved.[7] Today, Iceland's geothermal energy been used successfully for growing plants indoors place during the whole year, and this technology could also be used for fish farming. As a special innovation, Jacque Fresco says the use of the Gulf Stream, which would be "collected" with the help of large subsea construction and turbine and thus creating clean, green electricity. Of course, we should not leave out a huge solar potential that can be used in photovoltaic panels to large solar plants on land and in the sea. Radiation each year to reach the earth's surface, 10 000 times higher than the amount of energy used for that time on the planet. New technologies can take advantage of the potential of getting free electricity. [3]

Nanotechnology of the machines

Nanotechnology will eventually control and manage the construction of molecular structures, atom by atom, into the desired molecular configuration. Through this process, we will be able to modify the material and permanently eliminate lack. With sophisticated technology such as atomic and molecular reproduction, we will be able to reprogram a natural process with advanced robotic manipulators using tele-tactil communication phase air. Phase the air control and manipulation of light in order to create three-dimensional images that look like solid. Tele-tactil means adding a sense of strength and the ability to touch something that is merely the transmitted object. This advanced form will create a virtual simulation that one can see, feel, hear, smell and touch. [3]

2.3.Review of the economic future - Jacques Attali

Jacques Attali, a former key adviser to the French president, Francois Mitterrand, is today one of the most influential thinkers of modern Europe .As a former Acting President of the European Bank for Reconstruction and Development, it can be said that the extraordinary connoisseur of both present and future economic conditions in the world. The author is part of

[20]Thermionic means converting heat into electricity, heating of electrons on the metal surface, and their condensing on cold surfaces.(The article, "Energy," Journal of Literature, Art and Culture, No. 48-49/2012, p.63)

"*A Brief History of the Future"*, which skillfully present the facts of the economic history of the world and in a very precise manner provides our economic future by 2050 and then gives a forecast of the world by 2100. Attali states that the next 50 years, we can divide into 5 phases: before 2035. Will completed the domination of American empire, which will be temporary. After this phase will feature eleven division of power between the people and the market, and after that will come one after the other three major waves of the future - ***hyper-empire, hyper-conflict*** and ***hyper-democracy***. The first two waves are *a priori* fatal and the third is *a priori* impossible. The 5 future waves will mix there is no doubt.

I wave

Around 2035. predicts the end of the current financial and economic crisis, and in the midst of a serious ecological crisis, the U.S. succumb to the globalization of markets. United States will no longer rule the world. [5]

Wave II

After the "fall" of the USA, the world will temporarily become a polycentric entire world power will be distributed among ten regional powers. This period marked the second wave of the future. [5]

Wave III Hyper-empire

The third stage of the future will be marked by loyalty to oneself, the company will no longer carry national labels and the poor have the right of your market. Laws will replace contracts. It is anticipated that the vast masses of poor nomads, crossing borders in search of jobs. Resources will be thin and robots multiply. This situation can lead to a person becoming an artifact artifacts consumed and a cannibal who devours the man-eating facilities, a victim of nomadic disease. Start of hyper-empire will cause almost anyone to become any rival. This will lead to even more conflict than they are today over oil, water and territory. These conflicts will inevitably lead to growing and dangerous conflicts. [5]

Wave IV Hyper-conflict

Jacques Attali hyper-conflict described as the bloodiest war of all, in what will crystallize all other conflicts and may even lead to the disappearance of humanity. However, if humanity does not disappear under the horrors of war, new powers, and universal altruistic preferences, that are already present, it will come to power at the global level as an empire ecological, economic, ethical, cultural and political certainty. [5]

Wave V Hyper-democracy

Due to the new situation, there will be establishing a new equilibrium at a global level, between the market and democracy. International institutions with the help of new technologies to organize collective life, will determine the boundaries of commercial products, will favor the gratuitousness, accountability and access to knowledge. This will

enable the emergence of universal intelligence that enhances the creative abilities of people. There will be a new kind of economy - relational, which will create a non-profit resources will be developed in competition to the market before it is completely squeezed out, just as it was centuries ago the market put an end to feudalism. [5]

3. DISCUSSION OF EXPLAINED INNOVATION

From Table context (Tab.1) we can trace innovations that stand out as the key to 2050, was one of the economic or technical nature. Key areas singled out as an innovative field of information technology, transportation, energy sources and nanotechnology, which are essential for optimal management of natural resources, use them more efficiently and more cost-efficient exploitation. Michio Kaku and Jacque Fresco, as futurists foresee a number of innovations that will in the future become our everyday life and it is evident that there are a few overlaps with both the author tells us that our future is in some areas is already certain.

Let's start in the field of information technology, Michio Kaku predicts that the entire global network to stop at the small contact lens that will help him to have the "whole world" in front of his eyes. In this way we can and are giving some commands to be executed with a single blink, in other words we can call it controlled by a microchip placed in the lens. On the other hand, Jacque Fresco in the area mentioned cybernetic government or central computer system to manage all the resources of the planet and also followed the supply of resources and conducting necessary actions to protect, use, and storage resources. Shared by both authors is that all major activities of human life left to computers, and that a man of that time will be freed up hard, hard work and will be paid to mental work and training.

In the area of transport, Michio Kaku notes as one of the most important innovations, cars without drivers. This car also provides for Jacque Fresco, but next to the car, and said Maglev trains. It Maglev technology is also represented by Michio Kaku, and bearing in mind that just as successful and still used in Japan and China, we conclude that the transport constructed according to the principles of Maglev be our future. Knowing that the world now faces a power deficit, and that the largest percentage of energy based on fossil fuels, it is clear that we need as soon as we turn to renewable energy sources such as solar, wind, water, geothermal energy as an inexhaustible source of and other forms of each of these two authors in particular explains.

Both authors agree that our future seems inexhaustible solar energy as well as the enormous potential of hydrogen. Nanotechnology is definitely something you should pay attention because we're using it to solve many problems for which no solution today. Michio Kaku says nanotechnology as our chance of cure and the extension of human life, while Jacque Fresco says that using nanotechnology will be able to create a structure that we need, in principle, atom by atom.

Table 1. Comparative display of innovations (technical and economic) for the future according to the cited authors by 2050.

No.	Cited authors			
	Shape of economy / Future innovation	Michio Kaku	Jacque Fresco	Jacque Attali
		**********	Resourced based economy	Relational economy
1	**Information technology**	Global network through contact lens	Cybernetic "government", the central computer that controls all the resources	**3 core wavesof the future**
2	**Transportation**	Cars without drivers Maglev trains	Electric cars, computer navigation Maglev trains VTOL aircraft	**Hyp[illegible]pire** Loyality to yourself Firms without national labels „Poor“ market Contracts replace laws Movement of large masses o[illegible] nomads in search of work
3	**Energy**	Solar / hydrogen economy	Wind, waves, tides, ocean currents, geothermal energy, solar energy, hydrogen, bacteria, phase transformation termionic, Fresnel lens ...	**Hyper-conflict** Global conflict in which will crystallize all other conflicts Is a product of hyper-conflict empire environmental, ethical, economic, cultural and political certainty
4	**Nanotechnology**	Particular use in medicine, with the help of which will eradicate many diseases	Nanotechnology machine, getting the desired molecular structure	**Hyper-democracy** The establishment of a new balance Gratuitousness, access to knowledge Relational economy

This comparative review would not be complete if we did not perform another comparison, comparison of economic innovations by Jacque Fresco and Jacques Attali. In fact, Jacque Fresco says that our future economy based on resources, while the other gives Jacques Attali forecast economic future of the world in three main waves and these are – hyper-empire, hyper-conflict and hyper-democracy. Hyper-empire is already at the door, and in addition provides for the relocation of the weakness of the American center of power in other parts of the world, there are numerous features that are closer to describing and as such it will inevitably lead to a global scale, called hyper-conflict. If we make a comparison between today situation, resource-based economy and the economic wave of the future by Athali notice that there are some overlap. Specifically, in order to create a basis for resource-based economy, which in today's monetary world is impossible, it is necessary to crash happens on a

global scale, which will require a new system to restore social balance. The collapse, or the collapse of the monetary system, it can be identified as hyper-conflict. After said wave, it will perform hyper-democracy which is characterized by favoritism gratuity, promoting knowledge and relational economy and all these features are very similar if not the same, the characteristics of resource-based economy all of the resources of the planet is treated as a common heritage of all people. The resource-based economy resources are free, available without monetary restriction. Human knowledge is presented as a key resource, and on the other side of Jacques Attali as a characteristic of hyper-democracy states increased access to knowledge and the creation of universal intelligence. From all this we can conclude that the resource-based economy or hyper-democracy is our future but to reach it, unfortunately, we will go through the hard way of the world collapse or hyper-conflict.

4. CONCLUSION

With the development and advancement of science and technology, in the future, more and more decisions will be left to machines. Today's computing capacity exceeding 5000 billion of information per second, yet computers are still quite primitive compared to those that will arise in the future. Presented with the innovation in this paper today, may seem like science fiction, but for generations to come, will be a daily occurrence. The future does not depend on our current beliefs and social customs, but will continue to develop a set of values that is unique to that particular time. Utopias do not exist. The notion of utopia is static. However, the survival of any social system depends on its ability to allow the necessary changes that will improve society as a whole. Pathways we chose will ultimately decide which direction we are moving. Finally keep in mind the fact that history took place in cycles, with more or less similar phenomena, and we can predict our future and if we look at historical trends. Only when we analyzing detail and understand it, we'll be ready for what the future holds. One thing is for sure - in the halls of the past, are the keys to our future.

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LIFELONG LEARNING AS A FUNCTION OF SUSTAINABLE DEVELOPMENT

DOŽIVOTNO UČENJE U FUNKCIJI ODRŽIVOG RAZVOJA

Klaudija Milenković, Vesna Jovanović, Jelena Vulićević

Abstract: *Irresponsible attitude towards the environment and the rational relationship to natural resources caused environmental crisis and threaten the survival of future generations. Education is a fundamental resource that leads to the development of society and the improvement of quality of life and is central in the implementation of environmental protection and the realization of sustainable development. Education for the rational exploitation of natural resources, as a new paradigm of social development aims to redefine man's relationship to the environment. What is the extension of moral principles and the formation of a new value system of man in relation to nature and the environment. The paper emphasizes the contribution of lifelong learning to a sustainable -rational exploitation of natural resources.*
Keywords*: lifelonglearning, sustainable development, human resources, education*

Apstrakt: *Neodgovoran odnos prema životnoj sredini i neracionalan odnos prema prirodnim resursima, izazvali su ekološku krizu i ugrozili opstanak budućih generacija. Obrazovanje je osnovni resurs koji vodi napretku društva i poboljšanju kvaliteta života i zauzima centralno mesto u sprovođenju zaštite životne sredine i realizaciji održivog razvoja. Obrazovanje za racionalnu eksploataciju prirodnih resursa, kao nova paradigma društvenog razvoja ima za cilj redefinisanje čovekovog odnosa prema životnoj sredini. Ono predstavlja dogradnju moralnih principa i formiranje novog sistema vrednosti čoveka u odnosu na prirodu i okruženje. U radu se ukazuje na doprinos koji dozivotno ucenje ima na održivo- racionalnu eksploatciju prirodnih resursa.*
Ključne reči: *doživotno učenje, održivi razvoj, ljudski resursi, obrazovanje*

1. INTRODUCTION

Numerous changes of civilization marked the entry of modern man in the third millennium a series of problems of global character. Modern man is the most difficult exam in the course of its development - how to overcome the crisis caused by the limitations of humanity reserves of natural resources as renewable and non-renewable, to prevent the crisis of energy sources, environmental pollution drastically, and other environmental problems such as global warming, climate change, demographic explosion, hunger, poverty, social inequality, brain drain, keeping the environment. New global problems are not just to ensure sustainable development, but to overcome the economic growth model, a philosophy of progress and modes of consumption that makes the man more and more alienated from its outer and inner core, and lost human values and how to make today's modern man to constantly learn because just learning can help to conserve natural resources. It has become clear that the current economic and social development trends are not sustainable and that education is crucial to the development of society towards sustainability.

Each national economy and its long-term growth depends almost entirely on the quality of its human resources. In this case, the use of these resources and invest in their quality is the primary factor in the development. Benefits, but also the challenges of globalization appear, open competition, and information technologies that are all of this and allowed. The limitations are in the demographic structure of the population, as well as the legacy of

negative selection of personnel, the rigidity of institutions and legislation that today hinders progress and positive change in society. The concept of lifelong learning and human resource development of a society encompasses and coordinates the various forms of learning at all stages of life. Today, education is considered to be the condition for the survival and development of modern societies. Those who survive are the easiest to adapt and adopt the first newspaper.

2. EDUCATION - BASIC POSTULATION OF DEVELOPMENT

The development of global civilization has led to the problem of unsustainable social and economic life, and exploatation of natural resources and their resolution requires a direct link between environment and development as essentially inseparable. When talking about this phenomenon refers to the concept that implies respect for the interconnectedness and interdependence of economic, technological, social, environmental, economic and cultural development, as well as placing the environmental and quality of life at the center of development activities. All that are guidelines for setting objectives that should govern the future development on which to base relations to environmental responsible and rational relations to natural resources if we want to avoid ecological crises. Search for them indicates the necessity of education, that the underlying assumptions of the basic prerequisite for achieving sustainable development. After moving from the information society to the society of the present-creative knowledge society, education is significantly expands and becomes more complex, while going deeper and deeper into the future, that is, becomes a "force" that will transform the future of human society and show him the true value. Education for the conservation of natural resources, and education for sustainable development must: [1, page 5]

1. Include all levels of education, and introduce him to all the forms of teaching and multiple activities living
2. Continue working in organizations through training in order to reduce the chances of damaging the environment workflow
3. Empowers people to passive protection, but also empowers citizens to planned development environment with all its resources and formations
4. Instill understanding of man's destructive powers, limited fuel, mineral resources and land
5. Learn about the specific consequences of human activities some of its causes in regional and planetary

3. EDUCATION AS A FUNCTION OF RATIONAL USE OF NATURAL RESOURCES

In developed countries the main development resource is human capital, and its quality being determined by education and training, which should contribute to sustainable national development in order to create a rational relationship to the preservation of natural resources and thus environmental responsibility and continuous development of individuals and society. All developed countries education and human resources are considered a national priority, and implement the development strategy of lifelong learning which contributes most to the economic and cultural development of society, as well as the personal development of its members, and sustainable development. [2, page from 87 to 91] All of this new direction for education, human resources andmanagement of natural resources in addition to the education

of children and young people impose the need for informal, self-education and informal education. It is estimated that the country whose development policy is not based on the concept of lifelong learning convicted of economic and political marginalization, and the excessive exploitation of natural resources. The contribution of education and training conservations of resources is generally recognized fact. The contribution of education and training development is widely acknowledged fact. Research shows that investing in education and lifelong learning of individuals and companies a profit that is comparable with investments in physical capital. An increasing share of services in the economy, the speed at which technology is changing, growing share knowledge and information in relation to the value of production and the level of economic restructuring in favor of investment in lifelong education, which is essential for the sustainable development of society and economy. Each additional year of average schooling in developed European countries would immediately lead to an increase in economic growth of about 5%, or a long-term increase in growth of 2.5%. In the nineties, greater investment in human capital has led to an annual growth rate of 0.5% or more in several EU Member States compared to the previous decade. There are many factors that affect the increase in the share of education in the economic development of a community, the nation, the state, it will enable the company to rational use of non-renewable resources, and these factors will be presented in the table 1.

Table 1. Factors influence the share of education in economic development for sustainability

Factors influence the share of education in economic development for sustainability
Competitionand dynamism
• the key role ofeducation in attracting talented and retentivity
Development of human resources
• increase and better jobs
Social Inclusion
• availability of employer-funded training to all social classes
• investing in people
Regional politics
• development of human resources as a tool to reduce the gap between more and less developed regions
• education and human resources necessary for social and economic development
Globalization and global competition
• the need for training of skills and expertise in order to promote employment
• an increased level of investment
• Parallel reform process to increase the quality and appropriateness of education al institutions, universities
• education programs for adults and professional training programs
Demography
• birth rate-with old populations tend catching up with rapid technological changes
Investment in education and training
• private investment in vocational education
• training for Adult Education
Investing in a newly established skills-must be available to all age groups, racial digital literacy
• learning to learn
• social and entrepreneurial skills
• language learning
• the potential of information technology
• new electronic learning methods

3.THE IMPORTANCE OF EDUCATION

Knowledge and education as a process, a significant impact on improving the quality of life, improvement of living standards and conservation of natural resources. The importance of education and nurturing intellectual capital of a community, there is a comparison of nine richest and most prosperous states list of nine of the poorest countries in the world, established on the basis of observations of two elements: the average life expectancy and the percentage of literacy in these countries. Data clearly indicate that this is about "two different worlds". Dependence of the quality of life of education becomes even more impressive when put into focus the life expectancy. Poor countries become poorer because the funds that should be spent on education that they spend on debt repayment due to the high indebtedness of the even deeper crisis and the vicious circle of illiteracy continue constantly. In Serbia, the illiteracy very strong, and that because of neglect of the concept and application of intellectual capital, which in recent decades has led to a "brain drain" and out intelektutalne Serbian elite in the country that has provided better conditions for living and working. However, it is important to note that education is not important in quantity, but quality, which is best illustrated by recent surveys conducted by the EU institutions. Research has shown that over 25% of children living in the EU thinks that cotton grows on sheep, and as many as 10% could not say which is the capital of the country in which they live. In the modern world, knowledge has become the most important resource, and fostering the intellectual capital of the nation is a guarantee of progress in it.

Figure 1.Comparison of the nine richest and poorest countries in nine

4. "BRAIN DRAIN"

Underdeveloped societies, including Serbia, an enterprise in which the unemployment rate is high, growth is slow, low economic status, ecologic and social crises with no possibility of achieving personal ambitions of qualified staff. Serbia, like many developing countries inherited a social, political and economic crisis whose causes wars, sanctions and inflation, unsustainable consumption of natural resources, political instability and scientific and technological poverty. The consequences of leaving young intellectual labor in the developed countries of the modern world are visible to the naked eye, which can be identified in all areas of social life. Any company that invests in the development of human resources with high professional competence, it is expected that the investment return through their work in local institutions and organizations. However, if a number of such personnel move in developed societies in the pursuit of "better" conditions of professional and social life, then it is probable

that the economic, cultural, and scientific development of the societies be obstructed, delayed, corrupted, unsustainable. Migration of the intellectual elite, by which the Republic of Serbia is a country of emigration and "brain drain" affecting the economic and social development of the nuts and destination countries. All this leads to global problems in their home countries will slow down the transition of the economy and society, it is today an increasing challenge of the modern world. Spatial increasing migration more complicated connections and relationships of migration of elements within the demographic structure, and their influence inefficient use of resources available and thus the sustainable development in their home countries and in the world. The brain drain implies the need for society to concrete empirical knowledge about the essence and purpose of the movement of young professionals in order to speed to overcome negative trends are accelerating the demographic recovery systems, for the country to develop sustainable nut. In order to prevent the "brain drain", it is necessary to spread public awareness about the necessity of saving the intellectual elite in their home countries, to their knowledge directed towards sustainable development, and advocated the necessity of lifelong learning. Consequently, all the conferences and summits on sustainable development argue that sustainable development is impossible without life-long learning and that everyone should be involved in the lifelong learning.

Table 2. Raising public awareness of the necessity of lifelong learning for sustainable development

Objectives of Education for Sustainable Development
Social understanding the principles of sustainable development • understanding and developing a sustainable concept from vision to implementation in practice
Modern education for sustainable development in all areas
Lifelong learning for all people • improving knowledge • readiness for innovation • continuous learning-either formally or informally, or some other form of learning • accessible and well educated
The importance of education for sustainable development in all countries • improving the social, environmental and economic skills and knowledge innovation of existing education programs • promotion of the values inherent in sustainable development
Specialized training programs • to ensure that all levels of society to have the knowledge, skills and habits for sustainable living
Achieving the main goal of education for sustainable living • training people to fight for the positive, desired changes in the environment inhabited by • dedicated, active and resourceful approach to the process of sustainable education

5. LIFELONG LEARNING AND EDUCATION FOR SUSTAINABLE DEVELOPMENT

The road to sustainable development is a complex process that requires the world to engage all sectors of the social structure. Sustained efficacy is directly related to continuous learning and lifelong education of all members of a community, with the basic idea of success of education for sustainable development to values and knowledgekeeping natural resources for future generations. The essence of this relationship is in the sentence Lau *"... the hill of knowledge without values is not nothing but a heart full value and with a lean knowledge powerless ..."*. [3, page 136] Education for sustainable development and responsible attitude

towards the environment and the rational use of natural resources requires life-long learning, not just formal but also informal, self-educated and informally, that the developed countries are almost equal four types of learning that make up the structure of lifelong learning. To learn anytime, anywhere, the company is turning into a society of learning, which is particularly evident in the countries in transition, which is carried out so that the people now activated in order to preserve the natural resources already spent, not waiting for the future generations care for all. Only a holistic approach to education as defined in realizing his individual of local level results and the relevant local behavior will enable the cumulative effect of the express purpose of achieving the objectives set at the system level, or to achieving goals of sustainable development throughout the world. It is of local communities in creating sustainability through education pay special attention to the environmental, economic and social conditions in the community, and a responsible attitude to resources, because there is no general scheme of education for sustainable development, which can be applied in all states, regions or cities. It is impossible to project dealing with traffic problems in Shanghai, is the same as a project that deals with the use of solar energy in Serbia. Africans who live without electricity not only has different problems in their environment than someone living in the urban center of New York, but has a different cultural techniques and mechanisms to combat these problems. Concepts of education which are ignored these differences are doomed to failure before the beginning of the application, and the concept of sustainable development is meaningless if it can not be realized as a common practice in the community in which each individual is both passive and active part of the community.

In many countries, the current level of basic education is too low which seriously hinders the implementation of national plans for sustainable future. Unfortunately, the lowest quality of education is often in the poorest regions and communities. Insufficient or poor education seriously reduces the opportunities for the development of plans for short-and long-term sustainability. In order to develop the state, it is essential that primary education focusing on sustainable development and to increase training opportunities for students to analyze and identify problems in their community, to think critically and reason in order to assess the data that are important for achieving sustainability. Shift towards lifelong education requires teaching and learning that will motivate children, youth, and all the generations of today to pursue sustainable livelihoods, participate in a democratic society and live with a sense of responsibility towards the environment. Education for sustainable development, rather than as a learning adoption behavior based on their own experience requires innovative learning that emphasizes the necessity of prediction, as opposed to passive adaptation to the current, which is necessary to raise public understanding and awareness as one of the top priorities in education for sustainable development. Modern media can create enormous possibilities of allowing event simulation based on the available information, creative problem solving and critical thinking that are essential in the context of the goals of lifelong learning and learning for sustainable development. Also, it is necessary to reorient higher education to rational use of natural resources, with the resolution of problems relating to the environment, and orientation towards sustainability is an important element of quality as an indicator of the degree of commitment of students to gain an advanced and modern knowledge, abilities and skills that are to sustainable social, economic,ecological and development. For the purposes of lifelong learning in terms of sustainable development is necessary to define the strategic plans and take action to improve sustainability: maximum conservation of resources and their

rational utilization, improved resources, regulation and adaptation of space, willingness to change, increasing awareness of environmental issues.

Education for sustainable development, which refers to the theoretical discussions and lectures on sustainable development and education for sustainable development, which involves the use of education as a means of achieving sustainability, differ from each other. In times of crisis, the theoretical debate on sustainable development are certainly necessary, but not sufficient, is necessary as a means of education as a fundamental instrument for achieving sustainable development. Education has specific goals and objectives in the function of certain social interests and needs. The concept of education for sustainable development - the world will be a better, safer and better for present and future generations.

7. EDUCATION AS A FUNCTION OF SUSTAINABLE DEVELOPMENT - YESTERDAY, TODAY, TOMORROW

Total of human knowledge is created by in in 1900. year doubled up in the 1950. years. Since then, the whole of human knowledge doubles every 5-8 years. This fascinating figure except that in itself is interesting, has immense implications for the daily life of every individual and social and community. Social plan this "explosion" of knowledge has resulted in the country and the individuals who are newly won knowledge available to acquire high potential for the continuous improvement of the living standards, quality of life and wealth in general. On the business life of individuals, organizations, countries and the world observed the whole of this vast, rapid and daily changes affect the way that in every way and significantly alter the current way of life. At the beginning of the 21st century there is a huge change:

- Life, society and economy become more complex
- The time in which we live is unpredictable
- Nature of work is changing radically
- More jobs disappearing because of technological change
- Past may be less support and guidance for the future

Yesterday was characterized by manufacturing and non-manufacturing occupations where people shared the blue and white collar, which was one of the aspects of personality bypass roads and imposing drawn "clerical construction office." This company has not been able to find a subtle method to seamlessly and invisibly rational and desirable use civilization opportunitiesconservtaon of natural resources for education stifle the autonomy of the subject and the factors. Lack of factory "pollution" environment was partially preserved despite the lack of education of the population that would have an effect on sustainable development. Once the position is respected "*think globally act locally*", though perhaps unconsciously. [4, page 126]

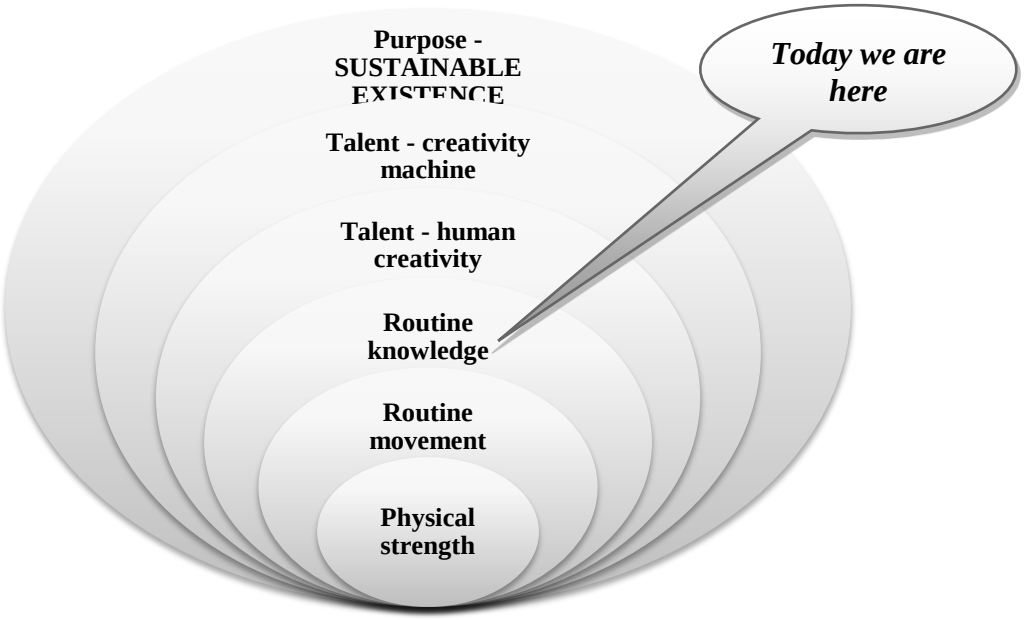

Figure 2. Education as a function of sustainable development-yesterday, today, tomorrow

Today, with the development of information technology society increasingly less attention is paid to the rational use of resources, promoting education for sustainable development is often underutilized. It is already difficult to predict what knowledge and skills will be needed and requested for the next ten years. How knowledge is doubling every few years, which means that knowledge of each induvidue need to double every two to three years just to "keep up" with the changes, and those not doing so will inevitably fall behind! Society in which knowledge is valued as a resource, investing in education and research, which was developed in the information infrastructure that is highly appreciated individuality, creativity and the ability of individuals and society are the innovative companies that are fighting for sustainable development, and such societies are prepared to act responsibly towards the environment, or to use the resources rationally. [5, page 165]The power that has been the main driver in the agricultural era was the first thing that people have created a routine that continued in the industrial age, when Charlie Chaplin in "Modern Times" showed the emergence of routines and the potential consequences, with routine greatly felt still in the education system that can not seem to grasp the importance of lifelong learning for sustainable development.

Tomorrow will be made on the division of those who know and those who do not know, the opposite of what characterizes today. The key competence of the latter will be the ability to sell themselves to the highest bidder, or to identify those who know how to engage the mand teach them that they know. All of this will enable global action all over the world, and routing developing countries from developed to lifelong learning, which is essential for conservation natural resources and environmental. National economies of the third world will then be able to participate in the global development of the world, in order to achieve this it is necessary to dijementralno opposing groups of producers who are characteristic of Dalekovod for today, we need knowledge workers. Give value to society by creating contrast and sustainable development with the main competence posit their knowledge and ability for lifelong learning. Future will mark the race for the professionals-the intellectual elite who can think independently and be creative, but also willing to spread their knowledge and share those who

do not know enough because without them there will be utilization of resources and the environment will be destroyed.[6, page 92] *Tomorrow is a lot closer than people think! The moment arrives tomorrow the world will change more and more drastically than ever.*

8. CONCLUSION

Society that wants to develop a sustainable an empty glass cup or a glass half-full, as if the glass is filled to the brim then all maximum utilization of natural resources and their continued use can completely destroy the planet earth. Constant changes in technology require that each company uses glass that it represents and to which nothing can stop, because it is full. Unfortunately, it would not be a problem if it is not filled with all sorts of things and that this "mishmash" does not attach too much significance. The full cup can not instill any more. Because entry into the spiritual waters also should mean emptying cups, or the start of a new era for continuous learning to upgrade the moral principles and the creation of a new value system of man in relation to nature and the environment. In order to achieve sustainable development of society, and thus improve the quality of life, one must throw out all the contents of the cup in order to acquire knowledge from which you can benefit. Like most other things, and it's just the idea is being discussed, but little of it does. In parallel with the realization of his ignorance and disengaging himself of what was recognized as harmful and useless company "enters" the exalted state of consciousness, because the content that dragged him down as gravitational influence, is slowly disappearing and are released from false beliefs, concepts, ideas and ideologies, or prevent irrational use of natural resources. Information and knowledge that can lead them to get umišljju achievements and gain a false picture that will be very difficult to break later, because her breaking causes severe pain and suffering. The background picture is wrong wrong motive and purpose, as well as incorrect understanding of information and knowledge that are accepted. It is therefore essential lifelong learning in terms of sustainable development, which offers a solution for the development and prosperity, but in a way that preserves the environment and preserve it for future generations." Nije dovoljno hteti, treba učiniti"

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IMPORTANCE OF MARKETING IN THE CONCEPT OF SUSTAINABLE DEVELOPMENT

ZNAČAJ MARKETINGA U KONCEPTU ODRŽIVOG RAZVOJA

Ana-Marija Đurić, Vesna Jovanović

Abstract: *At the beginning of the XXI century, the entire business philosophy is turning to the concept of sustainability and conservation of resources for future generations. Corporate social responsibility is concept in which companies integrate social challenges and challenges related to the environment. Thus, environmentally responsible and report on it can be seen as part of a corporate social responsibility. Special attention is given to ǵreen marketing," a new business concept that companies better position themselves in the market. This paper presents an overview of the concept of ǵreen marketing"and answer the questions in a situation where the company has a label that is ǵreen"is it really such activities are conducted to preservation of our environment.*
***Keywords**: green marketing, social responsability, natural resources, sustainable develompent*

***Apstrakt**: Na početku XXI veka celokupna poslovna filozofija se okreće konceptu održivosti, očuvanju resursa za buduće generacije. Društveno odgovorno poslovanje je koncept u okviru koga preduzeća integrišu društvene izazove i izazove vezane za okruženje. Dakle, ekološki odgovorno poslovanje i izveštavanje o njemu može se posmatrati kao deo ukupne društvene korporativne odgovornosti. Posebna pažnja se poklanja „zelenom marketingu“, novom poslovnom konceptu kojim se kompanije bolje pozicioniraju na tržištu. U radu je prikazan pregled koncepta „zelenog marketinga“ a i odgovori na pitanja da li u situaciji kada kompanija ima oznaku da je „zelena“, jeste li je zaista takva i koje aktivnosti sprovodi za očuvanje životnog okruženja.*
***Ključne reči**: zeleni marketing, društvena odgovornost, prirodni resursi, održivi razvoj*

1. INTRODUCTION

Humanity today faces many existential crises, including environmental crisis is especially important. To this day in the history of the development of mankind has not been possible to create an ideal civilization structure to avoid all crises. Environmental awareness is a necessary foundation for future, sustainable development of the environment. Protection and improvement of human environment is a significant global problem of modern society. Its solution initiates, including finding ways to rational and complex use of natural resources, and how to conduct an active demographic policy and to develop and promote international cooperation in the field of scientific research studies.

The limitation of resources, climate change, frequent earthquakes and floods, as well as many other changes in the environment have finally provoked a public reaction. At the global level are made many studies about the negative impact of people and businesses on the environment. Research shows that the situation is alarming and if they do not take strong measures and steps, there could be an ecological disaster. All these factors have encouraged the experts to consider new ways of working, ideas and strategies at all levels of the business organization. The business environment today is highly variable, uncertain and very risky, which eventually requires certain changes within each sector separately, including the segments in which it operates marketing. Accordingly, the need and desire for change led to the development of green marketing as one of the steps towards the betterment of society as a

whole. All marketing and advertising promotions are costly process. However, a new way of promoting a green marketing,through which producers sent a clear message to our customers about products and production methods and thus trying to create loyalty of their customers.

Turn of the century marked the beginning of intensive development of a sense of responsibility for the protection of the environment, and the parallel develops a need for a healthier diet. A fundamental shift in public opinion, which is more on the environment is not seen as something God-given, but as the only home that must be nurtured and preserved. World governments have reacted by introducing statutory regulation that fueled the development of businesses related to this industry. As a result, begin to develop concepts such as "Green Marketing", "Environmental marketing" and "Green marketing" as used in marketing products that are beneficial to the environment.

2. LIABILITY OF COMPANIES TO THE COMMUNITY AND THE ENVIRONMENT

The marketing concept has long existed as a business function that does not include the mandatory liability beyond economic and legal responsibility. The fast development of the economy and growth in the market place demands for an increasing number of different products and services, the production and distribution of a negative effect on the social or natural community, and developed economic conditions imposed by the need to increase the social responsibility of companies.

Corporate social responsibility is a responsibility to the community and the natural environment, and it needs to be refined moral responsibility. Realizing the implementation of activities that are social benefits to the community in which the company exists and develop their business. Social activities are the new marketing activities of this area interspersed with experience and practice in developed markets and have different characters, content and effects.

As the company operated environmentally responsible it is necessary to its economic and legal responsibilities are refined social liability company, or any marketing decisions must be examined from the standpoint of validity and justification. However, as much as is economically feasible any marketing decision that carries negative social consequences should be rejected or revised in socially justified. Consequently, social marketing assumes the stated requirement demands and interests of target markets as priorities of each company and delivering the desired satisfactions more effectively and efficiently than competitors in a way to maintain and extend the benefit of consumers and the community in which the company exists. [1]

When the business is focused on respect for social responsibility then it is impulse marketing ethics and humanity, and therefore social marketing as a core marketing concept consists: [1, str 48]

1. **Philanthropic Marketing - Marketing and Community**
2. **Green Marketing - Green Marketing and Environment**

Companies that use the concept of social marketing insist on accountability of all structures at all levels of the organization to the community and the environment. Philanthropic marketing is a part of social marketing, that insistence on accountability to the community as opposed to green marketing that insists on responsibility towards the environment. Philanthropy is produced in Germany as educational system in the 18th century, which is based on the development of the pure human nature. Philanthropic marketing means friendship, benevolence and benefit to each individual community that can be a consumer or any other actor marketing environment of the company. [2]

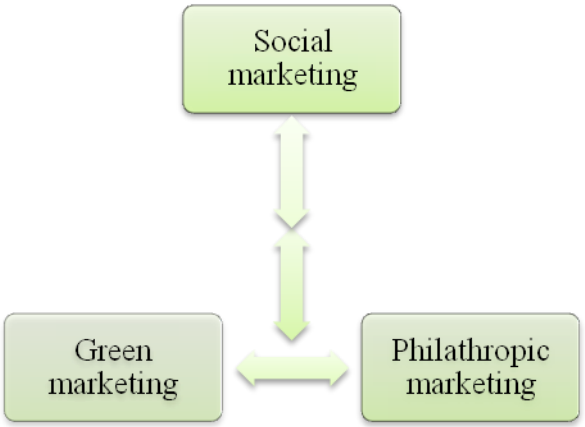

Figure 1. Concept of social responsible marketing

3. GREEN MARKETING

Nineties of the last century were called "environmental decade" or the "Decade of the Earth," because the environmental and social concerns significantly affect the purchasing decisions of consumers. Concern for the environment and customer needs for environmentally safe products, leading to the development of green marketing. The term green marketing occurs in the early eighties of the twentieth century in Europe, although its genesis postohjala long before the eighties, and in the U.S. occurs ten years later. originators of the study and application of green marketing producers are cutting-edge technology that are pushing the biggest polluters of the environment, and green marketing fidbeecku with ecology.

Figure 2. Green marketing
(source: www.google.com)

Green marketing has evolved in the movement for protection of the Environment - enivirоmentalists, which deals with the protection of the environment by eliminating the risk of exploitation of natural resources by minimizing their use and impact on environment pollution. New movement deepens enivirоmentalizma concept based on the environment, the natural environment and the overall human labor.

However, green marketing can be defined as a form of marketing that creates a challenge in itself, because of its definition in the commercial, social and environmental terms have somewhat contradictory meanings. Marketing of products that are presumed to be safe for the environment of man is the definition of commercial. The development and marketing of products that are designed to have minimal negative impacts on the environment or the improvement of the quality of the sociological definition. While the ecological definition applies to labor organizations to promote, package and produce products that are appropriate and acceptable for the environment.

Green Marketing is the marketing of products that are presumed to be environmentally safe, and it covers a wide range of activities, including product modification, changes in the production process, packaging changes, as well as modifying advertising. Green marketing, environmental protection and eco-marketing as part of a new marketing approach that will redirect, adapt or improve existing thinking and practice of marketing, but will provide a much different perspective. Legal implications of green marketing requires caution.

4. A ROADMAP FOR THE DEVELOPMENT OF THE CONCEPT OF GREEN MARKETING

The concept of green products, companies and marketing is still in its infancy and the vision necessary to monitor the implementation of activities, with views of management and strategy dictated by strict implementation of business policy. The most important thing is to develop a sense of environmental responsibility within the company to train employees to convey the feeling adekvazno to consumers and customers. All this raises the question of how promovistai green marketing and eco bebedne products and business. Does this mean the beginning of setting up recycling bins throughout the company or an ambitious building green office building? Of course, each company can decide for itself in accordance with its capabilities, but the employee must follow the ecological vision menadžmneta. Lately there has been a change in values and allocation of new consumer segments, where quality is more important than quantity, is not as important as short-term and not thinking more in the "I" but by "we", and in line with this new vision of the company should focus to new courses of action, that is, to focus on green marketing.
As the production of green products and introducing green standards in the company financially demanding, the main tasks are:

1. Finding ways to minimize the cost as it is not reflected in product prices, which would create apathy among consumers.
2. Educate target groups about what is necessary to produce the product and all its benefits to the price compared to the quality of a relevant and viable in the eyes of consumers.

It is unrealistic to expect consumers to express the cost of development and materials for green products because it is environmentally friendly concept is still in its infancy, and the benefits are still not clearly developed and explained.

3. Product positioning to justify the price, but that the company had set up as a market leader

It is natural that after the turn came a great position in the value system of the customer. The positioning must not rely solely on the environmental benefits, but it should be marketed as a value added product. In short, a reference to a person's environmental awareness and values will continue to sell the product are the primary criteria for the purchase of physical access to the product, price and comfort, while the environment was secondary, if at all present in the majority of customers.

4. Consumer education as an integral part of the marketing campaign

Highlighting the practical use of the consumer advertising of organic products, since a large number of green products have become part of the massive use because of its convenience - energy efficient machines and organic food.

However, based on experience in operating the largest and best known companies from different industries and national origin in the global market can be systematized activities and guidelines for the development and implementation of green marketing:

1. Use of natural resources
2. Rational use of energy resources
3. Reducing waste through reducing, reusing and recycling
4. An environmental packaging
5. Reducing pollution from transport activities
6. Protection of animals, water, soil and air

5. ECO MARKETING AS COMPANY ORIENTATION

Green marketing is a special challenge, because terms such as "green product" or "green company" are not fully defined. Globally, sincere concern for the environment, but also care about healthy diet will contribute to accelerating the legalization of these terms, which will make it easy for companies in an effort to complete its business environment and help customers choose the right products. The specificity and complexity of environmental marketing will require major changes in most companies that range from strategy management, planning products, the role of advertising in environmental management. The benefit of this is the fact that only the development of the entire environmental industry withstands the global economic crisis. In this sense, environmental responsibility and reporting on it can be seen as part of a corporate social responsibility, where marketing plays an important role in the introduction of new environmental products and promoting a healthy lifestyle with the aim of reducing the use of energy and material goods. We should not forget that green marketing involves collaboration with suppliers, partners and even competitors, in order to improve the environmental performance throughout the supply chain. In parallel, it requires the cooperation of all internal business functions in order to achieve satisfactory profits and long-term positive impact on the environment. [6]

However, from the perspective of the consumer, it should be noted that several aspects of the product leads to the identification of the buyer to environmentally friendly product. Most are

due to health concerns, the need for safety and security, energy, etc., and sometimes it's just a matter of status and prestige ─ desire to be different. The key to the successful marketing of ecological orientation involves taking into account all these aspects, which means that the company must focus on emphasizing the ecological value of their products or to meet customers. When you promote ecologically safe product it is necessary to emphasize that meets the needs of all clients, because when you reach this level should consider one of these key benefits that consumers expect from the product. [4]

Figure3.:Advanteges of „green“ product
(http://saibottechnologies.com/)

The moment you start the process of improving the environmental responsibility of companies, it is necessary to publicly share their commitment to environmental issues, because the mission to ecological responsibility competitive advantage that the company has, so it should be shared with customers, employees, suppliers and the general public by the to disclose:

1. on the website of the company
2. in working and showrooms
3. Signed in business e-mails
4. link to the website of the periodic informants and other printed publications

It is necessary to feedback information about the success of their environmental responsibility, as well as sharing the results of efforts with other stakeholders. Good tips will help to identify opportunities to improve the business, and also the achievements that provide diversity and what still needs to accentuate. Apart from informants and other forms of print publications, there are other options, especially social media and forms of communication. Regular use of the potential of the intranet to remind employees to environmental responsibility. Promotions, conferences, publication in newspapers, holiday cards, billboards, blogs, twitter, facebook ─ these are all forms of communication that will help promote environmental responsibility of the company. Do not forget that in his statement should include facts relating to the progress in terms of the contributions to environmental protection. [3]

4.1. GREEN WASHING

Green washing terimin that occurs when a company wants to fool their customers (and employees) false statements or information on the environmental impact created, you. There are a number of ways to implement enterprise greenwashing tactics: from slight misunderstanding to completely misrepresenting facts.

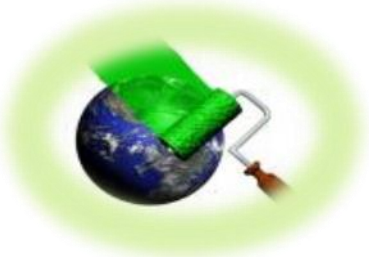

Figure 4 . Green washing
(http://dianevautier.com)

The "greenwashing" term was coined by Jay Westervelt, a New York activist for the preservation of the natural environment, in 1986. was used in his essay on the practice of the hotel industry for saving the natural environment. Westervelt noted that in most cases, little or nothing is done to reduce energy waste - as evidenced by the fact that this practice has not led to a reduction in price. It is therefore considered that Westerveld for many hoteliers, the real goal of this 'green campaign' any increase in profits. Westervald this and other acts which from the outside look like a reflection of ecological conscience, and whose hidden purpose of increasing profits, labeled as ekomanipulaciju, or in English "greenwashing," which translated in Serbian means green coloring and washing. [7]

The term is generally used when significantly more money or time devoted to advertising "green" and responsible behavior towards the natural environment and its protection but the implementation of these principles in everyday practice. Usually illustrates changing the name or product labels to represent nature or the natural environment of the forest-painting on a bottle containing harmful chemicals. Activists of nature conservation is often referred to as ekomanipulaciju shares of energy companies, which are traditionally the largest polluters. Norwegian Consumer Ombudsman automakers who claim that their cars are "green", "clean" or "friendly to the environment," promised the rules of advertising are among the strictest in the world. Bent over, clerk of the Ombudsman said: "Cars can not do anything good for the environment, but some can cause less damage than the others." Manufacturers risk fines if you do not leave out such claims in its advertising. Over said she did not know that any other country, went so far as disclosing relationships cars and environments.

However, it is possible to avoid, if ever in doubt, the company must honestly answer the following questions:

1. Do some form of polluting the environment over the legal limit?
2. Are exaggerated statements about the environmental results and performance of the product?
3. Whether the statements can not document the measurable evidence?
4. Do we meet an environmental aspect and tear down others?
5. Are environmental claims meaningful and clear?

Answers to these questions will help determine whether the moment that your product or service the company promotes itself as environmentally responsible. Honesty and accuracy of promotional messages, coupled with clearly defined benefits that consumers can get by consuming the product, is the key to a successful green marketing.

Many corporations already apply the principles of green marketing for better positioning of their brands. So the company Interbrand, publishes annual lists of the best global green brands. For the year 2011, by far the leadership went to Toyota, followed by Siemens and 3M. The ranking was done on the basis of the environmental effects of ukombinovanog with good environmental image that has been achieved among consumers.

Figure 5. Green marketing in Toyota
(http://gatewaytoyota.hubpages.com)

5. SWOT ANALYSIS OF GREEN MARKETING

In order to clearly comprehend the situation and assess the opportunities and threats of use of green marketing is best to do a SWOT analysis. Forces should be directed to the utilization of opportunities and minimize risk. Weaknesses need to minimize in order to exploit opportunities and minimize the risk comes from to the environment. SWOT analysis indicates the best way for orientation of resources and determines their structure. Allows you to get answers to the question of where the organization is located in the present, what its primary advantages - strengths and weaknesses and what are the possibilities of-way and that she threatened to reach the planned objectives in the future.

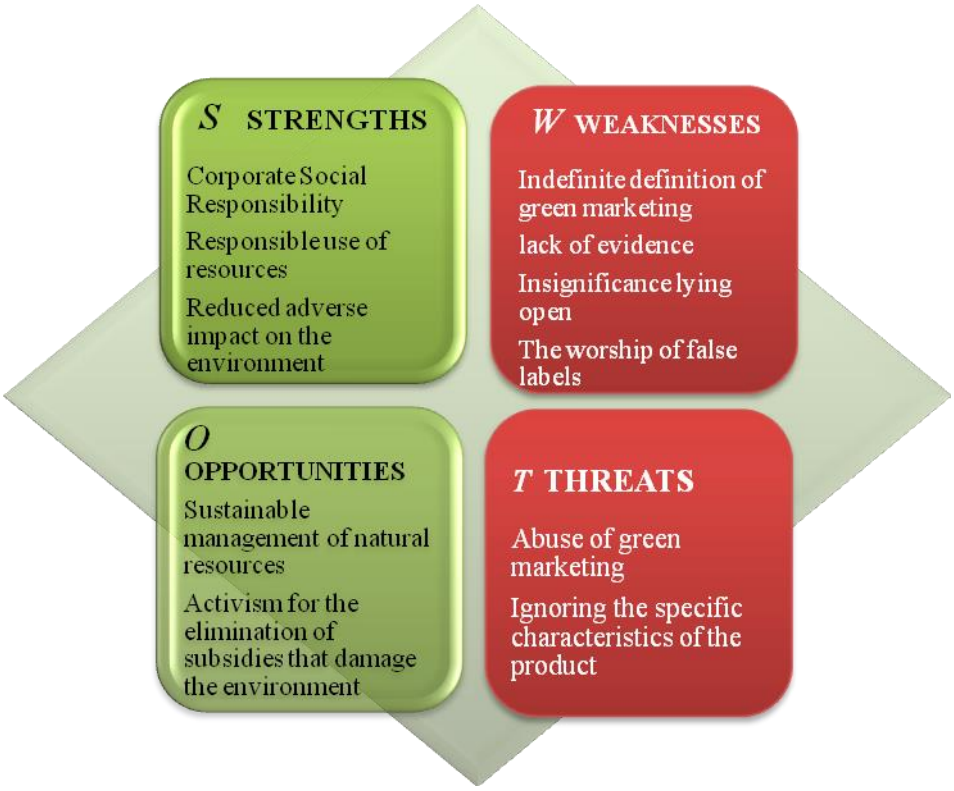

Figure 6. SWOT analysis of green marketing

6. DISCUSSION

From SWOT easy we see what are the strengths, weaknesses, opportunities and dangers of green marketing. We should certainly focus nasnage and opportunities, and threats and weaknesses minimized. Green marketing is a great opportunity for companies that want to be leaders in the market because in this way we protect the environment and sustainably manage the Earth's resources.

Information is the key to green business became the primary business model, which is important for several reasons. Sometimes people have prejudices and wrong are informasani on certain products and services. Indeed, the "greening" is primarily to raise awareness, with the most important to listen to the needs of customers and employees, and again work on its enrichment. Planting is easy and simple, when it includes a number of eligible shares instead nepododne "truth." Next, a little false premise is that "being green" is a process that requires a lot of sacrifice, investing a lot of money. Sacrifice and compromise will be, but judging by the new trends in the market that they become satisfied and economically rewarded by their green orientation and times are those that see it as a long-term transformation and investment choice, not a sacrifice.

7. CONCLUSION

Green business, green economy, green products, green marketing and green business ... ... terms that are increasingly dominated by the public, the media, textbooks, magazines, daily conversations, but do you really know their essential meaning? When business becomes "green business"? All the less believe that there is something limiting what green businesses or green product is. What is for one green, the other can be yellow or white and there is no precise tipping point after which an organization, corporation, company becomes green."Being green" is the unchanging attitude survives in a world of rapid change. "Becoming Green" is best seen as a journey and a process, not a destination and goal. Something like a friendship that grows stronger - right after all, that's not what we're trying to become - environmentally friendly? Entrepreneurs and business leaders around the world have focused their creativity and passion in order to find practical environmental solutions that will make the world a better place to live. "

"Whoever you are, whatever you education and wherever you are, there is a chance and possibility that awaits you to discover and turn into a profitable and successful outcome of green business and to become a part of the profound transformation that permeates the world."- unknown author

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CORPORATE PHILANTROPHY AS PART OF CORPORATE SOCIAL RESPONSIBILITY AND SUSTAINABLE DEVELOPMENT

KORPORATIVNA FILANTROPIJA KAO DEO DRUŠTVENOG ODGOVORNOG POSLOVANJA I ODRŽIVOG RAZVOJA

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Abstact: *Corporate social responsibility, as an integral part of a company's business strategy on one hand, and of the sustainable development concept, on the other, means that all the tasks and goals of a company are defined and implemented with respect to economic, legal and ethical principles. The essenceof corporate social responsibility, however, is notonly incompliance with regulations and standards, but much wider. It includes a proactive stance of the company and the so called corporate philanthropy, which is at the very top of the social responsibility pyramid.*
Keywords: *corporate social responsibility, corporate philanthropy, business strategy, sustainable development.*

Apstrakt: *Društveno odgovorno poslovanje, kao integralni deo poslovne strategije preduzeća sa jedne strane, ali i koncepta održivog razvoja sa druge strane, podrazumeva da se svi zadaci i ciljevi preduzeća definišu i implementiraju uz uvažavanje ekonomskih, pravnih i etičkig principa. Suština društveno odgovornog poslovanja, međutim, nije samo u poštovanju zakonskih propisa i normi, već mnogo šire. Uključuje proaktivan stav preduzeća i tzv. korporativnu filantropiju koja se nalazi na samom vrhu piramide društvene odgovornosti.*
Ključne reči: *društveno odgovorno poslovanje, korporativna filantropija, poslovna strategija, održivi razvoj*.

1. INTRODUCTION

The social responsibility concept has emerged as a consequence of great changes in all spheres of life when the world is facing a number of challenges and as a response to the accomplishment of the sustainable development concept. Striking a balance among achieving economic interests, social development and different aspects of the environmental protection is possible only if individuals and companies behave in a socially responsible manner. The paper offers the basic theses on socially responsible doing business and corporate philanthropy along with examples of good practice of socially responsible operations in Serbia.

2. APPEARANCE AND DEVELOPEMNT OF THE SOCIAL RESPONSIBILITY CONCEPT

Corporate social responsibilityis one of the newer concepts in management. In theory it was first mentioned in 1899 in *the Gospel of Wealth* by Andrew Carnegie. He was the first to point to the need of a company to help and enrich society and its immediate surrounding. At that time, the principles of charity and stewardship on which his view was based, were not widely accepted. The liberal doctrine of Adam Smith was rather more dominant according to which the only role of the company was to make profits while everything else was to be done by 'the invisible hand of the market'. [1]

Since 1950 a modern concept of corporate social responsibility has begun to develop in which the key issues are related to the moral principles and ethical behaviour such as: product safety, honesty in marekting, the employees'rights, possibilities to advance at work, the protection of the environment, etc. What has greatly contributed to this concept development are numerous human rights movements and organisations for consumer and environmentalprotection and the like which emerged in the 1960s. These organisations introduced new demands and requests that companies had had no obligation to pay attention to before. As a result, many companies began to take into account the safety of their products, they started protecting the environment and behaved ethically with interest groups they came in contact with. However, in the 1970s due to many problems (inflation and unemployment rise, oil prices increase, rising business costs, partly conditioned by previously passed laws on the consumer and environment protection) which endanger the normal company functioning, Milton Friedman readopts the classical interpretation of business according to which the only duty the company has is to make a profit and cheer up its shareholders. [2]

Corporate social responsibility (CSR) is a desirable marketing and business orientation in the long run. Its essence is much more than the mere words stated by the relevant laws; it is an idea that an inactive attitude to social problems ought to be replaced by proactive, voluntary and preventive activities so that limited resources are not to be spent on removing the consequences of illegal and unethical behaviour. The corporate social responsibility concept is not theoretically unambiguous. In practice, new trends such as the process of globalisation, the information and communication revolution, environmental problems, rapid development of civil society, etc have all encouraged research, discussions and the emergence of different theories which place this particular corporate responsibility development in a wider context. The existing theories in part rely on the development concept of social states, and are in part based on the development strategy of the economic sector in a new surrounding.[3]

The most often used definition is the one given by the World Business Council for Sustainable Development: Corporate social responsibility means reminding the business world constantly about the necessity of ethical behaviour and contribution to the economic development simultaneously improving the quality of life of not only workers and their families but the local community and society as a whole. The book *Corporate Social Responsibility - An Implementation Guide for Canadian Business*offers yet another definition: Corporate social responsibility is seen as a way in which companiesintegrate their social and economic interests and concerns about the environment into their values, culture, decision-making, strategies and activities, which helps make better practical operations, makes them richer and improve the society. [4]

Table 1 Evolution of CSR [5]

Institutionalization of CSR	**years**
Business in the Community founded	1983/4
Sastain Ability founded	1987
The Prince of Wales International Business Leaders Forum founded (IBLF)	1990
Group for the economic development of Amensty International founded	1991

World Business Council for Sustainable Development (WBCSD) Business for Social Responsibility (BSR)	1992
CSR Europe founded	1995
ISO 14000; World Economic Forum (WEF),Department of Civil Service	1996
SA 8000, Ethical Trading Initiative (ETI –) Global Reporting Initiative (GRI)	1997
The UK Government – appoints Minister for CSR The Copenhagne Centre	1998
Global Sullivan Principles	
UN Global Agreement	2000
EU Green Book WEF Initiative for Global Corporate Civil Service: Promotion of the European Framework of CSR	2001
EU – Statement on corporate social responsibility	2002
The Equator Principles	2003
ISO 26000	2010

3. THE PYRAMID OF SOCIAL RESPONSIBILITY

Social responsibility may be shown in the form of the pyramid of social responsibility. The starting point is economic responsibility, which means that only a profitable company (the one which has a significant income and market share) can play an important role in its industry and society as a whole. Legal responsibility means that the company operates in accordance with the law, regulations and expecations of the given state. Ethical responsibility means that the company operates in accordance with the expecations of the society regarding its ethics and current ethical principles. Ethical principles may sometimes change as times change but cannot be broken to reach business goals. A number of companies pays attention to etiquette regarding the actions that may cause potential or real harm (economic, mental, legal). Practice shows that unethical behaviour has negative consequences on the company's performance, perhaps not in the short run, but in the long run for sure. Philanthropic (discretionary) responsibility means that the company acts in accordance with the expectations of the society and different interest groups, and that it may be a donor or a charitable institution if required. The company should contribute to the development of culture, education, sport, etc. The pyramid of social responsibility is shown in Picture 1[6], while Picture 2 shows the key areas of corporate social responsibility.

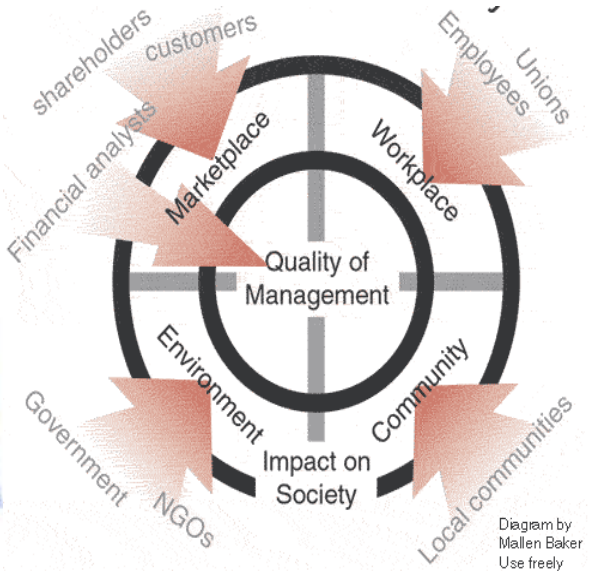

Figure 1. The pyramid of social responsibility Figure 2 - The key areas of CSR

4. THE STRATEGY OF CORPORATE SOCIAL RESPONSIBILITY

The strategy and promotion of corporate social responsibility in Serbia for the period from 2010 to 2015 defines the state of affairs in this area as a whole. As a country whose intention is to become a member of the European Union, the Republic of Serbia has a duty and obligation to accept the standards and practices of the EU which means that it has to adopt and promote CSR and its contribution to social harmony and sustainable competitiveness and development. The aim of the overall vision should be the promotion of sustainable business growth and development which encourage social inclusion and prevent environmental degradation. The government's role here should be focusing on the creation of such an atmosphere which would enable and encourage development, inclusion and sustainability. The vision of CSR includes the following:

- Using the existing good practices and models from the EU, particularly those practiced by the new member states and candidate states with the aim of developing CSR;
- Stimulating transparency, i.e. encouraging giving reports and public informing on CSR;
- Applying directly socially responsible practices in the situations when the Government has a role of an employer;
- Using proactively the international focus on CSR in order to attract and promote investments in the Republic of Serbia;
- Encouraging business, civil service and public sector organisations to use their influence and affect the economy, the society and the environment;
- Encouraging business, civil service and public sector organisations to undertake complementary actions to deal with the key challenges depending on their competences – at the local, regional and national level. [7]

Table 2. The goals and expected results of the CSR strategy

GOALS	EXPECTED RESULTS
Goal 1: promoting the CSR concept	- consumers take into account CSR aspects more and more when making decisions rgarding their purchases; - companies see CSR more and more as a possibility of developing competitive advantages; - most large companies recognize the importance and point of non-financial reporting;
Goal 2: developing the CSR practices	-a significant number of companies possess knowledge of how to apply CSR, particularly the ideas about the activities that could be undertaken and how they can be structured; - the civil service sector enters partnerships with business sector more and more and they range from acquiring finances to increasing awareness of the busienss sector about the importance of the relevant issues.
Goal 3: creating tools of encouragement and legal obligations that would ensure the development suitable for CSR spreading	-detailed rules, regulations and encouragement tools of CSR have been given

5. GOOD PRACTICE DATABASE OF CORPORATE SOCIAL RESPONSIBILITY

The concept of CSR is relatively new in Serbia and its promotion only began in the last decade. The research conducted in Serbia in 2005, 2006 and 2008 show that the knowledge of people regarding the need for CSR and of the concept itself has gradually increased from 2001. However, the majority of the population still does not understand the essence and importance of this concept and therefore pays little attention to it.[8] Even managers employed in Serbian companies are not much aware of the need for CSR (according to the opinion of a large number of managers, it is up to the state to take care of social problems) and do not pay much attention to organising their business in a socially acceptable way. Even the managers who say that CSR is important in their business operations mainly link this concept with various forms of one-off payments, since the majority of them see sponsorship and donations as the most apparent form of CSR a company may benefit from. Besides this, the majority of Serbian managers are not quite familiar with this concept (this is confirmed by the research in which many managers have not recognized that CSR includes a scope of

different issues such as women's rights, minority rights, rights of different social groups, discrimination etc.).
It is even worse in practice. CSR is mainly seen as a marketing tool which can be a powerful form of propaganda and possibly help build good reputation and is therefore paid no strategic importance. According to Good Practice Database, an extremely small number o Serbian companies (only 5) have a CSR manager, in some of them foundation executives are in charge of SCR, and in the rest in these issuesare the responsibility of the PR sector. Besides, the accomplished results of CSR usually do not find their place in the companies' resports; they are mainly published on websites or in the media. [9] According to the elements of the UE report, Serbian companies pay the most attention to engaging in the community. Most of the companies conduct research and then organise support programs andactivities to help solve local problems, but these are all periodical and one-off; only a small number of companies do this strategiacally and in the long term. Strategic cooperation is most often accomplished with universities and research centres (offering permanenet support to science and education) or they carry out joint projects with the local self government trying to improve health care quality. However, a far greater number of companies have no strategy or plan when participating or supporting community development projects (which are different and range from park arranging to supporting infrastructural projects such as road construction).

The development of CSR in Serbia can be shown in the following chronological order:

- In 2007 Holcim gave a Report on CSR, the first of the kind in Serbia,
- UNIDO, Smart Kolektiv and PKS organized the conference 'Corporate social responsibility in small and middle-size enterprises and advisory institutions in Serbia,
- BCIF introducedthe yearly award,VIRTUS, for corporate philanthropy
- The Global Compact Network in Serbia launched
- In 2008, PKS introduced Awards for corporate social responsibility
- After the suggestion of Smart Kolektiv and Serbian leading companies, Business Leaders Forum was founded
- In 2009, theMinistry of labour and social policies initiated the creation the national CSR strategy

The companies which are members of Business Leaders Forum: [8]

The main goal of Good Practice Database was to identify and systematize socially responsible practices in order to make them more apparentto the public and thus encourage other companies operating in Serbia to engage more. The data obtained after Good Practice Databasehad been created are a proof that there are significant differences among the largest companies in Serbia regarding their corporate social responibility practices when doing business as well as their will and readiness to develop themfurther. [9]

A relatively small number of companies, of all that the research covered, or more precisely only one-fifth (11 companies) have initiated a kind of fund or foundation as one of the forms of corporate philanthropy. This fact speaks volumes about a low level of institutional approach to philanthropic or socially engaging attitude of Serbian companies. The largest number, depending on the funds / foundations' sphere of activity, is dedicated to social protection, science and education, and culture and art (5 each). A somewhat smaller number is engaged in the environmental protection (3), then comes sport, health care and international cooperation development (2 each), while only one foundation has strategically chosen to deal with humanitarion aid and develop the local infrastructure.

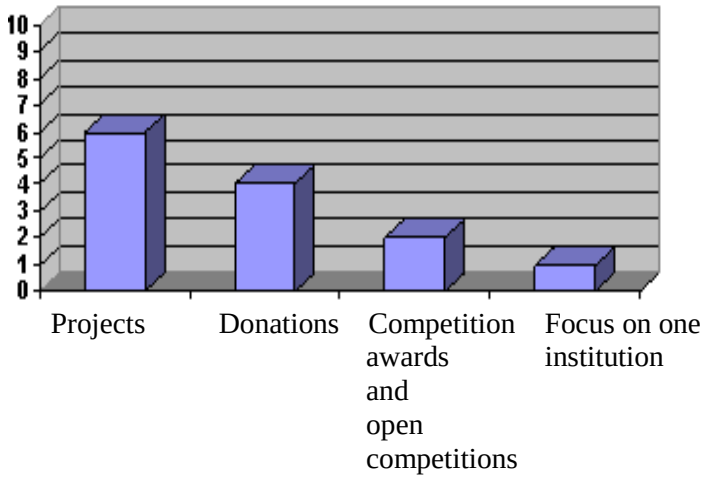

Figure 3. The way funds and foundations function

Of all the companies in the survey, the largest number has been engaged in giving tuitions and support to science and education in the last three years (46), or has taken part in hunanitarian or donor initiatives (44). Of the overall number, eight companies have no department within the company's organisational structure that deals with CSR. In the remaining 45 companies this issue is dealt with the communications department (corporate communications, marketing and PR) (24), and in 9 cases other departments dealing with businessin generalor develoment are in charge of CSR. The top-management is in charge of CSR in 6 companies (CEOs, board members) and in the same number of companies there is a separate CSR position (CSR manager, Fund / Foundation Executive, PR representative).

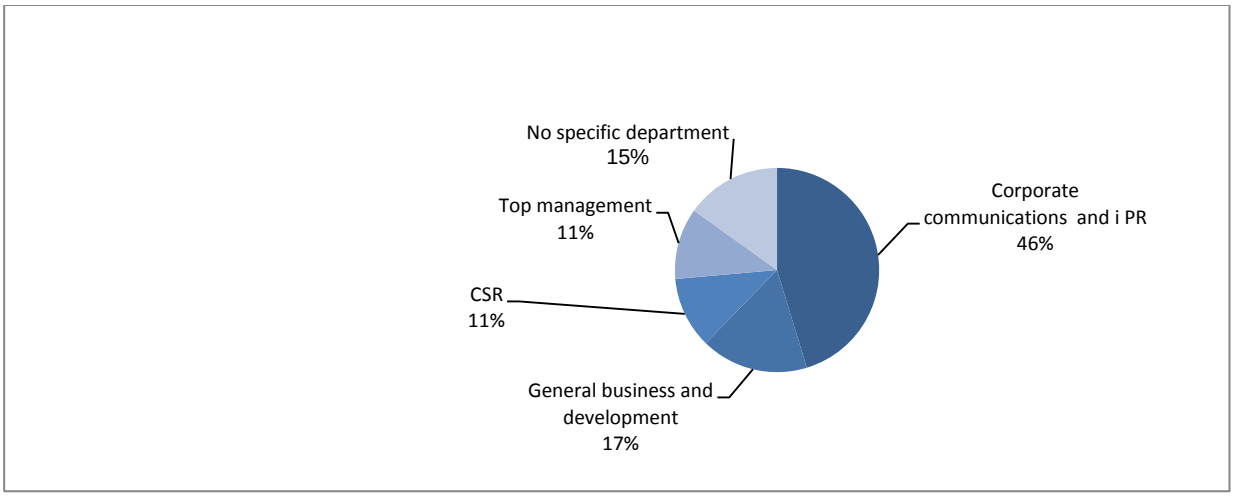

Figure 4. Departments in charge of CSR

On the basis of the obtained results, all the companies may be classified into three groups according to the degree of their CSR development : beginner, intermediate and higher. The **beginner** level make the companies in which some of the CSR activities have been encountered, but they have no permanent or organised systematic engagement. Talking about their organisational structure, there is usually no specific person in charge of CSR business dealings and there are no long-termed projects. 28% (15 companies) of the companies covered by this survey can be classified into this category. The **intermediate** level make the companies in which the proces of CSR system development has started and there is a clear determination to engage but has not been fully defined yet. What is characteristic of these companies in the sphere of social engagement is,first of all, their donor approach, which means that their activities are directed at donating institutions and organisations of different profiles, while diveloping long lasting partnerships with them is rather sporadic. 34% (18) of the companies covered by this survey can be classified into this category.The foreign companies are here also dominant making two-thirds, while the companies which are state-owned are relatively rare. The companies which fit into the third category – **higher** level – are characterised by an active approach and developed business strategies directed at the issues of CSR, which can be seen primarily in the existence of organisational units within the companiesthemself that are in charge of CSR and have clearly defined tasks and activities. In these companies it is completely clear who their stakeholders are and what spheres arepaidspecial attention to so all the undertaken activities are carefully planned and designed to initiate and develop long-term projects. 38% (20) of the companies this survey covered can be classified into this category. [9]

6. CONCLUSION

Corporate philanthropy is part of the corporate social responsibility concept and is one of the ways in which a company may successfully and clearly show its values and beliefs to its employees, partners, clients and the general public. Giving support in the form of money, products or services the company actually shows that it understands the needs of a wider community and society in which it operates. Corporate philanthropy is also a strategy as it

gives the basic strategic directions by help of which it meets the needs of both the community and society as a whole.

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GLOBAL SYSTEM FOR NATURAL RESOURCE MANAGEMENT

GLOBALNI SISTEM ZA UPRAVLJANJE PRIRODNIM RESURSIMA

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Abstract: *Let's imagine that we have a whole new planet like earth with all available resources, which is not yet settled with people and need to be regulated from the beginning. There is no states, cities, pollution, only primordial environment. Base of a new civilization should be sustainable and take into account the material needs of all people, and obviating all of which can be harmful in the long run. The resources that we need for life and are now on the planet, but in this case should call the help of information technology that will locate every available resource on the planet, as well as the quantity and availability. Starting in copper deposits, through the most appropriate place for the use of wind energy, clear water, the number of fish in the oceans, and the fertile soil on which we can breed a food. In addition to locating and identifying we need also actively monitoring of these resources.}What is dynamic balance, and what systems theory and how high is the significance of a global system for the management of natural resources, is aim of this paper.*
Keywords: *natural resources, global system, dynamic balance, system theory.*

Apbstrakt: *Zamislimo da imamo potpuno novu planetu nalik Zemlji sa svim raspoloživim resursima , koja još uvek nije naseljena ljudima i treba je ureditia od početka . Nema država , gradova, zagađenja, samo iskonsko okruženje . Baza nove civilizacije treba da bude održiva i da uzme u obzir materijalne potrebe svih ljudi , i izbegavajući sve što može biti štetno na duge staze . Sredstva koja su nam potrebna za život i da su sada na planeti , ali u tom slučaju treba da pozove pomoć informacionih tehnologija koji će pronaći sve raspoložive resurse na planeti , kao i količinu i raspoloživost. Počevši od lokacija naslaga bakra , do najpogodnijeg mesta za korišćenje energije vetra , lokacija čiste vode, kao i broja riba u okeanima , i plodnog tla na kojem možemo da uzgajamo određenu hranu . Pored lociranja i identifikovanja trebamo aktivno pratiti sve ove resurse. Šta je dinamička ravnoteža ,a šta teorija sistema i koliko je važan značaj globalnog sistema za upravljanje prirodnim resursima, tema je ovog rada.*
Ključne reči: *prirodni resursi, globalni sistem, dinamička ravnoteža , teorija sistema.*

1. INTRODUCTION

It is evident that human population consumes huge amounts of raw materials, which are necessary for his daily life. Uncontrollably wear can lead to a lack of which would be devastating for humanity. Nekontorlisana consumption of natural resources is the product of uncontrolled production. The first serious warnings about the uncontrolled growth of production and consumption of natural resources and increasing environmental pollution have been published in the book The Limits to Growth in 1972. But it was only after 20 years at the United Nations Conference on Environment and Development in Rio de Zainero, 1992, adopted the strategy of sustainable development, which places an emphasis on three strategic objectives: the preservation of the ecological balance, equitable distribution of resources between generations and Development nedvoljno developed part of the world. [1] However, after 20 years, we see great progress and compliance with the strategic objectives set forth in full. If we look deeply, we will notice that the ecological balance in the greatly disturbed,

resources, granted today, to the limits of thoroughness and undeveloped countries stagnating and not moving in the direction of improvement. If you want to do something for us, for the planet, we need to wake up and make a strategy to comply with the adopted goals of the UN Conference on the Environment, but also to elevate them to a higher level. We live in a time when information technology is all around us, in every aspect of our lives. However, if so, why do not we create an information system at the global level to simultaneously monitor stocks of natural resources and instead of people, performing efficient redistribution. Only in this way fulfill the adopted strategic goals that we can establish the ecological balance, to properly allocate resources and developing countries directed towards the development.

2. TODAY'S CONSUMPTION OF RESOURCES IN THE WORLD

The availability of natural resources is determined by supply and demand. According to the forecasts of the German Federal Institute for Geosciences and Natural Resources (BGR) and the U.S. Geological Survey, there will be for the foreseeable future general and absolute lack of natural resources due to limited supplies. However, due to the relative scarcity may be a problem of supply of certain resources, such as lead, copper, tin and zinc. So the key industrial sectors such as power and steel industries, there will be a shortage issue. The situation is particularly critical in relation to certain strategic metals, which will continue to be essential for the development of key technologies for the foreseeable future, and that is increasingly seeking to increase the price (the price has increased some 1,000% over the last five years).

At the same time, because of the concentration on a small number of supplier countries and a few countries in the value chain, the offer is subject to high risks. Antimony and indium are two examples. Antimony is mainly used as an alloying element for hardening metal as an additive for rubber mass, as the color. Significant reserves are located in China, Russia and Bolivia. Indium is widely used in the production of information and communication technologies (ICT), that is, liquid crystals are used to produce flat panels. This is a rare metal, while China is the main source of supply. Reliance on politically unstable regions creates geo-political risks. As is well known, about 70% of the world's oil and gas is in the "strategic" ellipses that stretch from the southern Arabian Peninsula, across the Caspian region in northern Russia all the way to the Yamal Peninsula. Although metal reserves far more evenly distributed around the world, there are also some addictions. Euromines-European Association of Mining Industries predicts increased rates of metal imports from the six countries in developing and newly industrializovanih countries such as Brazil, Chile, Peru, South Africa, the Democratic Republic of Congo and Zambia. The six countries will increasingly dominate the supply of mineral resources in the future (Figure 1).

Cooperation between Brazil, Russia, India and China (BRICS group) and other fast-growing economy is creating a new folder store raw materials, and these countries are increasingly influencing policy and funding resources market. Cooperation agreements concluded between these countries carry the exclusive right to this group. China and Chile, for example, signed a free trade agreement that gives China's long-term approach to about 50% of copper production in Chile.

Resources in international markets prices are currently at the highest level for the past few years. High altitude are recorded for nickel, which is used in the production of high quality steel, and above average price growth is happening in the markets of tin, copper and lead. Generally, the price index of raw materials on the basis of the U.S. dollar has increased in value by about 244 points in July 2007a. (Compared to 100 points in 2000), in other words, the prices of resources are more than doubled. This is evident from the jump in the index of price increases of resources between the 2000th and July 2007a. For the growth rate of 188% for non-ferrous metals, 200% for iron ore and steel, and 148% responsible for energy resources is especially China, whose demand is a key factor for the increase in prices in 2000. The numbers illustrate the Chinese economy hungry for resources in the past 12 years, China has achieved an average annual growth rate of over 10% and nearly 30% of GDP growth in the world since 1992. Despite some successful strategies that separate the resource consumption of GDP growth, and despite increasing its domestic mining activities, China is now the world's largest importer of raw materials, including the import of steel, copper, coal and cement, and is the second largest crude oil importer after the U.S. 's. Even if the growth rate stagnated Chinese demand is likely to remain high over the next few years.

The key factors are the demand for capital goods, the trend of urbanization, industrialization and the development of consumer demand. Analysts predict that the demand for raw materials to double or even triple in the period from 2020 to 2025. But focusing on the development of emerging economies ignores a major source of pressure on the resource constraint. Industrialized countries belonging to the Organization for Economic Cooperation and Development (OECD) are home to only 15% of the world's population, but account for about 56% of their total oil consumption, about 60% of the total gas consumption and about 50% of consumption of other raw materials. Consumption of natural resources per capita in industrialized countries is very high, but the consumption is still twice as high in China in absolute terms. It should also be borne in mind that the emerging economies are integrated into the world market and many companies that are in these countries import raw materials to produce goods for export. Generally, this means that access to resources is likely in the near future become tight and restricted. The world has no choice but to consider new strategies to deal with this situation. Poorer developing countries are at risk of becoming more distant from the world of economic development, while there will be an increase in conflicts world-wide because of its natural resources. [2]

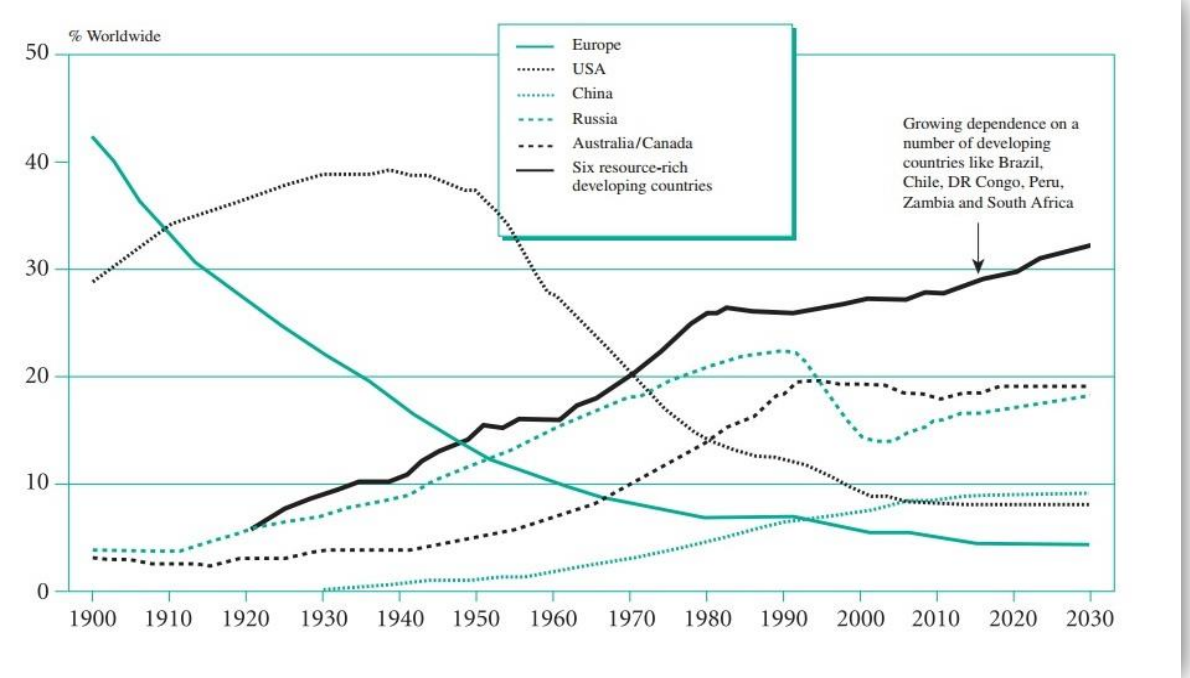


Figure 1. Incerasing importance of developing countries in the supply of raw materials Production of mineral resources of the period in 1900. -2030. the (*source: http://www.worldresourcesforum.org)*

Given the facts presented, we can see how, in fact, the need for the establishing an integral information system to the global state of resources is monitored and effectively manage them. Similar systems exist today, but have not been developed for a global plan, but to the smaller local areas. Such a system could be supported by GIS (Geographic Information System) technology, which make the resources of the planet unified software and disposed them up by hardware.

3. GLOBAL INORMATION SYSTEM FOR NATURAL RESOURCE MANAGEMENT

Geographic information system is defined as a computerized system for the collection, processing, transmission, storage and analysis of data with geographic references. In other words, it is a system for managing spatial data and their associated properties. More broadly GIS is a tool that is "smart cards" that leave enable users to ask interactive queries, analyze spatial information, and edit data.

GIS consists of four interactive subsystems:

1. subsystem that converts the input maps and other spatial data in digital form
2. subsystem to store and recall data
3. subsystem analysis
4. The output subsystem Irad maps, tables, and for providing answers to the given questions. [3]

Of course, this is a general model of GIS information systems. Global information system for the management of natural resources in addition to these, basic, element should contain additional sub-systems to be strategically focused and that could make decisions for people, but those that they be given time to the best possible solution. Only in this way can we stop the degradation of natural resources and to balance and thus preserve stocks of raw materials for generations to come.

We need start from the beginning. Imagine for a moment that we can make a whole new civilization. What if we discovered a planet completely identical to Earth, except that it is the more people showed up? How could there be opportunities. No states, cities, pollution, a primordial environment. What do we do? First we need a goal. We can say that the goal was survival, not mere survival, but optimal, healthy and prosperous life. Most people have a desire to live and to be free from suffering. Therefore, the foundation of a new civilization must be sustainable and take into account the material needs of all people, eliminating all of which can be harmful in the long run. If we aim for maximum sustainability, the question is how to achieve this. What would be our approach? The answer is in science. The scientific method is unique in that it requires that every idea, check and confirm and anything they come subject to disproof. Science has no ego and accepts that everything he came can not be rebutted. It is constantly reviewed and developed. How do we, the scientific knowledge that we have now and the aim of maximizing the use of resources, begin the process of building a global information system for the management of natural resources?

The first question is, what is us, the people, need to survive? The answer is clear, the resources of the planet. Needs of our drinking water, energy, materials used in the making of tools and homes. The country is a source of resources necessary for our survival. When we realize this, we need to know what we have and where it is located. This requires a large number of tests. You need to locate every resource on the planet and its quantity and availability. Since copper deposition through places most suitable for wind energy, the natural water source, the number of fish in the oceans and fertile soil in which the food is grown. However, as we will use these resources, we can not only locate and identify them, but to follow them. It would be very bad if we run out of something.

You should follow not only exploitation but also the rate of renewability of resources: how much wood needs to grow or source to be amended. This is called "**dynamic equilibrium."** If we cut trees faster than it grows, we have a serious problem, because it is unsustainable. How to make an accurate inventory, especially when resources are scattered across the globe? Large mineral mines in Africa, sources of energy in the Middle East, tidal potential on the coast of North America, and the largest source of fresh water in Brazil. Again we called to the aid of science: it is the "system theory." which says that the entire fabric of the natural world, of man over the earth's biosphere, the gravitational solar power system is one big pair of system synergy. Because one cell forming organs, and organ systems of the body, for which the survival of the planet's essential resources, food, air and water are vitally connected to the Earth. Nature is to make an inventory and tracking data to to manage the system.

Global System for management of natural resources would include every resource on the planet. There is no alternative. If our goal is to survive in the long term, we need to take care

of everything. You need also to address the production. Another issue is how to use resources located? What is the production process and what to pay attention in order to tailor it to maximum sustainability? The first fact that comes to mind is that we need to keep everything. Resources of the planet are not limitless, so is an important strategy. Strategic protection is absolutely necessary. Secondly, we recognize that some resources are suitable for use by others. The fact is that the use of some of them is destructive to the environment, and thus our health. For example, oil and fossil fuels as long as they use it, releasing harmful substances into the environment. Therefore, we should use them as rare as we can, and the best ever. Fortunately, we have solar energy, wind, waves, tides, temperature difference, geothermal able to make such a strategy to avoid the so-called spending. Negative retroaction, all of which can harm the environment, and even ourselves. Let's call it a **"strategic security".** However, it is not enough. We shall also need **"strategy effectiveness"** for the actual mechanics of production.

There are three protocols that you absolutely have to respect:

1. Each item must last as long as possible. The shorter the duration we will need more resources and make more waste.
2. When something breaks down or stop for something to be used, it should be recycled to the maximum. This protocol must be observed during the whole manufacturing process.
3. Technology such as electronics, fast-growing and fastest-barred, to make that kind of thing that can be easily rewritten. No one would want to throw the whole computer because it's one of the canceled or obsolete. You need to make custom parts, standardized and universally interchangeable, which are in line with technological trends.

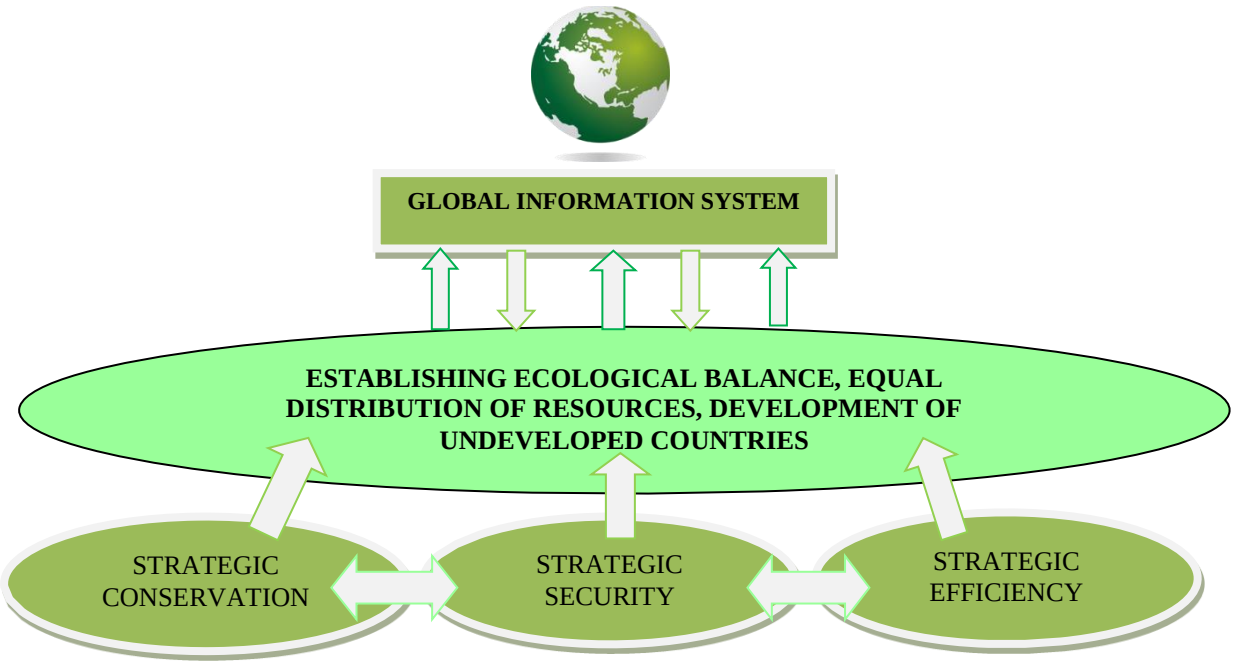


Figure 2. Schematic representation of the global information system

When we understand that the **"strategic conservation," "strategic security"** and **"strategic efficiency"** purely technical issues liberated attitudes and prejudices of people, I'll throw these strategies into your computer and perform relevant calculations and allows us to find the absolute best method for sustainable production. Although it may sound complicated, it's just a calculator,a flexible system for decision-making and monitoring, as is sometimes the world is already in use. Our only would be much higher. So, it is a system for the management of natural resources and production management system, which are computerized to the highest efficiency, conservation and safety. The human mind or set of minds can not follow all of the information that must be followed. It can and should work computers. [4]

However, we need to be clarified and distribution. Which strategy makes the most sense? The shortest distance between two points is a straight line, and transport machinery requires energy. The smaller the distance, the greater the efficiency. Produced on one continent and sent to another only makes sense if the production of a region is impossible. Otherwise, we are at a loss. If we localize the production, transportation would be easy, fast and energy would be spared. It's called "**strategy of proximity***", and means to shorten the maximum time of goods, raw materials and finished products.* Of course, we know that good transport it and why. This falls into the category of demand. Demand is what people need to be healthy and live well. Material needs of people ranging from basic necessities such as food, clean water and shelter, to things for recreation and relaxation, which are important factors in the overall health of the individual and society. We'll have an investigation. On the basis of human needs will establish the demand and production will start. Since the demand will vary across different regions, we will need a system to monitor demand and distribution, in order to avoid surpluses and shortages.

This is not a new an idea, they do all the major retail chains in order to have their stocks just now thinking globally. However, we can not understand the demand if you do not really know the utilization of goods. Is it logical and sustainable that everyone has a piece of everything produced, even when it does not? No, that is prodigality. If we needed anything, on average, 45 minutes a day, it is much better to be anyone available when it is needed. We forgot that the goods are not the goal, but a means. When we understand the importance of goods only its purpose, we see that the restriction which we now call the property, economically wasteful and environmentally illogical. Therefore, you should design a model of strategic accessibility. This would be the basis of our "system demand and distribution." The goods would be available whenever and wherever the any of us need. Within the supply network, the central and regional centers are located close to the place of residence would be functional solution. Anyone could come in, take an item, use it and return it when no longer needed, similar as libraries. Except locally, in a residential area, similar centers supply special-purpose there would be in an area where some goods are often used, in order to save power transportation. [5]

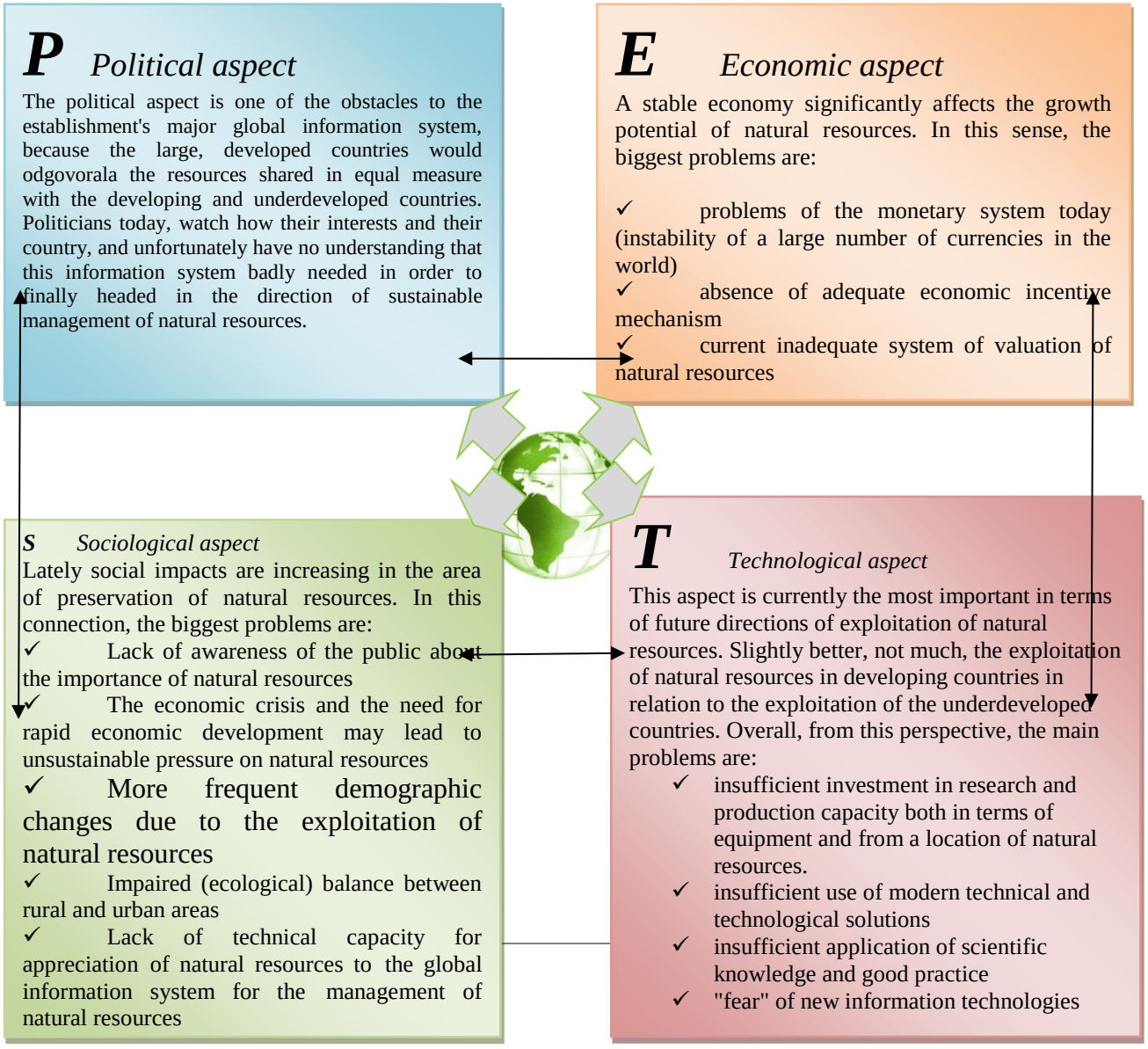
The monitoring system of demand linked to the system of production management, and system management of natural resources. They would form a single global control machine for balanced supply, which would secure the sustainability concerns of our limited resources and producing top-quality goods strategically designed to distrubuirala the smartest and most

efficient way. The uniqueness of the approach based on conservation, otherwise all the previous, is that this is a logical, thorough, empirical process of conservation and efficiency, which provides the only sustainable life on the planet, and can bring something unprecedented in human history - an abundance, not only the availability of all small part of the population than the entire human population. This economic model, a systematic global approach to the management of natural resources and processes, designed to responsibly take care of all of humanity in the most efficient and sustainable way.

4. PEST AND SWOT ANALYSIS

In proposing new strategies, the implementation of which, would have far-reaching consequences need also do PEST and SWOT analysis, to see whether our strategy is justified or not. PEST Analysis (political, economic, sociological and technological) is a method of analyzing the environment and is the basis for strategic planning. On the other hand SWOT analysis reveals that the indicators that are our strengths, opportunities, weaknesses and threats that could endanger our strategy.

Figure 2. PEST analysis of global information system for natural resource management



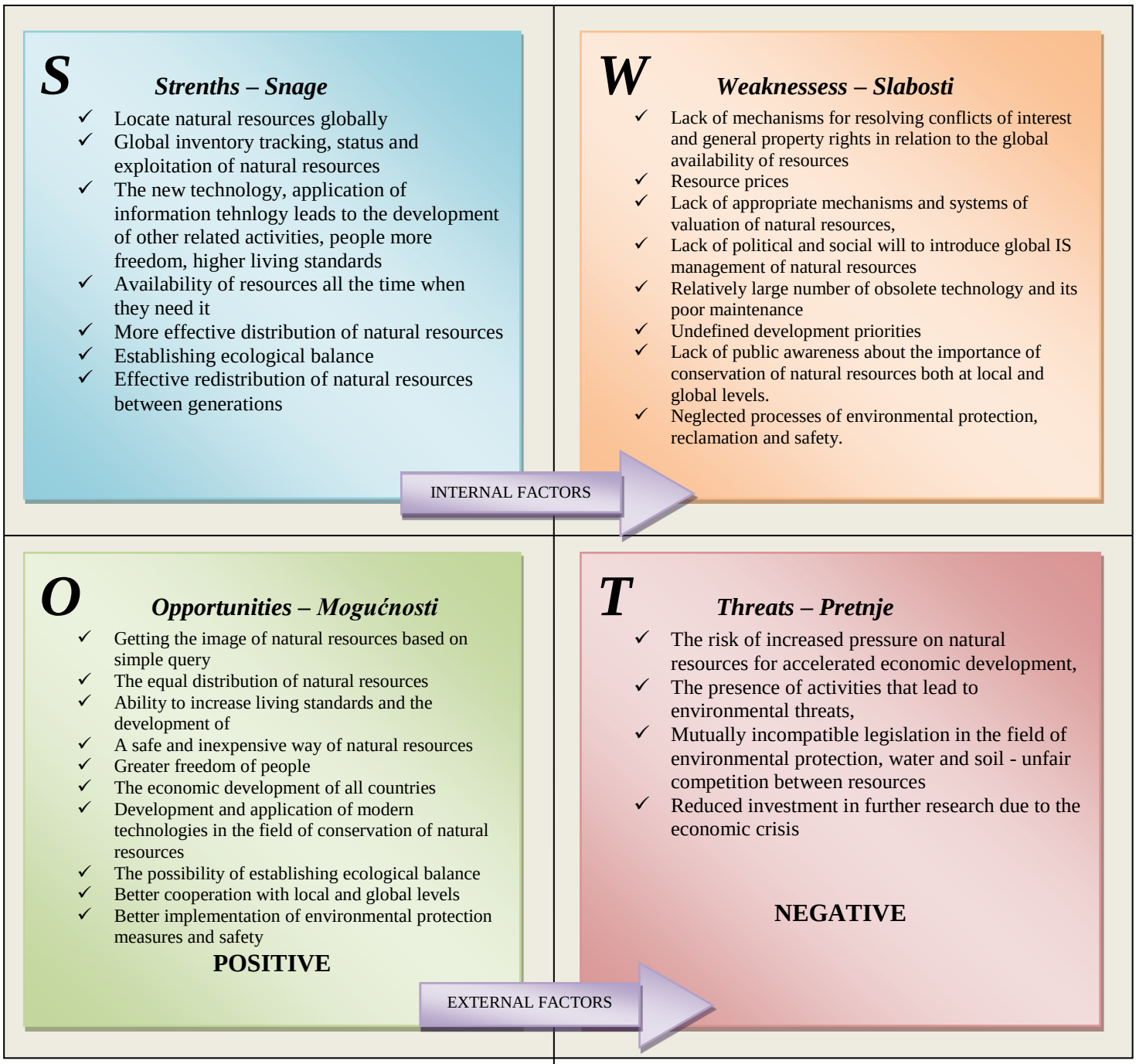


Figure 3. SWOT analysis of global informations system for natural resource management

5. DISCUSSION

Taking into account the results obtained with the help of PEST and SWOT analysis, we can say that such a system and only needs to humankind in order to preserve resources for future generations. Of course, each of these aspects of the method of analysis has its positive and negative characteristics, so in PEST analysis, the political aspect of the first and resulted in a negative attitude about equitable division of resources between developed and developing countries. In the shadow of all that there are powerful interests that, so this may be the main obstacle to creating such a system for the management of natural resources. Regarding the economic aspect, it should be noted that the development potential of natural resources strongly affected the stability of the economy, and in this sense the biggest problems today are the lack of appropriate market mechanisms, inadequate system of valuation of natural resources and perhaps the biggest problem from the economic point of view is the economic crisis in the world which has contributed to many strong currency devaluated be poljuljanje and to a certain extent. Sociological factor is very important when it comes to conservation of resources, however, it is evident that despite the daily activities of the mass media awareness of the importance of conservation of resources is satisfactory. The economic crisis, which a few years ago took hold still feel its effects, has left its mark on this area and just, the need for rapid economic development may lead to unsustainable pressure on natural resources. When talking about exploitation of natural resources is the most important technical and technological aspects. Somewhat better exploitation of resources in developed countries than is the case in underdeveloped or developing countries. In any case, the main problem we see this unfounded fear of people of information technology and it is perhaps the most immediate obstacle to the establishment of a global system for the management of natural resources. When we learn that the technology works in the same way that we shape then we will be freed from the bondage of fear and move in a sustainable direction. With SWOT analysis of similar data, we notice that there are some overlaps, so for example, it is evident that in both the analysis - eg, lack of appropriate market mechanisms, from which we can conclude that the first one should start with the reconstruction of the market. What would certainly be good for all is that with the help of a global system for the management of natural resources, preserve resources for generations to come, they would be almost equally available to all, both developed and undeveloped, and contributed to the establishment of the ecological balance between rural and urban areas, which is one of the three rated the goal of the UN Conference on the Environment.

6. CONCLUSION

Considering the fact that the consumption of natural resources today is very unplanned and uncontrolled, humanity has a great need for the introduction of a global information system to manage natural resources. Such a system would make the decisions instead of people, and thus we Resurese preserved for generations to come. We have a commitment to them to leave them half as similar to the planet as we are and we found it. It is our duty and obligation. SWOT and PEST analyzes show that the possibilities for the design of such a system, and now the rest of the people who still care about the preservation of the Earth and its natural resources. Future generations of us now asked to take specific measures to protect natural resources, so that they could live freely. No excuses, it's time to Oplaneti, sustainable start to

think and act responsibly towards our environment. The sooner we become responsible and start to Brog for the planet, it will return to us the benefits of his.

Our home, planet Earth is a living being that is characterized by a unique community of life. The forces of nature make life on earth, and uncertain adventure, but Earth at the same time provides all the necessary conditions for the development of life. Welfare of the community of life and humanity depend on preserving a healthy biosphere and all its ecological systems, a rich variety of plants and animals, fertile land, clean water and air, which is a common concern of all peoples. A preservation of vitality, diversity and beauty of the earth is sacred cause. - Charter of Planet Earth. [6]

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SUSTAINABLE DEVELOPMENT AS A SOCIOLOGICAL PROBLEM

ODRŽIVI RAZVOJ KAO SOCIOLOŠKI PROBLEM

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Abstract: *One of the interesting research problems of modern science is the problem of sustainable development. It is equally studied by both natural and social sciences. It is a development that represents meeting the needs of the present generations in a way that will enable the future generations meet their own needs. Vulnerability of ecosystems, pollution, natural resource problem, rapid growth of population, as well as numerous economic, social and political problems, indicate that the sources must be sought in the current functioning of the system - human - nature - society. The essence of this paper is to highlight the importance of the sociological approach to the study of sustainable development. It shows us that sustainable development as a concept of global development has important consequences for human society and its development.*
Keywords: *sustainable development, human society, sociological approach, ecological modernization theory*

Apstrakt: *Jedan od interesantnih problema istraživanja savremene nauke jeste problem održivog razvoja. Njime se podjednako bave kako prirodne, tako i društvene nauke. Reč je o razvoju koji podrazumeva zadovoljavanje potreba sadašnjih generacija na način kojim će se i budućim generacijama omogućiti zadovoljavanje njihovih sopstvenih potreba. Ugroženost ekosistema, zagađenje, problem prirodnih resursa, nagli rast stanovništva, kao i brojni ekonomski, socijalni i politički problemi, ukazuju da se uzroci moraju tražiti u dosadašnjem načinu funkcionisanja sistema – čovek – društvo – priroda. Suština ovog rada jeste da ukaže na značaj sociološkog pristupa u proučavanju održivog razvoja. On nam pokazuje da održivi razvoj, kao koncept globalnog razvoja, ima važne posledice po ljudsko društvo i njegov razvoj.*
Ključne reči: *održivi razvoj, ljudsko društvo, sociološki pristup, teorija ekološke modernizacije*

1. INTRODUCTION

Man's attitude toward nature is related to his attitude toward society and other human beings. First of all, man never acts alone or solely on his own when interracting with nature. He does so with other people with whom he lives, works etc. that is, through a social community. People's individual and group attitudes toward nature depend on interpersonal relationships among people; on the other hand, a series of human social activities depend at the same time on the environment and biological processes.

As all living beings, man is a natural being. However, he is also a human natural being, i.e. a being that exists only for his own sake, and a working being and therefore has to confirm his existence and manifest his knowledge. *Diferentia specifica* of this human natural being in relation to other beings is, beyond any doubt, his ability to produce whatever is necessary to survive and that includes the material life itself. [1]

Although man separated from his immediate natural surrounding, his origin is still natural and his overall existential structure depends on his environment. Bearing in mind this powerful causal bond among man – society – nature, it is very important to grasp the social significance of the ecological phenomenon seen in a structured causal relationship between man and his community in opposition to nature. [2]

2. A SHORT OVERVIEW OF SOCIOLOGY AND SUSTAINABLE DEVLOPMENT

Sociology can be defined as the most general social science which studies human society as a global phenomenom, i.e. a science which studies general laws of human society. However, it also deals with nature and man but only as much as they affect society. Therefore, the scope of its research encompasses the relationship between society and its biophysical surrounding.

As a theoretical system of knowledge, sociology searches for internal logic and necessary relationships which exist between society and nature and offers sociological explanations for them. [3] Generally speaking, its main subject of studying are the most general social laws and that is why it cannot avoid to deal with the relation between man and his ecosystem since society encompasses all human relationships with nature as well as their mutual dependance.

Sustainable development has become an exploited issue recently. It has been the central issue of both those who know its principles and those who are not quite familiar with them. Besides, there are only a few people who think of sustainable development as of a harmonious development linking the economy, the social and human development and the environmental protection and development. Economists primarily focus on sustainable economic development. Sociologists and humanists see sustainable development as a more humane society, while ecologists promote ecological ethics and environmental protection. [4]

The very nature of sustainable development is multidisciplinary and this is a concept which includes economy, ecology, ethics, sociology, law and connects the wellbeing of present and future generations with capacities and limitations of the biosphere in a way which will make life sustainable. One of the most general definitions of sustainable development is the following: Sustainable development is an integral economic, technological, social and cultural development which is in accordance with the needs that would protect and develop the environment and enable present and future generations to satisfy their needs and improve their quality of life. [5]

This picture is a graphic illustration of sustainable development where three crucial components overlap: society, environment and economy.

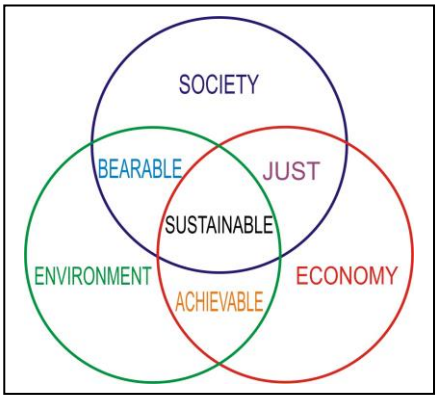

Figure 1. Sustainable development where society, environment and economy overlap

Brundtland Commission (the World Commission on Environment and Development, 1987) defined the concept of sustainable development as the one which unites economic, social and ecological policies with the aim of ''…making the development sustainable, a kind of development that meets the needs of the present without compromising the ability of future generations to meet their own needs'', and this is the first time the issue of development has been defined, not only as an economic category but as humane and primarily as an ecologically viable one.

The International Union for Conservation of Nature has redefined sustainable development in the following way: ''Improving the quality of life with simultaneous life within absorption abilities of relevant ecosystems''. This definition includes the other side of the problem, i.e. our 'fellow travellers' or other living beings. It has been acknowledged that people live within communities with other beings and all other beings are an integral part of human life. The fewer they are and the more they resemble each other, the more insecure human existence becomes. What is also emphasised in this context is that apart from biodiversity, it is necessary to preserve geodiversity and differences in culture and spirit.

Both of the above-mentioned definitions deal with the concern about the environment, its health in the long run and its integrity, how needs are to be met and quality of life increased of both present and future generations, as well as with how the spiritual dimension of life is to be developed. The conceptual model is taken as consensus of humane, social, economic, technological, cultural development and preservation, protection and development of the environment and protection of initial natural beuaties and primal ecosystems. Striking a balance among all aspects of human life should ensure human well being. [4]

3. SOCIOLOGICAL STUDYING OF SUSTAINABLE DEVELOPMENT

Much before the concept of suastinable development was coined, sociologists had carried out research on developmental questions (such as modernization, social and economic development, etc.) and sustainability (pollution, environmental degradation, non-renewable resources, and the like).

Why would sociology be interested in such topics as environment and sustainable development? The origin of our influence is of social nature, of the same nature are many of its consequences as well. [6] There is a significant consensus in scientific circles about the fact that the main global problems are a consequence of the human factor – cultural characteristics, social practice and behaviour: exploitation of valuable resources (water, forests, fossil fuel), exploitation of nature, destruction of ecosystems and uncontrolled emissions of toxic chemicals. The overall result is carbon cycle disturbance, climatedisturbance, disturbance of biotical and other biogeochemical cycles as well as a loss of biodiversity, deforestation, environmental degradation etc.

Since on one hand, the partial approach is insufficient, and the synthesis is complex on the other, not to mention that sustainable development includes a range of various topics different in both terms and contents, what is necessary is a sociological approach which would deal with sustainable development in a broader sense and show that it is a complex social

development theory and not a catastrophe theory or the total breakdown of the industrial society, nor 'the sociology of the future' which allows unequivocal answers to what the future has in store for us.[7]

Studying sustainable development and ecological problems from the sociological point of view means taking into account their nature. Since they are an outcome of the interraction between natural and social systems, these problems, because of their cause-and-effect relationship, represent a social phenomenon. However, for a long time the sociological approach has not been applied in their analysis or has been considered unnecessary. On the other hand, it was relatively late that sociology has taken part in the studying of social causes and consequences of environmental quality changes. [8]

The sociological understanding of susatinable development is necessarily related to specific general ontological and philosophical – anthropological theses on man, man's nature, social life, relationships between individuals and society, the individual and the collective, relationships among society, man and nature, different forms of social grouping and organising, the essence of social development, etc.

From the sociological point of view, sustainable development actually includes the following:

1. The creation of a new and alternative develomental philosophy;
2. The developed approach to social changes and their management.

These are two mutually dependant aspects. The first aspect or condition requires deep critical reconsidering of the current economic, social, demographic, resource, ecological, cultural policies and all developmental policies in general. The other aspect refers to the understanding of social changes and their management which is to be done as rationally as possible. Global changes which are complex and tightly interrelated permeate modern society and affect every single aspect of life. Bearing this in mind, systematic interpretations, understanding and explanations of social changes as multiplied structured social phenomena are necessary from the point of view of sustainability and sustainable development. [7]

Starting with the premise that sustainable development in a fundamental sociological sense means 'a process of going towards a better society' that process, according to Magdalenic, is possible to be analized at five basic and mutually related levels.

The first analytical level includes the systematic and critical studying of the most important global and social processes, their social consequences and effects on a social structure, whether a society is open or closed and to what degree, a system of social relationships, etc. It deals with the processes of modernization, globalization, urbanization and industrialization that have a strong impact on the social life of a modern man in all aspects and may lead to complex processes that in turn may change a modern society. Understanding these processes, primarily their social dimension, is necessary from the point of view of sustainable development.

The second analytical level includes social and cultural criteria and factors that in the broadest sense refer to the possibilities of achieving an autonomous social and cultural development,

without which sustainable development is virtually impossible. Culture is an important resource and one of the most important strongholds for understanding and explaining the differences and similarities between different societies, which explains why the cultural component is treated as a vital element of sustainable development.

The third analytical level is political-institutional and it refers to building a democratic society and creating efficient democratic institutions which make *conditio sine qua non* of sustainable development. Politics has always been an extremely important parameter of human social life and is therefore necessary when possibilities and potentials of sustainable development are in question.

The fourth level which is also very important for studying sustainable development is eco-technological which in the broadest sense refers to the possibilities of creating the desirable economic environment. The emphasis here is on the disbalance among the economic, ecological and cultural diemnsions of the social development. The point is that there is no and can be no sustainable development without a developed economic system. Such a system can be reached by striking a right balance among economic, ecological, cultural and all other aspects of the social development.

The fifth analytical level includes defining the fundamental ecological and demographic criteria that are related to the eco-system preservation and the development and nourishment of the whole socio-ecological approach which will ensure the efficient solving of current ecological problems that our planet is facing today, overcoming a serious crisis regarding the environment and creating a rational and responsible attitude toward natural resources and the way they are used. It is of crucial importance to understand the social dimension of ecological problems, to recognize their social origin and develop a well-designed eco-management which will take into account ecological values, principles and standards when developing a social development strategy. [7]

4. ECOLOGICAL MODERNIZATION THEORY

Ecological modernization theory has been occupying the more and more important place in the current sociological discussions on social causes and effects regarding socio-ecological problems. Ecological modernization theory is a result of critical reviews and an attempt to overcome the problems sociological research has encountered in practice so far.

The starting point of this theory is that the environental protection issue has to be part of the overall scientific and theoretical as well as practical and political considerations on the social development. For ecological modernization theory, social problems are a challenge, not an impassable obstacle in the further development of a modern society. [8]

Ecological modernization theory emerged in the early 1980s in West Europewithin a group of sociologists among whom were Martin Janicke,Volker Von Prittwitz,Udo Simonis,Klaus Zimmerman,Gert Spaargarn, Maarten Hajer,Arthur P.J. Mol,Joseph Huber. The theory has been pretty diversified both in terms of scientific discussions due to its geographical origin, its basic theses, the time it emerged (the beginning of the political and economic globalisation)

and in terms of chronological sequence of events. Spaargarn and Mol consider that ecological modernization represents a new era in hyper-industrialism in which nature (biosphere) has become a third sphere in modern society which used to be characterised only by two systems before that: an industrial one (technosphere) and society (sociosphere). [9]

According to David Toke, ecological modernization has the following six key goals:

1. The idea that economic and environmental problems can be solved simultaneously and with a positive outcome;
2. The economic development and the environmental protection are a precondition for the wellbeing of both the present and future generations;
3. Strict application of the principle 'the polluter pays ';
4. Ecological modernization has a hollistic approach to ecological problem solving and rejects the idea that environmental problems can be solved on their own, with no regard to other problems;
5. The ecological policy has to respect market trends but cannot operate without state intervention mechanisms at the same time;
6. Nations have to take part in ecological policies and modernization at a state level, which will ultimately lead to better results due to the competitive atmosphere among different national economies. [10]

Since the mid 1990s this theory has completely developed and there are now six areas that further define ecological modernization:

1. The primary sphere where ecological modernization operates is the way how ecological policy is to be conducted;
2. The second issue is that ecological modernization strives to gain a new scientific role which would be active in politics; also the public will be given evidence on various actions that are harmful to nature. Besides, new categories, unknown to sociology and social ecology before, have been included, e.g. a 'critical load'. It refers to the size of the capacities of natural eco-systems where science gets the task to determine the level of polution that is (not) harmful to nature in a particular case.
3. At a macroeconomic level, ecological modernization means moving away from the idea that environmental protection is only expenditure or that it only makes our costs higher; people have begun to realize that if one wants to pollute the environment, he has to pay for it.
4. Ecological modernization sees nature as public wealth or public resource, unlike economistic ideas according to which nature is free.
5. Eco-modernists suggest that ecological problems can be solved if law changes - if the principles of ecological policy are changed - where it is up to the potential polluter and not the victim of the pollution to prove that he has done or not done harm to nature;
6. Ecological modernization accepts the creation of new partnership relationships between the business and the civilian sector. [9]

As followers of ecological modernization emphasize, in modern societies socio-ecological problems are equally important as (if not even more important than) economic issues. That

further means that the process of ecological modernization is necessary and it will be carried out at different levels: social, economic, political, etc.

The sustainable development concept whose appearance coincides with the strengthening of ecological modernization theory, points to the fact that seeing social development only in terms of economic parametres is insufficient as well as a 'rat race' does not necessarily lead to the better quality of life. Just like the ecological modernization theory, sustainable developmet emphasizes that a new relationship has to be established: between natural potential and social needs but it requires parallel changes in all spheres of life. Therefore, the followers of sustainable development point out the importance of different aspects of sustainability: economic, ecological, cultural, political, and social. [8]

5. CONCLUSION

Recent years have seen the rise in the importance of the issues of the environmental protection and sustainable development and they have become inspiring for new social science ressearch. The term sustainable development has been approached more and more from the sociological point of view.

Ecologically sustainable development refers to our awareness about thephysical aspects of the environment. Therefore, it refers to sociological understanding of what is good for our present population and what is to be applied to the future ones.

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THEORETICAL AND METHODOLOGICAL APPROACHES TO THE CONCEPT SUSTAINABLE DEVELOPMENT WITH SPECIAL EMPHASIS ON SERBIA

TEORIJSKO-METODOLOŠKI PRISTUP KONCEPTU ODRŽIVOG RAZVOJA SA POSEBNIM OSVRTOM NA SRBIJU

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Abstract: *Today's economic development takes place in conditions of globalization, which brings certain limitations, which must be accepted in order to use resources in the most efficient manner. Define a strategy for the development of Serbian economy in the future is assumed appreciation of the basic characteristics of the globalization process which limits the ambit of national policies.In such circumstances, Serbian economy must accept the standards and rules concerning the protection of the environment, the optimal use of available resources and the development of alternative energy sources. The process of globalization, which is characterized by high levels of intensification of economic relations also limits the independent action of individual economies.The main task of the Serbian economy in the coming period, in accordance with a defined policy of joining the EU, its economic goals align with defined sustainable development policy adopted within the European Union.*
Keywords: *Serbian economy, sustainable development, globalization, the European Union priorities.*

Apstrakt:*Današnji privredni razvoj odvija se u uslovima procesa globalizacije, koja sa sobom nosi određena ograničenja, koja se moraju prihvatiti kako bi se resursi koristili na najefikasniji način.Definisati strategiju razvoja srpske ekonomije u narednom periodu pretpostavlja uvažavanje osnovnih karakteristika procesa globalizacije čime se ograničava polje delovanja nacionalnih politika.U takvim uslovima srpska ekonomija mora prihvatiti standarde i pravila koja se tiču zaštite čovekove okoline, optimalnog korišćenja raspoloživih resursa i razvoja alternativnih izvora energije. Proces globalizacije koji se odlikuje visokim nivoom intenzifikacije ekonomskih odnosa ujedno ograničava samostalno delovanje pojedinačnih ekonomija.Osnovni zadatak srpske ekonomije u narednom periodu je da, u skladu sa definisanom politikom pristupanja Evropskoj uniji, svoje ekonomske ciljeve uskladi sa definisanom politikom održivog razvoja koja je usvojena unutar Evropske unije*.
Ključne reči*: Srpska ekonomija, održivi razvoj, globalizacija, Evropska unija, prioriteti.*

INTRODUCTION

Sustainable development is a modern development concept, also respects and includes three key dimensions - economic, environmental and social. This concept of the past few decades is widely used in the strategic documents of the business world, as well as macroeconomic policy at the state institutions.

Sustainable development provides guidance for future development with the establishment of a balance between social, economic and environmental components.
At the beginning of the seventies suddenly became interested in the problems of the environment, which contributed to the introduction of a new dimension in debates about development. Began the formation of numerous environmental organizations at the national and international level. That is, first of all, adversely affect the environment caused by the

economic growth, but also the fear of scarcity of basic natural resources on which the modern production.

The foregoing relates to the need to define and create the concept of sustainable development in Serbia. In this context is defined and called. National Strategy for Sustainable Development of Serbia, as a strategic document that governs this area.

National Strategy for Sustainable Development of Serbia looks like goal-oriented sustainable, long-term, continuous, comprehensive and synergetic process that affects all aspects of life (economic, social, environmental and institutional) at all levels. Long-term concept of sustainable development implies continued economic growth besides economic efficiency, technological progress, more cleaner technologies and innovation across society and corporate social responsibility means of reducing poverty, better long-term use of resources, improving health conditions and quality of life and reduce pollution to a level that can withstand environmental factors, prevention of new pollution and biodiversity.

This article reviews the theoretical concept of sustainable development, with special emphasis on the determination of this phenomenon in the Republic of Serbia.

1. DEFINITION AND FEATURES OF THE CONCEPT OF SUSTAINABLE DEVELOPMENT

In the literature we can find many different definitions, meanings and interpretations of the concept of sustainable development. The use of this term has become common as increased awareness of the existence of global issues related to the environment.

Simplest terms, sustainable development is a development path which ensures that welfare per capita is not declining over the long term. It follows that the concept of sustainable development should be accepted as a process in which the constant changes taking place in the relationship between social, economic and natural systems and processes.

The essence of the concept of sustainable development makes ethical principle, or care about the legacy. This means that the quality of life of future generations must not be inferior to the quality of life that is today's generation. The idea was to promote a definition of sustainable development formulated by the World Commission on Environment and Development in the Brundtland conference in 1987. year. At this conference, sustainable development is defined as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”.

The definition of sustainable development, according to the International Institute for Sustainable Development (International Institute for Sustainable Development), based on the Brundtland definition, in addition to that, the essence of the concept of sustainable development lies in the idea that intra-and inter-generational equity affect the design or modification of national economies and global development [28].

According to the UN Department of Economic and Social Affairs (UN Department of Economic and Social Affairs), the achievement of sustainable development requires the integration of economic, environmental and social components at all levels [29].

World Business Council for Sustainable Development (World Business Council for Sustainable Development) defines sustainable development in the traditional manner: "Sustainable development is a form of progress that meets the needs of the present without compromising the ability of future generations to meet their own needs".

The definition of sustainable development one of the influential organizations such as the London Commission for Sustainable Development (London Sustainable Development Commission), reads as follows: “Sustainable development is a dynamic process which enables all people to realize their potential and improve their quality of life in ways which simultaneously protect and promotes earth systems to support living” [30].

Based on the previously presented definition of sustainable development, it can be concluded that it is not possible to precisely define its meaning. All definitions should be considered in mutually complementary and not mutually exclusive. After all, in one definition, can not be expected to cover all the determinants of a process.

1.1. The concept of intergenerational and intragenerational equity

Based on the concept of sustainability does not care about future generations and the use of non-renewable resources in production. According to the definition of sustainable development from the Brundtland report, this means that future generations should have at least the same wealth as the current generation. When making decisions about current consumption, you should take into consideration the welfare of future generations.

Concern about future generations can manifest in different ways. For example, when it comes to the use of non-renewable resources in the production, from the aspect of intergenerational equity, the positions of the constant consumption of resources is not acceptable.

Equality between generations means that we should each generation there is an acceptable level of income and environmental quality. Between equality between generations and economic efficiency in the use of resources must inevitably deal or a trade-off. If you are crossing borders in all modern manufacturing capabilities, regardless of economic efficiency, it would mean a reduction in production capacity and lower gross national product of future generations.

If we look at intra-equity, it would mean that all people have equal access to resources and opportunities, and to all members of the human community responsible for the environment and its degradation. It is generally accepted that equality means ensuring fairness in the distribution of income and losses, as well as the right of everyone to an acceptable quality and standard of living.

When it comes to intra-generational equality, we can say that inequality among men in the enjoyment of the quality of the environment, present in the present time. The poor are faced with more environmental problems than the rich. Rich people can afford to live in an unpolluted environment because they have a choice. Furthermore, employees in certain industries are at a much greater health risk than others. The dangerous, dirty and heavy industries are mainly employed poorer or less educated migrants.

1.2. Concept of “ strong'' and ''weak” sustainability

The concept of sustainable development can be analyzed in terms of the conditions necessary for its achievement. One of the basic conditions for sustainable development is that human welfare does not decrease over time. This condition can be represented as a rule of constant capital. The key issue for the implementation of this policy is the extent to which different forms of capital can be substitutes for each other. There are different views about the possibility of substitution of capital. So, there, “stronger" and "lower" forms of sustainable development, and concepts, “strong" and "weak” sustainability. Underlying assumption is that the total amount of capital, ie the sum of the natural and man made, of not falling over times. Then the assumption is that all forms of capital are interchangeable, ie, “there is some degree of substitution between different forms of capital”[16]. At the level of the existing capital stock, population growth leads to a reduction in welfare per capita, but technological progress is a possible solution for improving the welfare of people.

The concept, known as ” weak sustainability", means that any reduction of capital may be offset by investment in other forms of capital. For sustainable development in this concept, there is great concern about the depletion of resources.

One approach that supports the concept, sustainability is weak "Hartwick-Solow's. In this approach, dominated by the neoclassical perception of natural resources in ways that are natural and man-made capital substitutes. To achieve sustainable development is necessary to maintain a constant stock of capital, regardless of the structure of the stock. Therefore, the Solow-Hartwick's sustainability criterion says that," weak sustainability” criterion.

Hatwick-Solow's concept of sustainability can be displayed on the example of the strategic orientation of individual countries. Thus, the oil-exporting countries, their economic development based solely on the exhaustion of certain types of natural resources. However, in the case of sustainable development is not provided. According to Hartwick-Solow's approach to sustainability, the solution for the future development of these countries is the fact that the rent received from the extraction of natural resources reinvested in other forms of capital to the strategic orientation of economic development directed in a new direction (eg. tourism development).

In concept, a “strong” sustainability, which has been largely restrictive, identify the types of natural capital that is the substitution of natural man-made capital is unacceptable. Thus, the concept is introduced, the “critical natural capital" [20, str.169] that must be saved and the reduction of which can not be compensated by the creation of other forms of capital. For many of the natural resources and the conditions there are no substitutes. The simplest

examples are the ozone layer which has no substitute and water, as a resource for which there are no substitutes. However, ozone is possible to recover, but it takes ages to go. Another example are irreversible processes in the ecosystem. Unlimited substitution of natural man-made capital can lead to irreparable damage to the environment. Thus the possible degradation of the natural environment that is irreparable loss system that allows people's lives.

Natural capital and man-made capital can not be considered as substitutes unlimited. In fact, a lot more realistic assessment of these types of capital is in terms of a complementary relationship. For development are needed both capital. Sector of the economy can not function without natural capital. Therefore, natural capital can be seen as a limiting factor in the future and is very important for sustainable development. According to advocates, “strong" sustainability, to enable sustainable development is necessary to fulfill the condition that the degree of exploitation of renewable resources does not exceed the degree of regeneration.

1.3. Stability as the characteristics of sustainable systems

One feature of many definitions of the concept of sustainable development is the stability of the system and the system's ability to sustain a long period of time. Stability of the system includes a feature that after disturbances or sudden emergencies can return to steady state or equilibrium. This means that the values of the variables return to equilibrium after a disturbance. Therefore, a sustainable system is one that has the capability of flexibility and balance.

However, the explanation of the characteristics of sustainable systems, it is necessary to define, sufficiently “long period of time" within which the system may suffer some disruption and return to a state of balance. There are different ideas and defining the length of time in which to ensure sustainable development:
• According to some authors state the system is sustainable if it is possible to reproduce indefinitely.
• There are considerations of a sustainable system within a period of several hundred years.
• A system of sustainability can be seen in the way that some relevant sizes left the future at least as much good condition as it was in the initial period.

The conclusion which can be reached is that in defining a sustainable system there is no finite time period, ie, the time horizon is indefinitely long.

2. SUSTAINABLE DEVELOPMENT IN SERBIAN "NEW CONDITIONS"

Serbia is faced with very serious problems and challenges, both in the environment and the social, economic, scientific, educational, legislative, institutional and other aspects of living. Neither the concept of sustainable development, unfortunately, is not developed or implemented in our country. The reasons for this situation are numerous, but primarily to be found in any other economic and stagnation in the last 10-15 years. Sustainable development respects, above all, it is imperative compatibility.

Compatibility in the case of the Republic of Serbia means creating a system that is harmonized with the economic system of the EU. Serbia must have a system that is fully compatible with the EU check if they never join the EU.

As the global changes in the structure of factors indicate an increasing dominance and superiority so. intangible factors of economic growth, such as knowledge, information, organization, culture, information, education, the legal system, Serbia has no choice but to accept a strategy that relies on human capital development. That, in the experience of economic and technologically advanced countries, brings the highest value added per unit of invested capital and labor.

Therefore the choice of Serbia today is a commitment to knowledge-based economy that will dominate her economy. Our country needed broad use of knowledge in all aspects of living. The knowledge should come primarily from the market economy, ie. to be funded by private sources, in particular the competitive service sector, but also to encourage states. Knowledge can foster economic and social development in our country and in the progress of communication, better system information and development of e-government.

The perspective of sustainable development in Serbia can be seen by the model a small open economy that its position on the international scene should build by accepting the theoretical postulates of macro small but effective knowledge-based economies.

For the current level of development at which it is now the Republic of Serbia, and to sustain long-term growth rates and implement needed structural reforms, it is essential that the investment-to-GDP share of 22-25%. Investment growth should provide an increase in employment, productivity and exports. In addition, domestic savings are sufficient for only a small part of the investment, while most of the settled foreign accumulation through loans from abroad. This means that the payment of due installments of foreign loans and the interest rate will be an additional burden to future generations. The balance of exports and imports of goods and services in constant high deficit, which is covered by an uncertain and temporary sources (foreign transfers and revenues from privatization), and additional external debt, which burdens future economic activity in our country.

The new economic system and a modern structure of economic factors require educated people who learn fast, that are innovative and creative and adjust their capacities in line with technological progress and global development trends.

Of course, the role of the state in achieving the overall concept of sustainable development now and in the future is irreplaceable. To be a part of the solution, not the problem, the government needs to find a new balance between development, stabilization, and social roles.

CONCLUSION

Sustainable development is a problem that is increasingly present in the international as well as national and local levels. The requirements imposed on sustainable development as a problem to deal with an increasing number of countries in the world, and their respective

communities with the increasing attention devoted to this issue. In this way, local communities, regions and countries belong to the group of those long-term strategic thinking and improve various segments of sustainable development in their territory.

When it comes to the Republic of Serbia, its successful entry into a new competitive era of economic relations not only at the local but also national, regional, and overall, that is globally, by realizing the postulates and principles of the knowledge economy. Certainly, it will be a consistent, long-term process that requires a lot of investment and sacrifice, but that will fixed from the perseverance to bring the expected positive results. Thus, the enormous challenges ahead of us, not only in the economic sphere, but also in other constituents of sustainable development-economic policy and environmental policy.

Serbia must adhere to the concept of the knowledge economy because, we are not a country that has great natural wealth, nor are they likely to find oil in our great country, and our only wealth is its people, and only by investing in their education and intellectual improvement, Serbia has a chance to become competitive in the regional and world markets.

As regards, the environment, Serbia in recent years naprdovala in the fight for the environment. The state has passed several important laws, which have made a significant step in this area has.

It is obvious that the global trends of the world economy seem to ranges of income levels between rich and poor countries increased continuously. However,no country, even more so if it is small and undeveloped, can not think of isolation from the world economy if it seeks to achieve sustainable growth and development, making her the only long-term guarantee for breaking the vicious circle of poverty.

Finally it should be noted that plans are in place, and which deal with the concept of sustainable development can not be achieved overnight, nor in a relatively short time to expect large-scale improvement, but the most important is to reconcile different objectives and interests and direct them towards the achievement of the unique concept that will bring the common good to all, both at the local and broader, ie. globally. The most important is to remain steadfast on the path we are taking, and with the support of the state and all relevant ministries achieve a common goal and that is to live in Serbia, which provides an opportunity for all people to live in the general well-being, with the concern that future generations who will come after us, leaving the country in such a state that they will also be able to live normally and make further progress.

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