Faculty of Management
Zaječar
Megatrend University
Belgrade

FOURTH INTERNATIONAL SYMPOSIUM ON NATURAL RESOURCES MANAGEMENT

PROCEEDINGS

Edited by
Dragan Mihajlović
Bojan Đorđević

Zaječar, Serbia
31 May – 1 June 2014

4rd International Symposium on Natural Resources Management

Supported by Ministry of Education and Science of the Republic of Serbia

Publisher:	Faculty of Management, Zajecar, Megatrend University, Belgrade
For the publisher:	Dragan Ranđelović, secretary general
Editor in chief:	Full Professor Dragan Mihajlović, Associate Professor Bojan Đorđević
Technical editors:	Associate Professor Dragiša Stanujkić Assistant Professor Saša Ivanov Gabrijela Popović, MSc
Printed:	Printing office "Tercija" Bor
Copies:	100

CIP - Каталогизација у публикацији
Народна библиотека Србије, Београд

330.15(082)
502.131.1(082)
330.34:502.131.1(082)

INTERNATIONAL Symposium on Natural Resources Management (4 ; 2014 ; Zaječar)
Proceedings / Fourth International Symposium on Natural Resources Management, Zaječar, 31 May-1 June 2014 ; [organizer] Faculty of Management Zajecar, Megatrend University Belgrade ; edited by Dragan Mihajlović, Bojan Đorđević. - Zaječar : Faculty of Management, 2014 (Bor : Tercija).
- 350 str. : graf. prikazi, tabele ; 30 cm

Tiraž 100. - Bibliografija uz svaki rad.

ISBN 978-86-84763-04-6
1. Megatrend univerzitet (Beograd)
a) Природна богатства - Коришћење - Зборници b) Животна средина - Одрживи развој - Зборници c) Привредни развој - Одрживи развој - Зборници
COBISS.SR-ID 207592460

ISBN: 978-86-84763-04-6

Zaječar, Serbia

31 May – 1 June 2014

SCIENTIFIC COMMITTEE

Mića Jovanović, PhD, Chairman, Rector of Megatrend University Belgrade

Vladan Kutlešić, PhD, Rector Deputy of Megatrend University Belgrade

Dragan Mihajlović, PhD, Dean, Faculty of Management Zajecar, Megatrend University Belgrade

Jean Jacques Chanaron, PhD, Chairman of Megatrend University Belgrade, Grenoble Ecole de Management, France

John A. Nesbitt, Ed. D., CTRS Professor Emeritus, University of Iowa

Sung Jo Park, PhD, Free University, Berlin, Germany

Dominique Jolly, PhD at CERAM, Sophia Antipolis, Nice

Radomir A. Mihajlović, PhD, New York Institute of Technology, USA

Antonello Garzoni, PhD, Preside della Facoltà di Economia, Università LUM Jean Monnet

Antonio Salvi, PhD, Dean, Univesita LUM, „Jean Monnet“, Bari, Italy

Angeloantonio Russo, PhD, Univesita LUM, „Jean Monnet“, Bari, Italy

Nicolaie Georgesku, PhD, Rector of Alma Mater University of Sibiu

Maria Turtoi, PhD, Alma Mater University of Sibiu

Žarko Obradović, PhD, Vice Rector of Megatrend University Belgrade

Vencislav Ivanov, PhD, University of Mining and Geology „St. Ivan Rilski“ Sofia

Ljuben Ivanov Totev, PhD, Rector at the University of Mining and Geology „St. Ivan Rilski“ Sofia

Nadežda Ćalić, PhD, Dean of Mining Faculty Prijedor, University of Banja Luka

Žarko Lazarević, PhD, Institute for Contemporary History Ljubljana, Slovenia

Jane Paunković, PhD, Faculty of Management Zajecar, Megatrend University Belgrade

Jelena Bošković, PhD, Dean of Faculty of Biofarming, Megatrend University Belgrade

Grozdanka Bogdanović, PhD, Technical Faculty Bor, University of Belgrade

Bojan Đorđević, PhD, Vice Dean, Faculty of Management Zajecar, Megatrend University Belgrade

Srđan Žikić, PhD, Vice Dean, Faculty of Management Zajecar, Megatrend University Belgrade

ORGANISING COMMITTEE

Dragan Mihajlović, hairman

Bojan Đorđević, Deputy Chairman

Jane Paunković

Srđan Žikić

Dragan Ranđelović

Dragiša Stanujkić

Saša Ivanov

Nebojša Simeonović

Mira Đorđević

Milica Paunović

Sanja Stojanović

Sanja Jevtić

Ivana Nikolić

Gabrijela Popović

Anđelija Plavšić

Biljana Ilić

Aleksandra Cvetković

Dragica Stojanović

Jovan Vetović

„SUSTAINABLE DEVELOPMENT AND GREEN ECONOMY IN TRANSITION COUNTRIES – CHALLENGES AND PERSPECTIVES“

TABLE OF CONTENT

FOREWORD

Environmental issues have become increasingly incorporated in scientific agendas of the most diverse fields of knowledge. Its growing relevance originates from the widespread understanding that environmental sustainability is indispensable to the long term development of societies. The challenge of moving towards a more egalitarian and sustainable society is on the agenda, more than ever. This is the context in which the concept of green economy has emerged. Green economy will be one of the key topics of 4th International Symposium on Natural Resources Management in Zaječar, Republic of Serbia.

The challenge is not simple and discussions are only beginning. Despite having a formal conceptualization, precise delineations are still to be determined. After all, what is a green economy? Which economies are closer to reaching it? How to measure the degree of "greening" of an economy? What does it mean, concretely, to achieve transition to a green economy? What is the role of the state in this transition? How to finance the transition? Which sectors will be most affected? Which will be most benefited? How would the transition affect the daily lives of citizens? And in the case of Serbia, what has the country done and what is left to do to advance towards a green economy? How is the country doing, compared to the others? What are the main obstacles and challenges? How to address them? What would a transition mean for society, productive sectors, for government, for consumers? How can developed and developing countries cooperate in this transition? How can international promotion and cooperation organizations align themselves with these objectives? How can United Nations priority international initiatives, such as the Climate Change and the Biodiversity Conventions, encourage and implement common agendas aimed at achieving these objectives?

Green economy raises many questions that do not have simple and straight answers. We know, however, that the transition requires substantial efforts and engagement from all segments of society, especially government and the private sector. It demands that governments level the playing field for greener products by removing perverse incentives, revising policies and incentives, strengthening market infrastructure, introducing new market mechanisms, redirecting public investment and "greening" public procurement. The private

sector, on the other hand, will need to respond to these policy reforms through increased financing and investments, as well as by creating innovation skills and capabilities to make the best of green economy opportunities.

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, Ukraine, Bulgaria, Bosnia and Herzegovina and Macedonia, have also made contributions to this conference. The Proceedings are intended for the scientific and professional community as well as students of doctoral studies. The contents allow readers to learn about contemporary approaches, perspectives and challenges in the sustainable development and green economy of transition countries.

Enjoy the reading!

Zaječar, May 2014 Editors

4th International Symposium on Natural Resources Management
"Sustainable Development and Green Economy in Transition Countries"
31st May -1st June, 2014, Faculty of Management Zajecar, Republic of Serbia
www.fmz.edu.rs

EXISTING PRACTICES OF SOLID WASTE MANAGEMENT IN R. MACEDONIA

Biserka Dimishkovska,
Nikola Dimishkovski
Jovan Dimishkovski

"Ss.Cyril and Methodius" University, Institute of Eartquake Engineering and Engineering Seismology, Skopje, Republic of Macedonia
Todor Aleksanrov 165, 1000 Skopje, R. Macedonia

"Ss.Cyril and Methodius" University, Faculty of Economics, Skopje, Republic of Macedonia
Rudjer Boskovic b, 1000 Skopje, R. Macedonia

"Ss.Cyril and Methodius" University, Faculty of Mechanical Engineering, Skopje, Republic of Macedonia
Blvd. Krste Misirkov bb, 1000 Skopje, R. Macedonia

ABSTRACT

The fast development of industry and increase of consumption are the reason for the creation of large quantities of waste. Around 80% of the created waste is the result of agricultural, industrial and mining activities. The rest of the waste amounting to 20% comes from households. This waste can mostly be re-used or re-processed (plastic, metal, paper, glass, biodegradable organic matters). Efficient waste management enables avoiding the frightening future for the generations to come, i.e., their living in an environment overburdened with waste.
The European Union has introduced strict regulations referring to waste management that R. Macedonia must effectuate, as well. To that effect, our country started with removal of landfills in a number of towns without previous selection of those types of waste that can be reused or reprocessed. In future, only waste that can be re-processed, for example by recycling, will be allowed to be disposed on landfills.

KEYWORDS

Types of waste, waste emissions, principles of prevention of waste creation, environment

INTRODUCTION

Macedonia covers an area of approximately 25 700 km2. The annual precipitation ranges between 500 and 750 mm, while the average temperature ranges between 10 to 15^{0}C. At the moment, Macedonia has 2,4 million inhabitants, with approximately 584000 households. The average household consists of 4,1 members. According to Macedonian sources, in 2012, Macedonia generated 713564298 tons of communal solid waste. On the average, 349 kg/per inhabitant are generated annually, out of which a certain amount is generated in rural areas with inadequate or no refuse collection. It has been estimated that between 300 000 and 400000 tons of solid waste per annum is generated in a number of urban areas where a system for collection, treatment and final depositing is necessary in the initial phase. As a result, approximately 300 kg/per

inhabitant of solid waste is generated in the urban areas at an annual level. The composition of the communal solid waste in Macedonia includes waste from households, waste from institutions, waste from restaurants/hotels, office/commercial waste and some lighter fractions of waste originating from the industry and the enterprises (Omura20030. Approximately 50-70% of the quantity of waste originates from the households, while the remaining is commercial and other waste. In addition to the mentioned waste, most of the sources generate a certain amount of hazardous waste, as well.

TYPES OF WASTE

Communal solid waste

The communal solid waste is the main type of waste within the total quantities of waste generated in Macedonia. It includes the waste from the households along with the waste from the maintenance of public hygiene and collected waste from the parks, the commercial-institutional waste and the waste created by the industry. A minor part of the waste originating from the households is dangerous: batteries that contain heavy metals and acids or paints and solvents based on oil. In densely populated areas, there are created larger quantities of communal waste than in the municipalities of a rural character. The total creation of communal waste and its composition is given in (Table 1).

Table 1. Generated total waste and composition

Type of waste	Quantities (tons/per annum)	(%)
Waste from households	417,838	73
Commercial waste	154,543	27
Types of waste		
Bio-degradable waste	148,819	26
Waste from wrapping material	97,305	17
Debris	28,619	5
Other types of waste	297,638	52
Total communal solid waste	**572,381**	**100**

Waste from Wrapping Material

Most of this waste is deposited on landfills or on unlicensed landfills as part of the communal solid waste and similar types of commercial/industrial waste. At the moment, the capacity for recycling, re-use and return of wrapping material into the production cycle in Macedonia is very limited. There are certain capacities for recycling of metals, paper and cardboard, PET, PVC and HDPE. However, these are presently not functioning with a full capacity or to some considerable extent (Table 2).

Table 2. Recycled and re-used waste

Wrapping material	Paper/cardboard	PET	Glass
Recycled (t)	14,844	0,2	0
Imported	n/a	0	0
Exported	3,600	0	0
Deposited in a landfill	71,655	10,748	13,972
Total amount (generated)	86,499	10,748	13,972
Extent of recycling	21,1 %	0,01 %	0 %

Communal Services
The refuse collection services are mainly provided by communal enterprises that also include other activities: cleaning of streets, public parks and green areas. Only a minor part of refuse collection enterprises represent private companies that usually provide services to rural areas.

Existing Waste Management Practices

Regular refuse collection services are mainly limited to urban media, while insufficient attention is paid to rural settlements. Seventy percent (70%) of the total population in Macedonia receives regular refuse collection services, while only about 10% of the total number of rural settlements are encompassed with the organized services. There is no standardization since the communal enterprises use vehicles and containers for collection and/or compacting of waste of different kinds and sizes. In larger cities, the waste management system is more organized. Refuse collection services are provided at least once a week, but most frequently, old vehicles of a small capacity are used. The limited refuse collection services in rural areas, if any, are usually carried out by a tractor-trailer or, sometimes, by small multi-purpose municipal vehicles.

Return of Waste in Production Cycles/Recycling

In Macedonia, there are two parallel systems for collection of paper/cardboard. One of them is organized by the paper factory "Komuna" that collects around 20% of the respective waste, while the other is organized by collectors of secondary raw materials (mainly paper and cardboard). A few larger collectors/brokers at the market procure paper and cardboard from the other subjects included in the system. In this way, the brokers provide "Komuna" factory with the collected quantities of waste paper or export the waste paper to neighbouring countries.

The recycling capacity of paper factory "Komuna" is not completely used due to market limitations and also due to payment conditions regarding the end users.

Waste metals represent most of the collected recycling material. These are processed by the steel factory "Makstil" from Skopje. There is a well established network of collectors and/or brokers as well as a strong and stable market for the waste metals that are returned to production cycles (Lettinga1999). It can be concluded that 80% of the generated scrap iron is collected and returned to processing. The collected and processed scrap includes cars, appliances, technological/industrial waste, waste machinery/equipment and other different steel products that belong to the category of waste scrap. About 50% - 60% originates from industrial sources and thrown machinery.

The market for recycling of plastic in Macedonia is underdeveloped. Most of the "hard plastic" is collected, including HDPE, PVC, polypropylene and polystyrene. They originate from broken car batteries, tubes, boxes and containers. Due to high expenditures for collection, PET plastics is currently collected informally and to a limited extent.

Composting
Several existing composting capacities represent capacities for composting or anaerobic digestion (to a lesser extent) intended for degradation of agricultural waste, particularly fertilizers. Only a small capacity, a pilot project in Zrnovtsi used the organic fraction of the municipal solid waste (MSW) as the basic material for production of compost (Haandel 1994). The main barrier for development of the market for organic compost originating from waste in Macedonia is mainly the lack of information on the use of the compost and the associated benefits.

Industrial Solid Waste

The industrial solid waste consists of all kinds of solid waste created from industries and the very industrial processes as well as any other source within the frames of the industrial capacity. One should differentiate between industrial non-hazardous waste (all kinds of solid waste created within the frames of the industrial capacity that do not contain dangerous elements or contain hazardous waste below the minimal standards/norms) and industrial hazardous waste (Townsend 2005). The treated industrial waste waters (for example, silt) that contain constituents exceeding the minimal standards/norms are included in the total quantities of hazardous waste)Table 2).

Table 2. Creation of industrial non-hazardous and hazardous waste

Type of waste	Total (tons/per annum)	Non-hazardous waste (tons/per annum)	Hazardous waste (tons/per annum)	(%)
Waste from mining	17 246, 000	12 700, 000	4 546,000	26
Waste from thermal processes	2 090,726	2 015,379	75,347	3,6
Waste from other processing industries	108,877	106,830	2,047	1,9
Total	**19 445,603**	**14 822,209**	**4 623,394**	**24**

In Macedonia, the largest quantities of industrial waste and industrial hazardous waste are created in the mining sector. The biggest two generators in the sector of thermal processes are the MHK Zletovo smeltery with 70,000 tons/per annum of PB-Zn slag and dust from exhaustion gases from chimneys and the steel factory Makstil – Skopje that creates around 5,000 tons of dust from exhaustion gases from chimneys per annum. The remaining industrial waste and hazardous waste is created mainly by small and medium size processing industries or companies.

Existing Practices in Solid Waste Management (SWM)
Generally, the generators of hazardous waste do not separate their industrial non-hazardous waste. If any, such a separation is due to market demand – for example, only those kinds of hazardous waste that can be sold are separated. In the country, there are no officially licensed collectors and transporters of hazardous waste. The total quantity of industrial non-hazardous waste which is deposited on municipal landfills is estimated at 4.927 tons/per annum, while the amount of industrial hazardous waste is 487 tons/per annum.

Medical Waste

Medical waste (MW) is considered the solid waste generated by medical and health care institutions (outpatient departments, hospitals, policlinics and health care stations, dental clinics, etc.). The waste consists of used objects and materials for diagnosis, medical treatment (Bittton 2005), prevention of diseases among people and animals (Law on Waste). According to EU, medical hazardous waste is classified as follows:

- Parts of body and organs, including blood bags and blood reserves (pathological waste);
- Waste whose collection and depositing is the subject of special demands for the purpose of prevention of infections (contagious waste);
- Chemicals consisting or containing dangerous substances:
- Other chemical materials;
- Cytotoxic and cytostatic medicines;
- Other medicines.

In Macedonia, a roughly estimated 900-1.000 tons of MW is crated annually. It represents about 15% of the total waste created by health care institutions (Table 3).

Table 3. Creation of medical waste

Medical waste	Quantities (tons/per annum)	%
Skopje/Kumanovo region	350	5
Remaining part of RM	650	10
Total	6 670	100

Limited quantities of dangerous MW – around 35% are selected, transported and incinerated at Drisla landfill in Skopje. The remaining 65% of the dangerous MW is deposited on municipal landfills or "unlicensed" landfills.

Waste from Agriculture-Stockbreeding
There are no exact/reliable statistic information about waste generation from agriculture. The estimations are based on field studies including large agricultural capacities and animal farms in Macedonia (Table 4)

Table 4. Waste from agriculture and stockbreeding

Type of waste	**Fertilizer (tons/per annum)**	**Animal corpses (tons/per annum)**
Waste from stockbreeding		
Poultry	81,295	340
Swine	469,930	469,930
Cattle	3 000,000	
Sheep	1 300,000	
Plants	**Organic remains**	
Crops	500,000	
Vineyards	54,000	
Vegetable	13,000	
Fruit	6,000	

Animal excrement
The relatively large quantities of waste generated by breeding cattle and sheep are entirely used for fertilization of the land. However, this practice should be improved through corresponding training of framers related to composting and planned application of the compost for the soil (Burke 2001). There has not been any analysis so far as to definition whether the storing of this kind of a fertilizer in certain areas is risky or not.

Animal tissue waste
At the moment, there is no appropriate system for management or a legal frame for managing waste associated with animal tissues (Vandevivere 2002). The existing practice involves burial of animal tissues in holes dug in the earth on the farms, or their depositing on the rural "unlicensed" landfills. In both situations, this activity is carried out in a completely uncontrolled way which does not comply with the sanitary standards. There are only several, rare, organized regional places for burial of this type of waste.

Plastic waste
There is no system for collection and depositing of plastic originating from production in green houses. It is a general practice to burn the waste in an open fire on the same location along with the waste consisting of animal tissues. Local companies collect the plastic waste to a certain extent and perform its recycling.

Agrochemical waste containing dangerous substances
In Macedonia, there are no safe capacities for depositing agrochemical waste containing dangerous substances as are contaminated waste from wrappings of pesticides and consumables for maintenance of hygiene of sheep, etc. The contaminated waste from wrappings is usually burnt or deposited along with the communal waste.

Special types of solid waste

The following types of waste should be considered separately:

- Waste oils and oils containing PHB and PHT;
- Waste metalworks;
- Car batteries and accumulators:
- Waste tires.

At the moment, in Macedonia, there are no statistically accurate information on the creation of such wastes at annual level nor schemes of harmonization of collection and ecologically suitable return of the waste in the production cycles. The (Table 5) presented below shows the assessments made for Macedonia in 2004/2005 based on the study on evaluation of the market of recyclable matters in Macedonia:

Table 5. Creation of special types of waste (tons/per annum)

Type of waste	Quantity (ton/per annum)	Thrown units/per annum
Waste tires	5,000	
Waste oils	8,000	
Waste vehicles		17,500
Car batteries and accumulators	1,500	

Current practice

Waste tires
Although part of the annually created waste tires is collected and used as a fuel in production capacities for lime, most of the waste tires are being deposited at the moment. In addition to the locally created quantities, there is import of waste tires for different goals. There is no usage of energy from tire combustion despite the existence of processing capacities at cement plants in Skopje as well as a clear interest in processing of waste tires.

Waste oils and oil waste
At the moment, in Macedonia, there is no system for collection and processing of used motor oils and their components. Most of the motor oil components are deposited or poured in an inappropriate way. Most of the waste oils and oil emulsions that are created in enterprises and due to other activities are burnt.

Waste batteries and accumulators
Waste batteries used for appliances are deposited on landfills mainly as part of the communal solid waste. A large number of companies that import waste motor batteries (around 7.000 tons/per annum) disassemble batteries and export the components that can be recycled to processing capacities beyond the country.
Waste metalworks
There is no organized collection of waste metalworks. The remains of vehicles are usually collected through the informal sector and are processed for the purpose of returning the spare parts in production cycles.

PHB waste
Recent investigations related to PHB waste have indicated that a considerable amount of transformers which are considered to contain PHB oil are still used in the power supply system. Some of these oil wastes are intended for collection, export and depositing in Switzerland. There is doubt that waste containing PHB is created in some industries as are the railway capacities. It should be noted that the local laboratories in Macedonia do not have capacities for identification of PHB or PHT content in solid waste.

Construction waste/debris (waste from tearing down structures)
The construction waste/construction debris (waste created during tearing down) is generated by activities as is construction of structures/buildings and civil infrastructure, complete or partial tearing down of structures/buildings and civil infrastructure, planning and maintenance of the road structure. This waste usually consists from: concrete, tiles, reinforcement, asphalt pavement, asphalt cover material, timber material, gypsum plates, stone, earth and minor remains. These materials may also contain dangerous constituents: fluorescent tubes, asbestos, lead, mercury and paints. The creation of this type of waste at annual level depends very much upon the construction activities in the public or the private sector.

FINANCING/ COVERAGE OF EXPENDITURES

Based on the "the polluter pays" principle, the expenses for the financing of the communal solid waste management should be provided through the compensations paid by the users of communal services, for instance the households. These compensations are invoiced and collected directly by the public works companies, not the municipalities, which may impose some hindrances as to increased participation in the refuse collection activities of the private sector. The basis for definition of the level of compensations is different among the municipalities whereat one may differentiate among the following variable criteria:

- Payment per m^2 for houses and courtyards (mainly in urban municipalities);
- Fixed compensation (lump sum) per household/per month (which is most commonly the case with the rural and some semi-urban municipalities);
- Payment per household member (the only case is the Tetovo municipality).

For collection and depositing of the industrial non-hazardous and commercial waste, the public works companies also invoice fixed compensations but with tariffs that are higher than those for the communal solid waste.

INFRASTRUCTURE AND WASTE MANAGEMENT CAPACITIES

Capacities for Depositing

Solid waste created in Macedonia is most frequently deposited. Drisla landfill that is used for the Skopje region is the only landfill in Macedonia that is relatively well managed. In any case, the plans for installation of impermeable base for the purpose of prevention of possible contamination of underground waters have still not been realized. The area surrounding the landfill consists of permeable sand and gravel deposits. However, not any special construction measures have been taken to prevent possible penetration of drained matter into the subsoil and the deeper aquifers. At the municipal landfills or the "unlicensed" landfills in rural areas, the public works companies simply throw the waste without operative expenditures except some general expenses (payment for the keepers, if any) and occasional expenditures related to consumption of water for extinguishing occasional fires on the landfill (Table 6).

Table 6. Review of municipal landfills

Municipal landfill	Functions since	Deposits ($м^2$)	Area ($м^2$)
Kumanovo/"Krasta"	1960	1,832,200	65,000
Pehchevo/"Suvi Dol"	1974	20,000	4,500
Murtino/"Dineva Bara"	1999	5,000	4,500
Krivogashtani/"Livadski Pat"	2004	800	900
Novo Selo/"Solena Reka"	2004	480	600
Resen/"Alchevi Koshari"	1966	200,000	30,000
Bitola/"Meglentsi"	1982	1,500,000	75,000
Belchishta (4)	2002	16,250	10,000
Valandovo/"Suvodolitsa"	1972	80,000	15,000
Zletovo/"Melishte"	1974	72.000	70.000
Krushevo(2)/"Kole Nalcho"	1970	5.400	3.000
Sveti Nikole/"Nemanjetsi"	1977	60.000	12.000
Veles/"Bunardere"	1980	620.000	75.000
Probishtip/"Strmos"	1975	12.000	1.600
Kriva Palanka/"Konopnitsa"	1982	120.000	5.500
Lipkovo (4)/"Nikushtak"	1998	n/a	n/a
Струмица	1986	350.000	80.000
Kavadartsi/"Meltsi"	1978	480.000	60.000

Kochani/"Belski Pat"	1975	300.000	120.000
Vinitsa/"Leski"	1971	430.000	15.000
Mesheishta	2002	6.240	3.000
Karbintsi(4)	1998	5.824	4.500
Kichevo	1998	50.000	30.000
Mak.Kamenitsa/"Kamenichki Rid"	1986	50.000	5.000
Miravtsi/"Karainovi Kuli"	1998	2.000	1.300
Delchevo/"Ostrets"	1989	175.000	25.000
Gevgeliya/"Suva Reka"	1976	20.000	15.000
Gostivar/"Sushitski Most"	1971	720.000	32.000
Doyran/"Dekil Tas"	1975	12.000	6.500
Blatets/"Pochivalo"	2000	3.840	900
Orizari/"Bel Kamen"	1997	7.000	20.000
Obleshevo/"Yaz"	2002	n/a	n/a
Mak. Brod/"Barbaros"	1995	12.000	8.000
Ohrid/"Bukovo"	1972	200.000	60.000
Dolneni/"Tsrnilishte"	2004	1.000	800
Prilep/"Omets"	1974	530.000	38.000
Shtip/"Treshtena Skala"	2004	8.000	6.000
Berovo/"Iljadin Valog"	1992	22.000	5.600
Debar/"Krivtsi"	1971	150.000	19.000
Kratovo/"Zeleznitsa"	1968	20.000	2.500
Radovish	n/a	50.000	11.000
Bogdantsi/"Brdanov Kamen"	1967	50.000	20.000
Demir Kapija/"Pchenichni Dupki"	1982	101.200	35.000

Industrial Landfills – "Foci"

The Macedonian mining-processing industries are facing big problems in the transitional period, with the prospective to cease their activities without chances for a re-start in the near future. Their "unlicensed" landfills for in situ processing/treatment of waste were abandoned, without any or with very few information on the history of their use and the type and quantity of deposited waste. The made list/inventory resulted in identification of 16 larger industrial contaminated locations.
Except for the larger industrial "unlicensed" landfills that are considered national "foci", there are also minor "unlicensed" landfills on which processed and hazardous waste is deposited

Incineration/Combustion

In Macedonia, there are no capacities for incineration/combustion in solid waste management, except for partial combustion of medical waste. At the Drisla landfill that provides services for the Skopje area, an incinerator for medical waste is installed. It became operational in 2000. The main characteristics of the incinerator are shown in (Table 9) It is evaluated that about 35% of the total amount of hazardous medical waste generated in Macedonia is incinerated/combusted.

Table 9. Main characteristics of the medical waste incinerator in Drisla

Item	Specification
Capacity (hour)	200 kg/hour, approximately 1 ton/shift
Actual entry of waste (per annum)	2001:230 tons, 2002: 240 tons (assessment)
Incineration/combustion temperature	Chamber 1: 800^0C, Chamber 2: 1000^0C
Number and type of employees	5 workers, 1 engineer, 1 administrator
Liquid gas cleaning system	There is no additional cleaning system beside the secondary chamber
Data on emissions	Inspection by the Inspectorate of the Ministry of Environment and Physical Planning
Depositing of ash	Depositing

CONCLUSION

For the last two years, Macedonia has been undergoing intensive development of legislation referring to solid waste management. The preparation of the Draft Law on Waste Management ("Official Gazette of Rm" no. 68/04, 71/04) has contributed to the current process of approximation enabling the country a modern and comprehensive law based on the EU Directives on Waste and Hazardous Waste. The Law on Waste Management provides the general rules referring to the following issues: strategy, formulation of plans and programme, waste management procedures, hazardous waste management, landfills, incineration and co-incineration of waste, import, export and transit of waste through the territory of the Republic of Macedonia, monitoring and management of data, information system, financing, supervision and competent authorities, penal provisions, transitional and finishing provisions.
Namely, the Law on Organization of the State Administration Authorities, the Law on Local Self-Government, the Law on Public Enterprises, the Law on Physical and Urban Planning, the Law on Investment Structures, the Law on Concessions, the Law on Public Procurement regulate certain issues that are important for the Waste Management Sector in the Republic of Macedonia, assigning different competences in the implementation of individual aspects of WM. What is important to point out is that not all of the above stated laws have achieved complete harmonization with the legal regulations of EU and they will be the subject of further considerations and modifications by the regulating body.

REFERENCES

Bitton, G., 2005.*Wastewater Microbiology.* John Wiley and Sons, Inc. Hoboken, NJ.

Burke, Dennis A. Dairy, 2001. *Waste Anaerobic Digestion.* Handbook Environmental Energy Company, Olympia, WA.

Haandel, A. and Lettinga, G., 1994. *Anaerobic Sewage Treatment*: *A Practical Guide for Regions with a Hot Climate.* John Wiley and Sons Ltd., West Sussex, England.

Lettinga, G., et al., 1999. High-Rate Anaerobic Treatment of Wastewater at Low Temperatures. *Applied and Environmental Microbiology*, pp. 1696-1702,

Ohmura, T. Sakai, Y. Shindo, K., Nakamura, T. Ike and Y. Katayama, 2003. Start-up of full scale anaerobic digesters treating municipal solid waste. *Water Science and Technology*, Vol. 48, No. 4, pp. 249-252,

Townsend, T., 2005. *Solid and Hazardous Waste Management*, Class Notes. University of Florida, Department of Environmental Engineering Sciences.

Vandevivere, P.L. De Baere and Verstraete, W. 2002. Types of Anaerobic Solid-Liquid Bioreactor for Food Waste. *Digestion Biotechnology Letters*, 24, pp.757-761.

4th International Symposium on Natural Resources Management
"Sustainable Development and Green Economy in Transition Countries"
31st May -1st June, 2014, Faculty of Management Zajecar, Republic of Serbia
www.fmz.edu.rs

WEATHER DERIVATIVES: A NEW MODEL FOR HEDGING CLIMATE CHANGE RISK

Bojan Đorđević[1],
Dragica Stojanović[2]

[1]*Faculty of Management Zaječar, Kraljevica bb 19000, bojan.djordjevic@fmz.edu.rs*
[2] *Faculty of Management Zaječar, Kraljevica bb 19000, dragica.stojanovic@fmz.edu.rs*

ABSTRACT

Climate change, has led to a significant rise in the frequency and amount of claims paid by insurers and reinsurers over the past three decades. Major 21st century challenges, such as adapting to climate change, food security, and the development of renewable energy, have turned the spotlight on the ties that bind man to his environment. At the end of the 1990's, a new market emerged to enable weather-sensitive businesses to protect themselves from weather hazards: the weather derivatives market. At the interface of finance and insurance, weather derivatives are bringing to light a new risk transfer model, in which reinsurers are destined to play a leading role. In this paper, we present weather risks and contract features with key remarks and recommendations for successful development of weather derivatives market.

KEYWORDS

Weater risk, HDD, CDD, Futures, Options, Hedging

1. INTRODUCTION

In today's financial markets, derivative instruments have certainly a granted place on corporate risk management as a way to insure against or hedge business hazards. Derivatives are financial instruments whose values depend on the value of other securities known as the underlying. Those underliyngs are often traded assets such as stock, commodities, currencies, bonds but can also be non-traded assets such as stock index. Futures and options are actively traded on major exchanges while forward and swap contracts are evenly traded outside exchange by financial institutions in the *over-the-counter market* (OTC). A new class of derivative securities has been created to offer corporate managers an instrument to hedge their fims against climate conditions' hazards. They are known as *Weather Derivatives* and are designed to minimize or avoid the risks due to changes in weather conditions (Lazibat, Zupanic, 2010, p.731).

On the other hand, several questions have been raised for why corporate managers should hedge their business and on what are the consequences of the use of derivatives as a form to offset undesired risks. Sometimes, instead of using derivatives for hedging purposes, managers have traditionally used them to simply speculate in financial markets with the intention of profit from market discrepancies. (Leggio, 2007, p. 247; Yang et al. p.518). Nonetheless, an un cautious use of derivatives could lead to huge losses that might have an impact not only in the company but be spread to the whole financial markets.

The objective of this paper is fourth fold: i) first, present the weather market development and trading volume today, ii) second, importance of weather derivatives for weather- sensitive companies, insurers/ reinsurers, iii) third, corporate hedging theory behind it and attempt to shed some light on the use of weather derivatives as a form of hedging volumetric risks for corporate institutions and iv) fourth, a case studies where weather derivatives are used to hedge potential risks due to weather effects on a company's business (example energy sector and agro-business with weather options and swaps).

2. WEATHER RISK MARKET

The first weather derivative contract was signed in 1997 in the United States, between two major energy players. In 1999, Chicago, the main stock market for commodities, added several standard weather derivatives to its offer of futures. At the beginning of the 2000's, the market was primarily occupied by major energy groups. Enron, through its online trading platform Enron Online, livened up the market with several standard temperature-based contracts. Far from nipping the young weather derivatives market in the bud, the bankruptcy of Enron in December 2001 promoted the entry of new players into the market. The Enron weather traders dispersed into banks, insurance companies and hedge funds, here and there recreating, with varying levels of success, teams devote to the management of weather risk and the trading of weather derivatives (CME, 2008, p. 10).

Until 2006, the weather derivatives market grew spectacularly: volumes exploded, contracts diversified and the market also developed in Japan and Europe. Subsequently, until 2010, the market went through a period of contraction, accentuated by the financial crisis and investor aversion to these products, which are hard to evaluate since they are very illiquid and often highly specific. Nevertheless, according to the Weather Risk Management Association (WRMA) the 2010/2011 financial year marked the return of growth to the weather risk market, with this type of transaction representing around US$ 12 billion. Given the multiplication of recent initiatives, notably since 2011 (e.g. development of the offering aimed at the agricultural sector in the United States and Asia, and strategic investments and partnerships in Europe), and the attractiveness of an asset class whose returns are uncorrelated from the rest of the market, along with the increasing importance placed on risk management in companies, the weather derivatives market seems assured of a promising future.

Weather derivatives function like the financial markets: upstream, there is a primary market where securities are issued, and downstream there is a secondary market providing liquidity. The primary market is a meeting place for end users, i.e. weather-sensitive companies seeking to buy protection from weather risks, and companies prepared to offer such protection, mainly insurers, reinsurers and banks. (Ali, 2000, p. 152; Brockett, Wang, Yang, 2005, p. 128; Aleksandridis, Zapranis, 2013). On this primary market, sellers propose highly structured contracts in order to best respond to the needs of buyers. On the secondary market, coverage vendors trade standardized contracts that enable them to dynamically manage their weather risk portfolios (Jewson, 2004, p. 57; Van Lennep et al., 2004, p.72). This distinction between the primary and secondary markets is found in the division of the weather derivatives market between the over-the-counter market and the regulated market. End users buy customized products on the OTC market from weather coverage vendors, who in turn manage the risk using standardized contracts available on the regulated markets. It is important to note that the weather derivatives market offers a certain level of security to its participants, in so far as the weather data involved is determined by independent bodies (e.g. Météo-France through Metnext in France and the National Weather Service in the US). The risk of a dispute relating to manipulation of the underlying index is therefore significantly lower than, for example, in the equity market (Ali, 2004, p.75).

The Chicago Mercantile Exchange (CME) is the leading market for the trading of weather derivatives. In Europe, Euronext Liffe suspended its weather derivatives activities in 2004. The CME offers futures and options. The most frequently traded contracts are based on cumulative Heating Degree Days (HDD) and Cooling Degree Days (CDD) in the major cities in the United States. The CME also proposes contracts based on the temperatures of several cities in Canada, Japan and Europe. It also allows traders to trade contracts based on accumulated precipitation (rain and snow) and frost values. The regulated CME market has a two fold attraction: it ensures a certain level of transparency (the prices are freely available on the CME website: http://cmegroup.com/trading/weather), and eliminates credit risk thanks to its clearing house.

A weather derivative or weather option is a financial instrument that has a payoff derived from variables such as temperature, snowfall, humidity and rainfall. However, the industry has set up temperature as the common underlying for those contracts. Unlike insurance and catastrophe linked-instruments, which cover high-risk and low probability events, weather derivatives shield revenues against low-risk and high probability events (such as mild winters). Temperature contracts are more specifically traded in what is called Heating Degree-Days (HDD) or Cooling Degree-Days (CDD) defined on daily average temperatures. The number of heating degree-days is the difference between 65 degrees Fahrenheit (or 18 Celsius) and the daily average temperature whilst the number of cooling degree-days is the difference between the daily average

temperature and 65 degrees Fahrenheit (or 18 Celsius). HDD and CDD can never be negative. Daily average temperatures are the arithmetic average of the minimum and maximum records in a midnight to midnight basis. A more elegant description of HDD and CDD is done below (Hull, 2009, p. 574):

$$DailyHDDs = Max\left[\left(T_{Base} - \frac{T_{Max} + T_{Min}}{2}\right), 0\right] \quad DailyCDDs = Max\left[\left(\frac{T_{Max} + T_{Min}}{2} - T_{Base}\right), 0\right]$$

Typical contracts are written on cumulative HDD/CDD structured by options, futures, swaps and collars for a given period. HDD contracts last during the November to March period whilst CDD for May to September. One could define four basic elements in options or futures/swap contracts: i) the underlying variable HDD/CDD; ii) the accumulation period: a season or a month; iii) the specific weather station that record the daily temperature and iv) the tick size assigned to each HDD/CDD. (Consodine, 2000, str. 8). **Table 1., 2.**and **3.** Provides an examples of contracts traded on the CME for HDD futures for some European cities.

Table 1. The main characteristics of weather agreement in USA and Europe

	USA	**Europe**
Active since	1996	1998
CME –listed since	1999	2003
Execution	Brokers and CME screen	Brokers, Auctions and CME screen
Main Winter Index	Heating Degree Days (HDD)	Heating Degree Days (HDD)
Main Summer Index	Cooling Degree Days (CDD)	Cumulative Average Temperature (CAT)
Temperature measure	Fahrenheit	Celsius
Treshold	65 F	18 C
Tick size	USD 20	GBP / EUR 20

Table 2. Example of contracts traded on the Chicago Mercantile Exchange for HDD option for Atlanta and CDD futures contract for Chicago

	Chicago CDD Futures contract	**Atlanta HDD Option contract**
Contract size	100 x CME degree day index	One futures contract
Measuring station	O Hara Airport (ORD)	Hartsfield Airport (ATL)
Contract month	12 consecutive calendar month	5 months HDD: Nov-Mar 5 months CDD: May-Sep
Minimum tick size	1.00 (HDD/CDD) index point = $100	1.00 (HDD/CDD) index point = $100
Regular strike price	Not Applicable	HDD: 50 index points CDD: 25 index points
Exercise	Not Applicable	European Style
Final settlement price	The Exchange will settle the contract to the CME degree day index of the contract month by EarthSat	Not Applicable
Initial strike range	Not Applicable	150 HDD / 75 CDD index points up and down from at-the-money
Position limits	10,000 Futures contracts	(Futures equivalents)
Trading hours	3.45 p.m To 3.15 p.m (next day)	Same as futures

Source: http://cmegroup.com/trading/weather

Table 3. The example of some HDD futures for European cities on CME

Exchg	Asset Class	Product	Product Code	Start Period	End Period	Initial	Maint.	Initial Vol. Scan	Maint. Vol. Scan
CME	WEATHER	LONDON MONTHLY HDD FUTURES	D0	01/2014	12/2016	8.1%	6.0%	40.5	3
CME	WEATHER	ROME MONTHLY HDD FUTURES	D9	01/2014	12/2016	6.6%	4.9%	40.5	3
CME	WEATHER	PARIS HDD MONTHLY FUTURES	D1	01/2014	12/2016	6.6%	4.9%	40.5	3
CME	WEATHER	AMSTERDAM HDD MONTHLY FUTURES	D2	01/2014	12/2016	7.6%	5.6%	40.5	3
CME	WEATHER	BERLIN HDD MONTHLY FUTURES	D3	01/2014	12/2016	6.8%	5.0%	40.5	3
CME	WEATHER	PRAGUE MONTHLY HDD FUTURES	D7	01/2014	12/2016	6.8%	5.0%	40.5	3

Source: http://www.cmegroup.com/trading/weather/snowfall/monthly-snowfall_performance_bonds.html

Weather derivatives structures commonly used are (Hull, 2009, p. 574): 1) cap - a call option; 2) floor - a put option; 3) collar - a put and a call option, usually with little or no premium;4) swap - a derivative with a profit and loss profile of a futures contract and 5) digital option - an option that pays either a predetermined amount if a certain temperature or degree day level is reached, or nothing at all in other case. A business with weather exposure may choose to buy or sell a futures contract, which is equivalently to a swap such that one counterparty gets paid if the degree day over a specific period are greater than the strike level, and the other party gets paid if the degree day over that period are less than the strike (Rohrer, 2004; Yang, Brockett, Wen, 2009). A business may also choose to write an option. A heating oil retailer may feel that if the winter is very cold they will have high revenues - so they might sell an HDD call. If the winter is very cold, the retailer can afford to write the option and pay out with higher than normal revenues.

Table 4. HDD and CDD calculated values (Scandinavia, Europe)

Date	T *min*	T *max*	T *avg*	CDDs	Σ CDDs	HDD	Σ CDDs
July 1, 2012	10.7	23.2	16.9	0.0	0.0	1.1	1.1
July 2, 2012	13.9	24.1	19.0	1.0	1.0	0.0	1.1
July 3, 2012	12.5	28.4	20.5	2.5	3.5	0.0	1.1
July 4, 2012	17.4	28.7	23.1	5.1	8.6	0.0	1.1
July 5, 2012	16.7	29.5	23.1	5.1	13.7	0.0	1.1
July 6, 2012	11.3	18.4	14.9	0.0	13.7	3.1	4.2
July 7, 2012	9.5	11.9	10.7	0.0	13.7	7.3	11.5

Source: authors

3. TRADITIONAL INSURANCE AND WEATHER DERIVATIVES

Weather-sensitive companies may then seek to mutualise or transfer their risks. Traditional methods of coverage consist of mutual insurance funds or indemnity - based insurance contracts, as it is the case in France (Munich Re, 2000):

- Thus the Union des Caisses de France has implemented a mutual insurance fund to which all companies in the Construction and Civil Engineering industry contribute. In the event of bad weather, the fund covers a large part of the operating losses suffered by the companies involved;
- Homeowners' all risk insurance, which includes mandatory "storm" and "natural catastrophe" coverage, should also be mentioned here. Storm coverage covers not just the impact of wind (from storms, hurricanes and cyclones) but also the damage caused by rain, snow and hail. Natural catastrophe insurance, which is defined in article 125-1 of the French Insurance Code, covers avalanches, flooding and drought in particular. Nevertheless, the concept of natural catastrophes is subjective and is assessed by the public authorities. Natural catastrophe insurance only comes into play in specific areas and in the event of bad weather, as defined by inter-ministerial decree. Traditional insurance contracts are generally unsatisfactory from the point of view of the insurer. For high-risk, low probability extreme weather events, insurers are often confronted with the problem of portfolio diversification. Moreover, and this is also true for low-risk, high probability non-catastrophic weather events, the indemnity reasoning behind traditional contracts exposes insurers to problems linked to information asymmetry (adverse selection and moral hazard) and generates significant management costs.

To respond to the issues involved in the diversification of catastrophe risks, the insurer has three main choices (Munich Re, 2000; Berg et al., 2005, p.160):
- To use co-insurance, thereby sharing catastrophe risks with other insurers;
- To use reinsurance and cede a part of its risks to a reinsurers;
- To turn to the capital markets by issuing a catastrophe bond (CAT-Bond). The operating principle of a catastrophe bond is simple, and comparable to that of a corporate bond. If a catastrophic event occurs, the bond may default, which for investors means total or partial loss of the capital invested. In exchange, the investors who buy such securities receive an annual coupon payment that is generally high, at a rate of around 8%.

When looking at the merits of such transactions there are a number of advantages and disadvantages relative to traditional catastrophe reinsurance products:

1. Advantages

- Cedant loss history is irrelevant as the payout is determined purely by an index of objective measurements. Problems with poor quality historic data are less important than for traditional catastrophe reinsurance;
- Catastrophe software modeling error eliminated;
- Extension of markets to reinsurers otherwise unwilling to play in this arena and wider financial markets;
- Event definition clearly and objectively defined;
- Payout determined immediately by index;
- Cost of structuring the deal is less than for other ART solutions such as CAT bonds;
- Difficult to insure risks can be covered, and
- There are no exclusions for individual risks.

2. Disadvantages

- Damage incurred may exceed the indemnity received, and
- Requires a correlation analysis between cedant portfolio and selected index.

4. WEATHER DEIVATIVES DESCRIPTION

Most weather derivatives have payouts which are based on "degree days". The contract is best illustrated by an example (Jewson and Brix, 2005; Tindall, 2006):

Type of option: Call
Heating Degree Days (HDD)
Contract period: November 1, 2004 – March 31, 2005
Weather Station: Chicago/ O'Hare Airport
Strike: 5000
Dollars per unit: $10,000
Maximal payout: $2,000,000

Beginning on November 1, 2004 we repeat the following process every day: take the maximal weather recorded at the weather station and the minimal weather. Take the average of the two numbers. This determines the "weather" for that day. For each day *i*, the station releases *Tmax(i)* and *Tmin (i)* the maximal and minimal temperatures recorded on that day. We define *W(i)*, the weather for day *i* as

$$W_{(i)} = \left[\left(\frac{T_{Max(i)} + T_{Min(i)}}{2} \right) \right]$$

The next step involves looking at the difference between the weather of the day and 65 degrees. Since this is an HDD option, we only consider cold days in which the weather was below 65 degrees. These are days in which people would have to turn their heaters on. Thus *HDD(i)*, the heating degree days measured on that day would be

HDD(i) = max{65-W(i), 0}

Similarly, options trade on cooling degree days CDD. Therefore *CDD(i)*, the cooling degrees generated on day *i* would be

CDD(i) = max{W(i)-65, 0}

The third step involves summing the HDD(i) for all the days in our contract period, including the first and last days, November 1, 2004 and March 31, 2005 respectively.

Total = Sum(i=November 1, 2004 to March 31, 2005) [HDD(i)]

On the day following the expiration of the option, that is April 1, 2013 we can compute the payout

*Payout = min(Dollars per unit * max(Total-Strike, 0), Maximal payout)*

In our example,

*Payout = min($10,000 * max(Total-5000, 0), $2,000,000)*

The party who buys this option will be paid if the winter in Chicago will be severe. In that case, the winter will be cold, a lot of HDDs will be generated and *Total* would be large. Thus call options pay out in extreme weather conditions and put options pay out when the weather is mild. Actually, the payout of this option shows a greater similarity to a traditional call spread rather than to a call option. Note that our option can not be in the money by more than 200 HDDs.

4.1. Hedging With Weather Futures

A company can use HDD and CDD futures contracts traded on the market to hedge their weather risk exposure. These contracts trade like other futures but are "priced" based on degree day indexes (Gardner, 2003, p. 8). Futures traded on the CME can be either bought or sold. If a company buys a monthly weather futures contract, the more degree days in the month, the greater the value of the futures contract. A company will buy the futures contract at a degree day index level traded in the market. If the number of degree days in

the month turns out to be higher than the index level where the contract was bought, the buyer gains on the futures contract. In a similar manner, a company can sell a HDD or CDD monthly weather futures contract. If the number of degree days in the month is lower than the index level where the contract was sold, the seller gains on the futures contract. Suppose a wheat farmer wishes to hedge the event of an extremely cold winter, she can buy an HDD contract. If the weather is unusually cold, she will receive payment from the futures position because the HDD index went up, (i.e. there were more HDDs in the colder month). However, if the weather is only mildly cold, she will likely harvest a large crop of wheat and earn favorable revenues but lose money on the futures position, which can be offset by the revenues from the larger crop. In the same way as HDD futures, CDD futures can be used to hedge the risk of decreased revenues when the weather is extremely hot. For example, if a corn farmer wishes to hedge his risk that the summer will be extremely hot, he can buy CDD futures contracts. If the summer is indeed hot and his corn crop does poorly, the value of the CDD futures contracts will increase and offset the loss of revenue from a bad crop.

However, if the summer is mild and his crop does well, he can offset the loss on the CDD contract with the additional revenue from his corn crop. Taking the other side of these contracts, suppose a company wishes to hedge a mild winter or summer, it could sell HDD or CDD futures contracts. For example a utility company experiences reduced revenue when the winter weather is mild. The utility can sell an HDD futures contract and, if the winter is mild, collect a gain in its futures position because the HDD index would move down (i.e. there would be fewer HDDs in the month). However, if the winter turned out to be extremely cold, the utility's revenues would increase, but the company would realize a loss in the futures position, which would be offset by the increase in revenue. As in any hedging case, weather futures can be used to "lock-in" the revenue that a company might forgo if the weather is unfavorable to its profit. Entering into a CME weather futures contract is essentially like entering into a swap based upon the weather, only clearing through the CME Clearing House. The two parties essentially swap payments based on the weather; one party is paid if the weather is relatively extreme and the other party is paid if the weather is relatively mild. For example, suppose that the utility in the previous example wishes to hedge its potential loss of revenue due to a mild summer in Des Moines, Iowa. The utility could enter into a short July CDD futures position (sell the CDD contract) for Des Moines at a CDD index "price" of 850. If the CDD in July were lower than 850, hence cooler days and less need for power to run air conditioners, the utility would gain from the futures position. Now suppose that a corn farming company took the opposite long position in the same futures contract (bought the CDD contract)at 850. The farming company loses revenue if the summer is too warm and burns up the corn crop, so it wishes to hedge against this risk. At the end of July, if the CDD for the month were 950, the utility would pay to the Clearing House $2,000 ($20 x 100) and the farming company would receive $2,000

4.2. Hedging With Weather Options

The options that the CME offers on HDD and CDD futures contracts add the aspect of limited risk to the extensive market coverage offered by futures. The buyer of a weather option has theoretically unlimited profit potential on the upside, while only risking the premium paid for the option on the downside. This limited downside risk is transferred to the writer of the option, who accepts potentially unlimited downside risk in return for receiving the option premium at the time of the sale. Weather options derive their value based on a strike price, which is indexed as the number of degree days in a period. If a company wishes to hedge the risk of a period of extreme weather (i.e. wanted to gain if there were more degree days in a given month), they would buy a call option with a strike price equal to the number of degree days above which they wanted to realize a gain (Russ, 2004, p.299) The higher the strike number of degree days, the cheaper the option, but the more degree days in the period would have to accumulate for the company to realize a gain on the option position. This call option would increase in value as the number of HDD or CDD in a period increased above the strike price. If a company wishes to hedge the risk of a period with mild weather, they would buy a put option at the desired strike price. The put option would have a greater value the more the cumulative number of degree days in the period was below the strike price. CME options on HDD and CDD futures are European style, which means that they cannot be exercised before their respective expiration dates. The underlying instrument for each HDD or CDD option is one HDD or CDD futures contract. Like weather futures, a weather option contract is worth $20 times the premium or price of the option. For example, a quote of 3.00 on an HDD or CDD option represents a premium of $60, or 3 price ticks. For example, if the underlying July 2006 CDD futures for the city of Atlanta are trading at 800, and an "at-the-

money" CDD call with a strike price of 800 is trading at 10.00, the call would have a value of $200 ($20 x 10 CDD Index points), whereas an "out-of-the-money" 830 CDD call might have a value of 5.00 or $100 ($20 x 5.00 CDD Index points).If a farmer wanted to have protection from an extremely cold winter or hot summer, he could buy HDD call options, in the case of winter, or CDD call options, for summer. For example, if a wheat farmer wanted to use options to hedge his cold weather risk, he could buy January HDD call options for the city of Kansas City, Kansas at a strike of 450 HDD. The call options would be worth $20 times each HDD above 450. Thus, the farmer would receive payment if the weather were extremely cold and his wheat froze but would only lose the premium paid for the call options if the winter was mild and the option expired out-of-the-money (i.e. the HDD index was below 450). In much the same manner, a corn farmer could hedge his warm weather risk on his corn by buying CDD calls for July. If the cumulative CDD for the month of July were above the strike price of his calls, the farmer would realize a gain on the calls; otherwise he would only lose the premium paid for the calls. Weather options can also be used to hedge against the risk of insufficient GDD, or mild weather, in a period. While HDD and CDD calls can hedge against extreme winter or summer conditions, a farmer can buy weather put options to protect against the risk that the crop does not have good enough weather conditions to sufficiently produce. For example, suppose corn needed 3,000 GDD to produce and the farmer expects these GDD to accumulate over 120 days. These 3,000 GDD, with a base temperature of 50 degrees, over this time period equal 1,200 CDD. The farmer could buy CDD put options over the season with a strike price of 1,200 CDD and would gain $20 on each put option for every degree day that the CDD index was below 1,200. He would only lose the premium paid for the options if the weather was warmer but his corn would produce and provide greater revenue to cover the option premium.

4.3. Hedging With Weather Swaps

One hedging technique that is available is to hedge with zero cost swaps. Assume that a dealer sells a 5000 HDD call option on Chicago. The option runs from November 1 to March 31. It pays $10,000 per HDD with a maximal payout of $2,000,000. Here are some modeling results:

ATM DD	Sold 5000 Call	P&L on Call	Buy 5016 call	Sell 5016 Put	price of swap	P&L of swap
4,966	$709,649	$ 113,104	$668,830	$869,192	$ (200,362)	$ (200,216)
5,016	$822,753		$782,386	$782,532	$ (146)	
5,066	$910,081	$ (87,329)	$889,733	$725,206	$ 164,527	$ 164,673

Assume that the zero cost swap strike price is 5,016. The price of the 5,000 call option which was sold by the dealer is $822,753.Assume that several days have past and that the forecasters change their prediction. Based on new information they predict that the winter will be slightly milder than usual. That would mean that the strike of the zero cost swap would move downwards. Assume that it would change to 4,966..If the zero cost swap strike was to move by 50 HDD to 4,966 the price of the 5,000 call would decline to $709,649 and the dealer would show a profit of $113,104. On the other hand if the zero cost swap strike was to move by 50 HDD to 5,066 the dealer would show a loss of $87,329.

Let's consider the 5,016 swap. The swap consists of a long position in a 5,016 call option and a short position in a 5,016 put option. Both options have a payout of $10,000 per HDD with a maximal payout of $2,000,000When the at the money swap strike is 5,016, the price of the call almost exactly offsets the price of the put and the cost of the swap is zero (a zero cost swap).If the zero cost swap strike was to move to 4,966 the price of the 5,016 swap would decrease by $200,216. On the other hand, if the zero cost strike price would increase to 5,066 the price of the 5,016 swap would increase by $164,673. As the dealer does not know what the future will bring, he should hedge himself by entering into a fractional amount of a swap. The amount of swap entered in this example would be:

($113,104- (-$87,329)) / ($164,673 – (-200,216)) = 0.549

Note that the "delta" of the call option is 0.549. We expect the delta of a slightly in the money call option to be slightly greater than 0.5. Also note that the profit on one side $113,104 does not exactly match the loss

on the other side $87,329. This is due to the gamma effect. The delta of the option changes as the strike of the at the money swap increases or decreases. Therefore, our dealer could enter into 0.549 units of swap for every call option sold. In reality, the dealer would probably adjust the payout amounts per HDD and the maximal payout amount. Assume that the 5,016 options entered into as the swap position were to be changes so that the payout is $5490 per degree day and the maximal payout is $1,098,000. We now repeat the calculations as above:

	Buy	Sell	price of swap	P&L of swap
ATM DD	**5016 call**	**5016 Put**		
4966	$ 376,427	$ 479,616	$ (103,189)	$ (103,376)
5016	$ 431,435	$ 431,248	$ 187	
5066	$ 487,091	$ 399,120	$ 87,971	$ 87,784

We note that the profit and loss on the swap almost matches the profit and loss on the option exactly. In a traditional delta hedging approach, the dealer would constantly adjust his delta hedge ratio and increase or decrease his exposure to the swap (Schmitz, 2007). This may be very costly to do in the weather derivatives market as the instruments are not liquid.

5. CONCLUSION

More than 80% of the worldwide business activities are dependent on weather conditions and climate changes. Corporations, in particular utility companies may hedge the risk of a drop in their sales and/or profitability due to unfavourable weather conditions by entering into weather derivative transactions. Possible counterparties for these transactions are reinsurers, investment banks and specialized trading houses. The focus of activities lies in degree day options hedging adverse temperature fluctuations. Degree day options are very similar to XL/stop/loss reinsurance contracts with a fixed priority and treaty limit. The weather derivatives business so far has been preliminarily a US business, with a transaction volume of about US$ 3bn. With the further deregulation of the energy sector in Europe and other regions of the world and an increasing awareness of the weather as an important factor for companies sales and results, the weather derivatives market is expected to be a fast growing business segment.

KEY REMARKS AND RECOMMENDATIONS

Even where the sensitivity of economic activities to weather conditions is proven, it may be difficult to accurately identify the link between the variability of weather conditions and income volatility. In addition to this, the weather derivatives market is still suffering from a lack of liquidity linked to demand asymmetry. Thus, coverage against a too-cold summer is far more sought after than coverage against a too-hot summer. This is, moreover, why the Euronext Liffe market stopped trading weather derivatives after three years, in 2004. Due to the difficulty involved in quantifying risk, and the low level of liquidity on the secondary market, risk premiums remain high for weather contracts. This constitutes one of the major brakes on development. The mastery of new technology and the adoption of an appropriate marketing approach will help to overcome this problem. Regulatory transparency also constitutes one of the development conditions for weather derivatives. States and international institutions must therefore continue to work in this direction. Today, three key priorities of weather derivatives market successful development are:

Marketing

The climate is often viewed as an inevitability that it is virtually impossible to curb. Even though weather-sensitive agents often deplore the negative impacts of the weather on their business, they are not in the habit of protecting themselves against this risk. Marketing therefore plays a key role in the development of weather derivatives. This involves properly understanding the sensitivity of potential clients to pricing and drawing up a business strategy that will make them aware of the advantages of protection. As the culture of weather

risk management spreads, pricing data will become more abundant, risk premiums will get lower and coverage will become more appealing.

New technologies and Data bases

Indexed solutions for the transfer of weather risks are also developed through the mastery of new technologies. The companies designing such solutions must be able to understand and digitally analyses weather data taken from measuring instruments as advanced as the Cross-track Infrared Sounder (CrIS) on board *NASA's National Polar orbiting Operational Environmental Satellite* (NPP), which provides profiles of temperature, pressure and humidity. Moreover, in order to measure the link between the potential losses of an agent seeking to cover himself and weather conditions, data concerning the economic activity of the weather-sensitive agent must be collected and compared with weather data, in order to be able to construct a weather index that captures the weather-sensitivity of such activity. Consequently, the designing companies must be able to manage large databases. Cloud computing, which is expanding rapidly, provides appropriate responses to the problem of managing large volumes of data.

The support of states and international institutions

States and international institutions have a major role to play in the development of weather derivatives. Indeed, States and international institutions must continue to define the regulatory framework surrounding these new products, with regard to both the legal form that they may take and their associated accounting methods. Moreover, the development of weather derivatives, particularly in the agricultural sector, often rests on the implementation of public-private partnerships (PPP). International organizations seeking to promote private development initiatives, such as the World Bank, offer their expertise to poor countries in order to enable small farms to access the weather risk market. States, for their part, act through subsidies. Anxious to support the two key business sectors constituted by agriculture and energy, governments facilitate the transfer of risks that curb the development of these sectors. Thus, agricultural insurance is largely subsidized by states, which may pay for up to almost two thirds of premium sand a portion of reinsurance. Finally, states may also stimulate the development of weather derivatives by facilitating access to data and promoting the roll out of weather stations on their territories.

REFERENCES

Alexandridis, Antonios, Zapranis, Achilleas. "Weather Derivatives: Modeling and Pricing Weather-Related Risk". Springer New York. (Electronic Edition) eBook Collection, Springer Link: 2013

Ali, Paul. "Weather Derivatives, Hedging Volumetric Risk and Directors` Duties". *Company and Securities Law Journal*, 18, 2000: 151-155.

Ali, Paul. "The Legal Characterization of Weather Derivatives". *The Journal of Alternative Investments*, Vol. 7, No. 2, 2004: 75-79

Berg, Ernst, Schmitz, Bernhard, Starp, Michael, Trenkel, Hermann. „Wetterderivate: Ein Instrument im Risikomanagement für Landwirtschaft?". Agrarwirtschaft 54, Heft 3, Berlin, 2005: 158-170.

Brockett, Patrick, Wang, Mulong, Yang, Chuanhou "Weather derivatives and weather risk management", *Risk Management and Insurance Review*, 8 (1), 2005:

Considine, Geoffrey. Introduction to Weather Derivatives. Weater Derivatives Group, Aquila Energy, 2000. Internet: http://www.cmegroup.com/trading/weather/files/WEA_intro_to_weather_der.pdf. (20.12.2013)

Chicago Mercantile Exchange. An Introduction to CME Weather Products, 2005.

Chicago Mercantile Exchange & Storm Exchange, Inc. What every CFO needs to know about weather risk management. 2008 Internet: http://www.cmegroup.com/trading/weather/files/weather-risk.pdf (20.12.2013)

Gardner, Lisa. "New Options for Managing Agricultural Weather Risk." *CPCU e-journal*, Vol. 58, № 8, August 2003: 1-23.

http://bif.rs/2012/12/ekonomska-kriza-i-klimatske-promene-klimatski-kapitalizam/#sthash.S0hcGRnj.dpuf

Hull, John. Options, futures and other derivatives, 7 ed., New Jersey: Prentice Hall, 2009

Lazibat, Tonći., Zupanic, Ivana."Weather derivatives – aninnovative product of futures market". Proceedings of 2nd International Conference „Vallis Aurea - focus on: Regional Development", ISBN 978-953-7744-06-9, ISBN 978-3-901509-76-6, Editor Branko Katalinic, Published by Polytechnic of Pozega, Croatia & DAAM International Vienna, Austria, 2010: 0729-0735

Leggio, Karyl. B. "Using weather derivatives to hedge precipitation exposure", *Managerial Finance*, 33 (4), 2007

Munich Re Art Solutions, Weather derivatives, *Geneva Papers on Risks and Insurance*, Munich Re Group, april 2000.

Jewson, Stephen. "Introduction to Weather Derivative Pricing", *The Journal of Alternative Investments,* 2004

Jewson, Stephen, Brix, Anders. Weather Derivative Valuation: The Meteorological, Statistical, Financial and Mathematical Foundations. Cambridge University Press, Cambridge, 2005.

Rohrer, Mario. B. "The Relevance of Basis Risk in The Weather Derivitives Market". Computational Finance and its Applications (Computatinal Finance 2004), UK, Wessex Institute of Tehnology: 2004

Russ, Ray. "Weather derivatives: Global hedging against the weather", Derivatives use, Trade Regulation (4), 2004

Schmitz, Bernhard. Wetterderivate als Instrument im Risikomanagement landwirtschaftlicher Betriebe. Doktorarbeit im wissenschaftlichen Studiengang Agrarwissenschaften an der Rheinischen Friedrich-Wilhelms-Universität zu Bonn, Institut für Lebensmittel- und Ressourcenökonomik, Bonn, 2007

Tindall, Jon. Weather Derivatives: Pricing and Risk Management Applications. Institute of Actuaries of Australia, 2006

Van Lennep, David, Oetomo, Tedy. N., Stevenson, Maxwell and De Vries, Andre. "Weather Derivatives: An Attractive Additional Asset Class". *The Journal of Alternative Investments,* Vol. 7, No. 2, 2004:65-74

Weather Risk Management Association / PwC Survey 2006. Internet: http://www.wrma.org/members_survey.html/ (21.12.2013)

Weather Risk Management Association "Weather market shows robust 35% increase in trades for 2007–2008", Press Release. From http://www.wrma.org/documents/WRMA%20PwC%202008%20Survey%20results%20press%20release.pdf

www.cmegroup.com/trading/weather/files/cumulus-preso-052012.pdf

www.cmegroup.com/trading/weather/snowfall/monthly-snowfall_performance_bonds.html

Yang, Charles.C., Brockett, Patrick.L., Wen, Min.M."Basis risk and hedging efficiency of weather derivatives". *The Journal of Risk Finance*, Vol. 10, No. 5, 2009:517-536

4th International Symposium on Natural Resources Management
"Sustainable Development and Green Economy in Transition Countries"
31st May -1st June, 2014, Faculty of Management Zajecar, Republic of Serbia
www.fmz.edu.rs

STRATEGIES OF GAMZIGRAD SPA DEVELOPMENT TOWARDS GREEN ECONOMY

Biljana Ilić[1],
Dragan Mihajlović[2]
Gabrijela Popović[3]

[1]*Faculty of Management, Zajecar, biljana.ilic@fmz.edu.rs*
[2]*Faculty of Management, Zajecar, gabrijela.popovic@fmz.edu.rs*
[3] *Faculty of Management Zajecar, dragan.mihajlovic@fmz.edu.rs*

ABSTRACT

Tourism is integral part of modern business, and also part of green economy. Spa tourism must bee seen as a major part of the tourism in the countries that are rich in spas. In this case it must be considered as tool of achieving important economic goals. The paper proposes an evaluation model based on TOPSIS, and ELECTRE mathematical methods to help the decision makers in selection of the optimal strategy for Gamzigrad spa development. AHP method is used as ancillary method to determine the weights of criteria. A real case study is used for determination of the development strategies, towards green economy.

KEYWORDS

Modern society, economic goals, green economy, TOPSIS, ELECTRE.

1. INTRODUCTION

In the last few years, there have been more and more proofs pointing to the fact that doing tourism means being highly concerned with sustainability of natural resources. Green economy is the growth in income and employment growth, through investments that reduce emissions of harmful elements in the eco-system, increasing the efficiency of nature and maintaining biodiversity. Harmful elements, such as waste gases, hazardous substances, formed as by-products of modern human activity. In order to reduce the harmful effects to the environment, mankind would have to think of finding the ways to help a sustainable economy, and to compliance it with environmental objectives. The main goal of the economy is realization of economic gain, regardless of other factors, while the main goal of environmental protection, is protection of natural resources and the environment in which human activity is performed. Based on that facts, it can be concluded that the green economy as a new branch of economics, encompasses the achievement of economic goals, but with maximum consideration of environmental objectives, too. The paper is based on finding the adequate development of spa tourism strategies, in case studies of Gamzirad spa, using the appropriate mathematical methods to help decision makers in the selection of appropriate solutions. In that case development strategies of Gamzigrad spa contained both economic component, as well as environmental factors, taking into account the concept and objectives of a green economy.

2. POTENTIAL OF GAMZGRAD SPA

Gamzigrad spa has a great potential for the tourism development, and because of that it is necessary to determine appropriate strategies for achieving the desirable improvement. But choosing the appropriate

strategy is not easy task and very important question is: *Which strategy is the appropriate choice for present conditions?* The answer to this question could be obtained by using MCDM (Multi-Criteria Decision-Making) methods. Many authors have discussed MCDM methods in the papers and example of that are reviews include: [1-7]. This paper presents the possibility of finding adequate strategy for sustainable development of Gamzigrad spa by using TOPSIS and ELECTRE. Criteria weights are determined by using AHP method. The paper is organized as follows: in section 2 the methods are explained; section 3 contains numerical example; and conclusions are discussed in section 4.

3. THE AHP METHOD

AHP was proposed by Saaty [8, 9] to model subjective decision-making processes based on multiple criteria in a hierarchical system. This method is very convenient for determining the relative criteria weights. Three of the most used methods for determining the weights in AHP are: average of normalized columns (ANC), normalization of row average (NRA), and normalization of the geometric mean of the rows (NGM) [10]. The AHP method includes following steps: **Step 1.** Construct a pairwise comparison matrix using the fundamental scale of the AHP (Table 1).

Table 1. Fundamental scale of AHP

The evaluation scale	Definition
1	Equally important
3	Slightly more importance
5	Strongly more importance
7	Demonstrably more importance
9	Absolutely more importance
2, 4, 6, 8	The medium value of the adjacent scale

Table 2. Pairwase comparison matrix

	C_1	C_2	C_3	…	C_j
C_1	a_{11}	a_{12}	a_{13}	…	a_{1j}
C_2	a_{21}	a_{22}	a_{23}	…	a_{2j}
.	.	.	.	.	.
C_j	a_{j1}	a_{j2}	a_{j3}	…	a_{jj}

In the pairwase comparison matrix where a_{ij} denotes the comparative importance of criterion C_i with respect to criterion C_j. In the matrix $a_{ij}=1$, when $i=j$ and $a_{ji}=a_{ij}$. **Step 2.** Calculate relative normalized weight w_j of each criterion by using the following formulae:

$$GM_i=\left(\prod_{i=1}^{n} a_{ij}\right)^{1/n}, \tag{1}$$

$$w_j = GM_i / \sum_{i=1}^{n} GM_i, \tag{2}$$

where *GM* is geometric mean.

Step 3. Determine the maximum eigenvalue $\lambda_{\max}$ and calculate the consistency index CI:

$$CI=(\lambda_{\max}-n)/(n-1). \tag{3}$$

Step 4. Obtain the random index RI for the number of criteria used in the decision making (Table 3).

Table 3. Random index details

Number of criteria	1	2	3	4	5	6	7	8	9
RI	0.00	0.00	0.58	0.90	1.12	1.24	1.32	1.41	1.45

Step 5. Calculate the consistency ratio CR by using following formula:

$$CR = CR/RI. \tag{4}$$

Judgment is appropriate when the value of CR is 0.1.

4. THE TOPSIS METHOD

The TOPSIS was first introduced by Hwang and Yoon 1981 [11]. 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 [12]. There are a lot of examples of using TOPSIS for improving the decision making process in many different fields and one example of that is paper of Dağdeviren et al. [13]. The TOPSIS method consists of following steps: **Step 1.** Establish decision matrix. Criteria shown as qualitative values need to be changed into quantitative values. A numerical scale, which is using for that purpose, is shown in Table 4:

Table 4. Transformation of linguistic scales into quantitative values

Linguistic scale	Quantitative value	
	Benefit - max	**Cost - min**
Very high	9	1
High	7	3
Average	5	5
Low	3	7
Very low	1	9

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

$$r_{ij} = x_{ij} / \sqrt{\sum_{i=1}^{m} x_{ij}^2}\ , \tag{5}$$

where 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 [14]. **Step 3.** Create the weighted normalized decision matrix. The weighted normalized value v_{ij} is calculated as:

$$v_{ij} = w_j r_{ij}. \tag{6}$$

Step 4. Determine ideal solution A^+ and anti-ideal solution A^- using formulae:

$$A^+ = \left\{v_1^+,...,v_n^+\right\} = \left\{\left(\max_i v_{ij} \,\middle|\, i \in I'\right), \left(\min_i v_{ij} \,\middle|\, i \in I''\right)\right\} \tag{7}$$

$$A^- = \left\{v_1^-,...,v_n^-\right\} = \left\{\left(\min_i v_{ij} \,\middle|\, i \in I'\right), \left(\max_i v_{ij} \,\middle|\, i \in I''\right)\right\} \tag{8}$$

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 using formulae:

$$D_i^+ = \sqrt{\sum_{j=1}^{n} \left(v_{ij} - v_j^+\right)}, \tag{9}$$

$$D_i^- = \sqrt{\sum_{j=1}^{n} \left(v_{ij} - v_j^-\right)}. \quad (10)$$

Step 6. Calculate the relative closeness to the ideal solution (where $0 \le C^+ \le 1$) as follows.

:

$$C_i^+ = D_i^- / \left(D_i^+ + D_i^-\right), \quad (11)$$

5. THE ELECTRE METHOD

The ELECTRE method was developed by Roy 1968 [15] as response to the existing decision making methods. This method could be viewed as a philosophy of a decision aid. The main steps of the ELECTRE method include: **Step 1, 2** and **3** are equal to the TOPSIS methodology. **Step 4.** Determine concordance C_{pr} and discordance D_{pr} sets by using follows formulae:

$$C_{pr} = \left\{j \middle| \ xpj \ge xrj\right\}, \quad (12)$$

$$D_{pr} = J - S_{pr} = \left\{j \middle| \ xpj < xrj\right\}. \quad (13)$$

Step 5. Define the concordance matrix c_{pr} on the basis of the concordance sets. The elements of this matrix are the concordance indices and it is calculated as:

$$c_{pr} = \sum_{j \in Cpr} w_j. \quad (14)$$

Step 6. Determine the discordance matrix d_{pr} on the basis of the discordance sets. The elements of the matrix are the discordance indices determined by the following formula:

$$d_{pr} = \frac{\max_{j \in Dpr}\left[w_{pj} - w_{rj}\right]}{\max_{j \in J}\left[w_{pj} - w_{rj}\right]}. \quad (15)$$

Step 7. Determine the matrix of concordance domination, on the basis of the average index of concordance - *AIC* by using formula (where $p \ne r$).

:

$$AIC = \sum_{p=1}^{m}\sum_{r=1}^{m} \frac{c_{pr}}{m(m-1)}, \quad (16)$$

Step 8. Analogously to the matrix of concordance domination, there is a need for determination of the matrix of discordance domination on the basis of the average index of discordance-*AID*, (where $p \ne r$) as follows:

$$AID = \sum_{p=1}^{m}\sum_{r=1}^{m} \frac{d_{pr}}{m(m-1)}, \quad (17)$$

Step 9. Determine the matrix of aggregate domination – mad_{pr} whose elements are equal to the product of the elements on a certain position in matrices of agreement and disagreement domination:

$$mad_{pr} = msd_{pr} \cdot mnsd_{pr}. \quad (18)$$

Step 10. Less desirable actions are eliminated, while one or more alternatives are separated as most desirable. Therefore, the ELECTRE I method provides a partial order of actions.

6. A NUMERIC APPLICATION OF PROPOSED METHODS

Tourism potential of Gamzigrad spa is not properly used. Future development of this spa requires realization of suitable projects which could promote different tourism capacities of this area. TOPSIS and ELECTRE are

used in ranking of the development strategies in order to improve the presence position of this spa and East Serbia region as well. The available alternative projects, defined by management team of the spa, are: A_1 – **health tourism**; A_2 – **sports tourism**; A_3 – **recreation tourism**; A_4 – **country tourism**; A_5 – **congress tourism.** The following five criteria were defined for evaluation of the projects: C_1 – **financial investments (€).** Project that requires less investments are more desirable; C_2 – **solution delivery (€).** Second best investment solution for the observed projects. As previous, project that requires less investment has the advantage; C_3 **- strategic contribution.** Project with higher contribution to the development of the Gamzigrad spa is desirable; C_4 **- risk management**. The project with the least risk has the advantage; C_5 – **environment.** Project that more relies on the environment potentials is more desirable. Presented methods are applicable to any decision making problem, not only to strategies determination presented here.

Determination of the criteria weights

Three experts in the field of tourism resources management are consulted in order to determine the relative importance of all possible pairs of criteria with respect to the overall goal. Their judgments are arranged into the matrixes and presented in Tables 8, 9 and 10. The relative normalized weight w_j of each criterion j is calculated by using formulae (1) and (2). The consistency ratio CR is checked by formulae (3) and (4). Three different judgments and therefore, different weights, are reduced to a common weight by using formula (1).

Table 5. Pairwise matrix - Expert 1

	C_1	C_2	C_3	C_4	C_5	w_j
C_1	1	1/7	1	5	1	0.136
C_2	7	1	3	7	7	0.539
C_3	1	1/3	1	5	3	0.190
C_4	1/5	1/7	1/5	1	1/3	0.042
C_5	1	1/7	1/3	3	1	0.093
						CR = 9.30%

Table 6. Pairwise matrix - Expert 2

	C_1	C_2	C_3	C_4	C_5	w_j
C_1	1	1/7	1/3	1	1	0.072
C_2	7	1	5	7	7	0.580
C_3	3	1/2	1	3	3	0.188
C_4	1	1/7	1/3	1	1/3	0.061
C_5	1	1/7	1/3	3	1	0.099
						CR = 7.39%

Table 7. Pairwise matrix - Expert 3

	C_1	C_2	C_3	C_4	C_5	w_j
C_1	1	1/7	1/3	3	1	0.091
C_2	7	1	5	7	7	0.569
C_3	3	1/2	1	5	3	0.204
C_4	1/3	1/7	1/2	1	1/3	0.045
C_5	1	1/7	1/3	3	1	0.091
						CR = 9.50%

Table 8 presents final weights of observed criteria calculated by formula (1).

Table 8. Weights of criteria

Criteria	**Weights**
C_1	0.100
C_2	0.094
C_3	0.049
C_4	0.194
C_5	0.563
Σ	1

Ranking by TOPSIS Method

Table 9 presents the raw data which are base for decision making process. Qualitative data is changed into quantitative by using numerical scale shown in the Table 4 (see Table 10). Normalized decision matrix (Table 11) is calculated by using formula (5).

Table 9. Raw data

	Financial invest. (€)	Solution delivery (€)	Strategic contribut.	Risk managem.	Environ.
	min	min	max	min	max
Health tourism	200.000	250.000	High	Average	Very High
Sports tourism	70.000	90.000	Very high	Average	High
Recreation tourism	60.000	70.000	Very high	Low	Very high
Country tourism	120.000	140.000	High	Low	High
Congress tourism	40.000	60.000	High	Low	Very high

Table 10. Initial decision matrix

Alternatives	Criteria				
	C_1	C_2	C_3	C_4	C_5
	min	min	max	min	max
A_1	200.000	250.000	7	5	9
A_2	70.000	90.000	9	5	7
A_3	60.000	70.000	9	3	9
A_4	120.000	140.000	7	3	7
A_5	40.000	60.000	7	3	9

Table 11. Normalized decision matrix

Alternatives	Criteria				
	C_1	C_2	C_3	C_4	C_5
	min	min	max	min	max
A_1	0.7875	0.7958	0.3982	0.5698	0.4874
A_2	0.2756	0.2865	0.5120	0.5698	0.3791
A_3	0.2362	0.2228	0.5120	0.3419	0.4874
A_4	0.4725	0.4456	0.3982	0.3419	0.3791
A_5	0.1575	0.1910	0.3982	0.3419	0.4874

Steps 1 and **2** are done. **Step 3.** The weighted normalized decision matrix is calculated by formula (6) and shown in Table 12. **Step 4.** The ideal A^+ and anti-ideal solutions A^- are determined by formulae (7) and (8), and they are as in Table 13. **Step 5.** The separation measures D_i^+ and D_i^- are determined by using the formulae (9) and (10). The results are shown in Table 14.

Table 12. Weighted normalized decision matrix

	Criteria				
	C_1	C_2	C_3	C_4	C_5
Weights	0.100	0.094	0.049	0.194	0.563
Alternatives	min	min	max	min	max
A_1	0.0787	0.0748	0.0195	0.1105	0.2744
A_2	0.0276	0.0269	0.0251	0.1105	0.2134
A_3	0.0236	0.0209	0.0251	0.0663	0.2744
A_4	0.0472	0.0419	0.0195	0.0663	0.2134
A_5	0.0157	0.0180	0.0195	0.0663	0.2744

Table 13. The ideal A^+ and anti-ideal solutions A^-

A^+	0.0157	0.0180	0.0251	0.0663	0.2744
A^-	0.0787	0.0748	0.0195	0.1105	0.2134

Table 14. The separation measures and relative closeness to the ideal solution

Alternative	D_i^+	D_i^-
	I	II
A_1	0.0958	0.0610
A_2	0.0768	0.0703
A_3	0.0084	0.1079
A_4	0.0729	0.0635
A_5	0.0056	0.1135

Step 6. Relative closeness of a particular solution to the ideal solution C_i is calculated by using formula (11), and it is given in Table 15. According to the results, the rank is followed:

Table 15. Ranking results

Alternative	C_i	Rank
A_1	0.3888	5
A_2	0.4780	3
A_3	0.9276	2
A_4	0.4655	4
A_5	0.9532	1

Ranking by ELECTRE Method

Available alternatives for improving the conditions in the Gamzigrad spa are ranked by using ELECTRE method. **Step 1**, **2** and **3** of this method are the same as in TOPSIS. **Step 4.** Concordance C_{pr} and discordance sets D_{pr} are determined by applying the formulae (12) and (13) and they are shown in Table 16.

Table 16. Concordance and discordance sets

C_{pr}	D_{pr}
C_{12} = 1, 2, 4, 5	D_{12} = 3
C_{13} = 1, 2, 4, 5	D_{13} = 3
C_{14} = 1, 2, 3, 4, 5	D_{14} = -
C_{15} = 1, 2, 3	D_{15} = 4, 5
C_{21} = 3, 4	D_{21} = 1, 2, 5
C_{23} = 1, 2, 3, 4	D_{23} = 5
C_{24} = 3, 4, 5	D_{24} = 1, 2
C_{25} = 1, 2, 3, 4	D_{25} = 5
C_{31} = 3, 5	D_{31} = 1, 2, 4
C_{32} = 3, 5	D_{32} = 1, 2, 4
C_{34} = 3, 4, 5	D_{34} = 1, 2
C_{35} = 1, 2, 3, 4, 5	D_{35} = -
C_{41} = 3	D_{41} = 1, 2, 4, 5
C_{42} = 1, 2, 5	D_{42} = 3, 4
C_{43} = 1, 2, 4	D_{43} = 3, 5
C_{45} = 1, 2, 3, 4	D_{45} = 5
C_{51} = 3, 5	D_{51} = 1, 2, 4
C_{52} = 5	D_{52} = 1, 2, 3, 4
C_{53} = 4, 5	D_{53} = 1, 2, 3
C_{54} = 3, 4, 5	D_{4} = 1, 2

Step 5. Concordance matrix c_{pr} is calculated by using formula (14) and data from tab. 8 and it is as in tab. 17.

Table 17. Concordance matrix

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

Step 6. Discordance matrix d_{pr} is calculated by using formula (15) and it is presented in table 18.

Table 18. Discordance matrix

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

Step 7. The matrix of concordance domination is calculated by using formula (16) and presented in table 19.

Table 19. Matrix of concordance domination

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

Step 8. The matrix of discordance domination is obtained by using formula (17) and it is presented in tab. 20.

Table 20. Matrix of discordance domination

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

Step 9. Matrix of aggregate domination mad_{pr} is determined by using formula (18) (table 21):

Table 21. Matrix of aggregate domination

A_1	0	0	0	0
0	A_2	0	0	0
1	1	A_3	1	0
0	1	0	A_4	0
1	1	0	1	A_5

Step 10. Table 22 shows recommended projects that are obtained by eliminating less desirable alternatives.

Table 22. Ranking results

$A_3 \rightarrow A_1, A_2, A_4$	Dominate under A_1, A_2, A_4
$A_5 \rightarrow A_1, A_2, A_4$	Dominate under A_1, A_2, A_4
A_2	Not dominant
$A_4 \rightarrow A_2$	Dominate under A_2
A_1	Not dominant

7. CONCLUSION

A decision model presented in the paper is provided for strategy determination for improvement the business position of Gamzigrad spa. TOPSIS and ELECTRE decision-making methods have been used in the proposed model as the tools that can help in making the right choice. The obtained results are not completely identical. TOPSIS shows alternative A_5 – congress tourism as the most appropriate choice for the present conditions and alternative A_3 – recreation tourism is in the second place. The first two places are the same in the ELECTRE but other three alternatives have different ranking. Application of the ELECTRE method was relative successful because precise ranking was not determined. But, solution gained by the TOPSIS is more accurate and elegant because it gives the precision ranks of observed alternatives. Efficiency of the strategy selection is significantly increased by using the proposed methods. These methods could consider any number of different criteria and offers a more objective, simple and reliable strategy selection approach. Proposed methods could be combined with different mathematical models for improving the decision making quality.

REFERENCES

Chen F-H., Hsu T-S., Tzeng G-H, A balanced scorecard approach to establish a performance evaluation and relationship model for hot spring hotels based on a hybrid MCDM model combining DEMATEL and ANP, *International Journal of Hospitality Management*, Vol. 30, No. 4, 2011, pp. 908-932.

Zhang H., Gu C., Gu L., Zhan Y., The evaluation of tourism destination competitiveness by TOPSIS & information entropy – A case in the Yangtze River Delta of China, *Tourism Management*, Vol. 32, No. 2, 2011, pp. 443-451.

Chen C-F., Applying the Analytical Hierarchy Process (AHP) Approach to Convention Site Selection, *Journal of Travel Research*, Vol. 45, No. 2, 2006, pp. 167-174.
Law R., Qi S., Buhalis D., Progress in tourism management: A review of website evaluation in tourism research, *Tourism Management*, Vol. 31, No. 3, 2010, pp. 297-313.
Hsieh L-F., Lin L-H., Lin Y-Y., A service quality measurement architecture for hot spring hotels in Taiwan, *Tourism Management*, Vol. 29, No. 3, 2008, pp. 429-438.
Popović. G., Stanujkic, D., Jovanović, R., Ore deposit selection by using combined TOPSIS and AHP method, *Rudarski radovi*, Vol. 3, No. 1, 2012, pp. 203-222.
Popović G., Stanujkić D., Stojanović S., Investment project selection by applying COPRAS method and imprecise data, *Serbian Journal of Management*, Vol. 7, No. 2, 2012, pp. 257-269.
Saaty T.L., A scaling method for priorities in hierarchial structures, *Journal of Mathematical Psychology*, Vol. 15, 1977, pp. 234-281.
Saaty T.L., *The Analytic Hierarchy Process*, New York, McGraw Hill, 1980.
Huang Y.S., Liao J.T., Lin Z.L., A study on aggregation on group decisions, *Systems Research and Behavioral Science*, Vol. 26, No. 4, 2009, pp. 445-454.
Hwang C.L., Yoon K., *Multiple attribute decision making: Methods and* applications*, A State of the Art Survey*, New York: Springer-Verlag, 1981.
Ertugrul I., Karakasoglu N. Performance evaluation of Turkish cement firms with fuzzy analytic hierarchy process and TOPSIS methods, *Expert Systems with Applications*, Vol. 36, No.1, 2007, pp. 702–715.
Dağdeviren M., Yavuz S., Kılınç N., Weapon selection using the AHP and TOPSIS methods under fuzzy environment, *Expert Systems with Application*, Vol. 36, 2009, pp. 8143-8151.
Jahanshahloo G.R., Hosseinzadeh Lotfi F., Izadikhah M., An algorithmic method to extend TOPSIS for decision-making problems with interval data, *Applied Mathematics and Computation*, Vol. 175, No. 1, 2006, pp. 1375-1384.
Roy B., Classement et choix en présence de points de vue multiples (la méthode ELECTRE), *La Revue d'Informatique et de Recherche Opérationelle (RIRO)*, Vol. 8, 1968, pp. 57–75.

4th International Symposium on Natural Resources Management
"Sustainable Development and Green Economy in Transition Countries"
31st May -1st June, 2014, Faculty of Management Zajecar, Republic of Serbia
www.fmz.edu.rs

CONTRIBUTION TO GREEN AND SUSTAINABLE ECONOMY BY REDUCING GAS EMISSIONS

Biljana Ilić[1], Leposava Jovanović[2]

[1,2] *Faculty of Managament, Zajecar, biljana.ilic@fmz.edu.rs*

ABSTRACT

Natural disasters as well as climate changes which occur are threats for life on earth more and more. Result of harmful human emission is global warming, which increases in average temperature of the atmosphere and ocean. Because of that, survival of a large number of species on Earth is uncertain. It is necessary for humanity to take action with the aim of contributing to a green and sustainable economy. Introducing licenses for emissions is one way. The aim of paper is to highlight the importance of these licenses as a tool for reducing the effects of modern human activities.

KEYWORDS

Natural disasters, global warming, action, green economy, sustainably economy.

1. INTRODUCTION

Population explosion and rapid progress of mankind in terms of technology are a dominant feature of human civilization in the twentieth century, which caused pronounced climatic changes. The rapid growth in demand for energy was accompanied by rapid population growth. It is expecting that till the end of 2020th year could be an increase of 60% in energy use, compared to the energy needs of mankind in the 2008th. If fossil fuels continue to have the highest share in the production of energy, it can be concluded that there was a marked increase in emissions of greenhouse gases (GHG)(http://www.pmf.ni.ac.rs). In order to eliminate the possibilities of climate change by loosening the worst possible scenario, as well as to reduce and control global atmospheric concentrations of carbon dioxide, methane, nitrous oxide and other greenhouse gases, it is necessary for humanity to undertake some comprehensive measures. Due to the fact that the Earth and its entire climate system are not able to withstand the pressure of increasing human population and growing energy needs, demographic and technological development must be, without a doubt, adjust the limited capabilities and capacities of man only home - the Earth. The adoption of the UN framework convention on climate change (UNFCCC) in 1992. year, as well as the Kyoto protocol, which was adopted in 1997. the International Community has established principles, as well as institutional mechanisms and rules to solve the problem of global warming. The ultimate objective of the UN Framework Convention on Climate Change refers to the provision of stabilizing atmospheric concentrations of greenhouse gases at safe levels.

In order to implement the concept of sustainable development and environmental protection, inevitably raises the question of economic instruments. Using these tools does not work directly on the application of different technologies or environmental standards, but it tends to be their application documents irregularities.

2. CONSEQUENCES OF CLIMATE CHANGE

Most scientists around the globe, warn us that climate change is present and obvious, and that their consequences without doubt take on an increasing scale. We often wonder: Is the hot summers and mild winters suggest a global shift? Will the Alps will soon be out of a glacier? And why the climate is changing? Does the "Kyoto Protocol" repress the economy? Can we have the influence on the climate system? And will the renewable energy ever be able to provide enough energy? Considering all the facts, it is clear that climate change definitely have the potential to shake the foundations of our civilization.

Discussions about global warming, have focused on a variety of issues, ranging from whether the earth really getting hotter, and review of the extent to which the human factor contributing to global warming (http://www.mojafarma.rs/ Klimatske-promene). The global increase in the concentration of carbon dioxide caused by the burning of fossil fuels, and the increased concentration of methane and nitrous oxide is primarily a consequence of agricultural activities. Report on the fourth Intergovernmental Conference on Climate Change (IPCC) noted that the concentration of carbon dioxide has increased from 280 million particles (ppm) in pre-industrial period to 379 million particles (ppm) to 2005th year. The second value refers to the period of observation of 650,000 years, and ranged from 180 ppm to 300 ppm. The expected rate of increase in the concentration of the end of life is as high as 800 ppm. Some scientists argue that the amount of carbon dioxide that is currently emitted able to keep in artmosferi the next 200 years. It is believed that the global warming is a consequence leads to the following (Hacker, Cain, Bowman, 2008):

1. Sea level rise,
2. increase in air temperature,
3. change the amount of rainfall - an increased number of extreme weather conditions;
4. melting ice layer at the poles
5. changing direction of ocean currents (there is a possibility that the gulf stream "change its direction of movement," which would cause a drop in temperature in north-west europe).

Increase in sea level is the result of melting glaciers and polar ice caps and the effect of thermal expansion of the entire water mass. Data from the satellite (Fig. 1) show that annual average Arctic sea ice extent has shrunk by 2.7% per decade, especially in the summer.

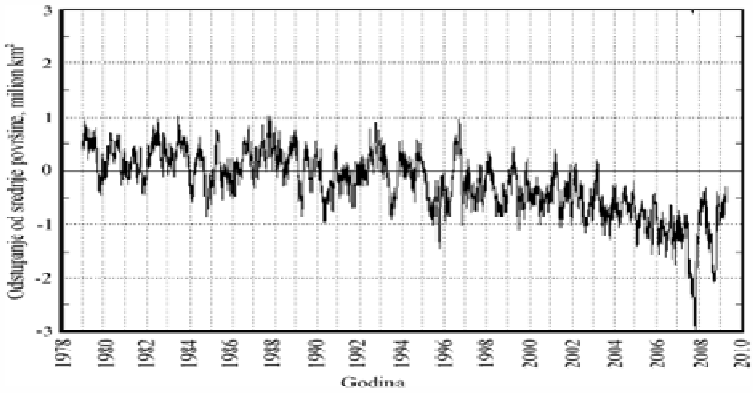


Figure 1. changing the annual minimum sea ice in the Nnorthern hemisphere
Source: (Jovanović, Đorđević, 2009)

The increase in temperature was recorded in the world, but it is higher in Northern latitudes (Jovanović, Đorđević, 2009). It was noted that the land surface heat faster than water, and the ocean. As a result of increased levels of carbon dioxide is predicted that the temperature at the surface increased from 1.4 to 5.8 C, for up to 2100.god. For comparison, it is necessary to emphasize the fact that the temperature of the Earth in the period in 1900. years, until today, has increased by 0.7 C.

There is a significant risk of increasing the temperature for even more than 5 C by the end of this century, if the value of emissions continue to grow at the current rate. The increase in temperature of 5 C is something in the history of human civilization has never happened. Some changes were observed precipitation, as well as the increase in extreme weather. Significantly higher rates of both the eastern parts of North and South America, northern Europe, northern and central Asia .. On the other hand, the precipitation deficit was recorded in the Mediterranean, southern Africa and parts of southern Asia. There is some evidence of an increase in tropical cyclone activity in the North Atlantic and elsewhere, but for now still difficult to determine long-term trends (Smith, Smith, 2009).

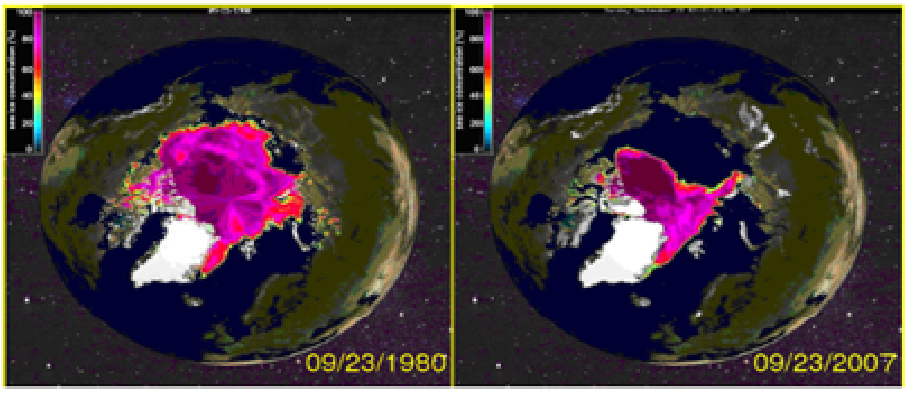


Figure 2. The deviation from the mean sea-ice extent in the Northern Hemisphere
Source: (Smith, Smith, 2009)

Changes in the ice, snow and frozen ground (Figure 2) resulted in the increase in the number and size of glacial lakes are deteriorating ground instability in mountain and other permafrost ("forever" frozen soil) regions and led to changes in some Arctic and Antarctic ecosystems.

3. SUSTAINABLE DEVELOPMENT

The second report from the Intergovernmental Panel on Climate Change, based on available evidence and research results, brings the conclusion that the main factor of influence on climate change is the human factor, as well as to further the activities of mankind in terms of technology pose a threat to the further development and survival. Based on these findings paved the way for the development and signing of the Kyoto Protocol in December 1997. year. The protocol is a set of individual, legally defined objectives a number of industrialized countries that were willing to take steps to reduce emissions. In order to achieve a legal obligation, the protocol had to be ratified by a number of developed countries that were willing to so declare themselves accountable even though they have a significant impact on emissions of greenhouse gases in the world. Countries, states that have ratified the protocol, have become parties to the international agreement, although the ratification of the Protocol is not required that signatory countries legally adopt binding emissions targets (Schofield, 2007). Kyoto Protocol provided a framework different mechanisms that would enable countries to meet their obligations. Each of the countries for which the Kyoto Protocol was legally binding, has set limits for emissions, and set emission reduction targets. To reduce emissions varied from country to country, and the difference was between 8% -10% reduction in greenhouse gases based on measured values from 1990. Despite the varying range of objectives, the parties agreed to a total reduction of emissions to be 5% lower for the period since 2008. until 2012. The protocol was offered a three mechanisms leading to the achievement of the set plan:

1. The draft for the purchase of permits for greenhouse gas emissions;
2. The mechanism of development using clean technologies;
3. Common implementation strategy to reduce emissions.

The first two mechanisms have the project, while the third had a market approach. Enumerated mechanisms, however, have never been seen as the only way by which countries should get to grips with emissions. The Contracting Parties are expected and the implementation of appropriate policies that would have an incentive to reduce emissions of greenhouse gases.

4. MECHANISMS FOR POLLUTION CONTROL

One way to control pollution is to apply the direct regulation of polluting activities. In that case, emission standards for specific industries or products that will be subject to the legal provisions, can be set. People meet with that kind of standard, at the annual technical inspection of cars. The cars must be in compliance with the set of standards for emissions from the exhaust pipe (Haris, 2009). Standards are an effective way to control the pollution, which have clearly determined the outcome. Regulations is clearly defined by the maximum allowed level of pollution above which pollution should not be aired in the environment. Applying standards ensures protection of public health. However, standards of individual pollutants put at a disadvantage in terms of technology. Producers who are able to obtain better and new technology will emit less pollution, contrary the ones who are not able to obtain better technology, and therefore they are not in a position to meet the set of standards easily (Magdalinović, Kalinović, 2011). Lack of implementation of the standards is the fact that all the 'Economic factors should meet the same standard, and there is the problem of inflexibility. Fixed standards are useful when they are polluting activity resemble.

But what about the industry that has multiple drives of different age and size? Older industrial plants will tend to meet set standards, that could lead to their closure. In contrast, for the more modern plants a certain standard may be set too high, and they were able to transmit the amount of pollution, that can be reduced with low cost. When industry encompasses a wide variety of plants it can be imported pollution control system based on the market. Such systems include taxation or fee per unit of emitted pollution. Applying taxes stimulates economic interests of polluters to reduce pollution. The amount of taxes paid to pollution is directly proportional to the amount of pollution emitted. Taxes are a particularly good way of controlling pollution substances that have a cumulative impact on the environment, such as gases in the atmosphere. However, the tax application can not achieve the exact desired result in the reduction of pollution. The Company will issue the amount of pollution that are able to pay. As long as the costs are less than the costs of more stringent pollution controls, the company will bear the costs.

Transferable licenses for gas emissions, represent a particularly convenient way of controlling the emission into the atmosphere of carbon dioxide and other gases that cause the effect of "greenhouse gases". Through that licenses it is given the set of limits for the whole territory and in line with a certain number of licenses awarded to companies. Portability means the ability to permit the company to one another can buy and sell these licenses. In the next part of paper it will be more discussed about transferable licenses and the effects that they can achieve.

4.1 Licenses for control gas emissions

Economic efficiency in pollution control is the benefit that obvious can be achieved. As we have already said, one of the drawbacks is, that it is impossible to predict the total amount of pollution reduction that will result from such fees. Let's start from the assumption that the policy objective of accurately and ultimately reduce the level of pollution in the region. The total number of permits issued corresponds to levels of pollution that can be emitted. These permits can be sold at auction or can be assigned to existing companies. Companies, which came into the possession of a license may trade them among themselves and with other stakeholders. Companies can choose whether to reduce pollution or to purchase an additional quantity of permits, if they are able to. However, provided a framework of pollution can not be exceeded. Interested private groups may draw a number of permits, thus reducing the total amount of pollution that can be emitted.

Permits may be issued for a period of time after which it will be reduced the number of re-issued licenses, and therefore will reduce the overall level of pollution. On that way it contributes to the efficiency of the economic and ecological point of view. In order to illustrate the effects achieved by portable permit it will be used the example that gave Jonathan Harris in his book "Economics of Environment and Natural

Resources." Figure 3 shows a simplified version of the system of transferable permits. Displayed are the companies A and B, each of which emits at 50 units per year pollution. The total amount of pollution emitted is 100 units per year. The aim is to reduce the contamination of a year for 60 units. Marginal costs of pollution control are not the same. Figure 3 shows the different ways of distributing the total reduction of 40 units between the two. Curves of marginal cost control MCC for listed companies are shown on the same axis, but curves go in different directions. Pollution abatement for the company A goes from left to right, and the company B from right to left. This method of presentation allows us to determine the point at which it met the principle of equality (marginal cost control for both companies are equal).

The two companies, as we have already mentioned, together emit 100 units of pollution, and the goal is to reduce pollution by 40 units. In order to achieve this it is necessary to issue 60 licenses (1 license = 1 unit of pollution). Suppose that the basic allocation of permits was 30 permits per company. If there is no possibility of trading permits, then each company has to reduce pollution by 20 units. This is illustrated in the middle graph. At that point, the marginal cost of control for the first company is $ 200, and the other company $ 2,600.

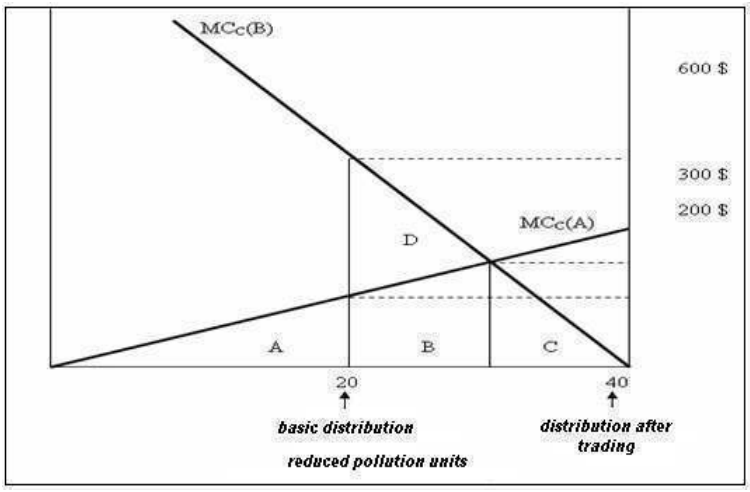


Figure 2 Tradable permits for pollution
Source: (Harris, 2009)

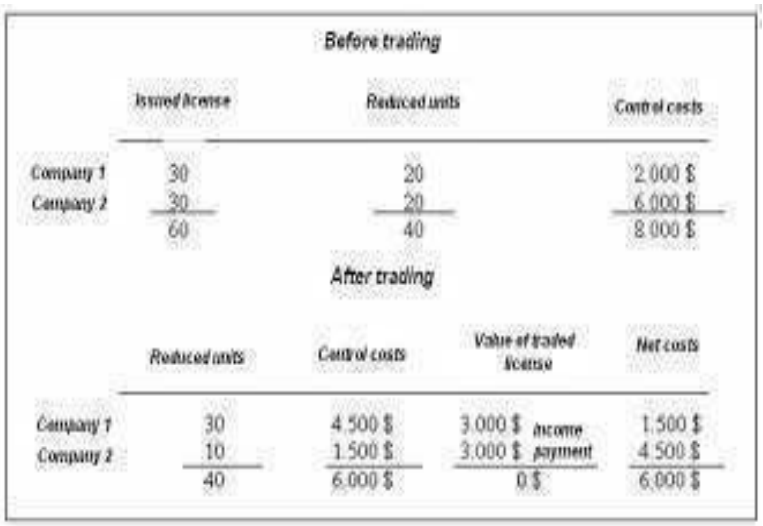


Figure 3 Tradable permits for pollution
Source: (Harris, 2009)

This method is achieved by reducing emissions, but from an economic point of view this solution is inefficient. Cost control for each firm can be seen on the graph as the area under the curve MCC. The total cost of the first companies to control pollution is presented area A = 2.000 $, while the total cost of the other company covers an area B + C + D = $ 6,000. However, trade in permits can contribute to improving the overall status and economic efficiency of the companies surveyed. The first company has a low cost of pollution control, and it would be advantageous to reduce pollution by 10 units (total of 30 units, which would use 10 licenses, and the remaining 10 would be sold to another company). For the other company it will be profitable to buy an additional 10 permits for pollution, which will allow it to reduce pollution by 10 units. The equilibrium price of permits will be $ 300, which represents the value of the marginal costs of pollution control for both companies, at the point where the first company reduces pollution by 30 units, and the other companies for 10 units.

Attained equilibrium, the total cost to company A is $ 4500 (area A + B), and for company B $ 1,500 (Area C). The total combined cost of $ 6,000 principal amount. Area D is the net energy that is generated by using this effective solution. Figures 2 and 3 present the costs of trading and not trading. We conclude that the trading of contributing to the individual reduction, and the total costs of both companies observed in this case.

To some extent, the system of transferable permits combining the advantages of direct regulation of the system and the system of collection programs. This method enabled the authorities to set limits overall level of pollution, and the use of market processes to find an effective method for achieving this goal. Economically justified to allow the reduction of pollution at minimal cost (Harris, 2009).

4.2 Trading of transferable permits - stock transactions

EU market authorization includes a variety of ways and instruments of trade in which it is possible to classify the following (UK National Allocation Plan, 2008 –2012):

1. Current futures;
2. Trades based on financial grounds;
3. Products for investment.

EU permits can be sold on the basis of currently valid price with delivery time of 2 days from the date of purchase until the payment is usually performed 5 days after delivery. According to the Convention, the market for futures transactions Permissions EU adopted a way that first December is one day a year for the calculation of the license. Although randomly selected, this date is logical because it coincides with the end of the year. There is no need to permit purchases in January and throughout the rest of the store, because it only creates additional financial costs. However, since this kind of merchandise can be one hundred percent to sell, the price of a license in the EU over the next two years, can be calculated using conventional techniques in calculating forward prices. Suppose, for example, the forward price for delivery of licenses in December 2008th, is 20 monetary units and the 12-month Euribor is 5%.

If all the other elements have not changed, according to the contract that was signed by December 2009., It is possible to generate income by 10139 monetary units.

This difference may be calculated in the following manner. So if someone bought the contract in December 2008th year and held him for a year, he would have to ,,borrow" the amount of the purchase price, together with the current interest rates, exposing the costs in one year from 10 139 (20 × 5 % × 365/360), but the agreement could also to sell and earn this amount. Although the EU Permits may be used in accordance with the goals of reducing greenhouse gas emissions, those who trade will seek the opportunity to trade them and if possible earn as much on these transactions. Geographic arbitrage, it can also lead to profits on these permits. If the price of a Permit EU is not uniform and varies by geographic location, those who trade these permits can be purchased at the same one, and then sell it to another location to take advantage of the differential.

Table 1. Futures Contract

Trade date:	March, 2007.
Date of entry into force:	1 December 2008.
Date of the first completion	December 2008.
Date of price formation	1 November 2008
Delivery date	1 December 2008. EU trade licenses
The total possible	Amount of 25 000
Payer fixed	Amount of Company A
Fixed Price	14.00
Payer variable rates	Bank
The reference price index LEBA	Carbon per day pricing for the appropriate delivery date
Reference source prices announced	On Telerate in
The calculation	Of cash

Source: (Schofield, 2007)

Also, an important characteristic of these permits trading in the stock market is that if a trader believes that the price of the license is inadequate, it can sell and buy the one which considers him more.

There is also a market for certificates of reduced emissions, to which these licenses are classified according to whether they are primary or secondary. Primary confirmation of reduced emissions is one that we can expect a loan from the project on the mechanism for development using clean technologies, however, these licenses have yet to be issued. Secondary confirmation of reduced emissions exceed the price of permits EU for the same maturity date but have a slightly lower price than primary.

What is most important is that the retailer lower the price of a license for a specific EU delivery for the amount that reflects the existence of a risk if combined with confirmation of reduced emissions. As a rule, certificates of reduced emissions tendency have to sell at a price that is 75-90 % of the price of permits is bigger in EU.

Table 1 shows the futures contract for trading certificates reduced emissions. Shop is only valid for one day and includes cash transaction, which is defined as the variable, that is not fixed. In a sense, this method is similar trade agreements in which the seller must pay the buyer the difference between the current value and the value at the time of contracting, which is popular in the stock market (World Bank, 2006). Primary confirmation of reduced emissions is one that we can expect a loan from the project on the mechanism for development using clean technologies, however, these licenses have yet to be issued. Secondary confirmation of reduced emissions exceed the price of permits EU for the same maturity date but have a slightly lower price than primary. What is most important is that the retailer lower the price of a license for a specific EU delivery for the amount that reflects the existence of a risk if combined with confirmation of reduced emissions. As a rule, certificates of reduced emissions tend to sell at a price that is 75-90 % higher of the price of permits in EU. Table 1 shows the futures contract for trading certificates of reduced emissions.

Shop is only valid for one day and includes cash transaction, which is defined as the variable, that is not fixed. In a sense, this method is similar trade agreements in which the seller must pay the buyer the difference between the current value and the value at the time of contracting, which is popular in the stock market (World Bank, 2006).

5. CONCLUSION

Climate change and natural disasters are the result of global warming that increasingly threaten life on Earth. Uncertain question is survival of a large number of species, but man can prevent and minimize what mankind created. If we take into account the fact that climate changes are caused by excessive greenhouse gas emissions into the atmosphere, the modern civilization should take the blame and swiftly drastically reduce emissions. Bearing in mind that global warming is the greatest enemy of humanity, environmental problems are solved by a combination of economic and market instruments. The essence of the use of economic instruments leads to properly establishing the mechanism of price use of environmental resources. If in fact achieve that environmental resources are more properly valued, they will be treated equally with other production factors and they are more efficiently allocated. The most modern economic instrument of environmental policy in developed economies is trade pollution permits. In this case, the government is more interested in reducing the overall level of pollution, without identifying the largest emitters of pollution. While the market price of permits is higher than the marginal cost of reducing pollution, companies are interested in selling licenses, that is, when the marginal cost of reducing pollution in excess of the market price, permits, companies will be interested in buying a license. Unfortunately, the world is still a more concerned about money than about solving urgent problems affecting the planet Earth.

As long as the benefits of clean water, air, biodiversity, etc., observed without economic value, the state regulation leaves little room for companies to voluntarily reduce pollution below a certain level. It seems that we always have "enough time" to resolve these problems, but when it comes to finances, than it is solved immediately.

REFERENCES

1. EU Emissions Trading Scheme: *UK National Allocation Plan 2008 –2012.* Department for Environment, Food and Rural Affairs.
2. Jovanović S. Savić S., Đorđević Z., 2009. Globalno zagrevanje – ozbiljna pretnja razvoju i opstanku ljudske civilizacije, *4 Nacionalna konferencija o kvalitetu života,* Festival kvaliteta, Kragujevac, pp. 44-48.
3. Harris J. M., 2009. *Ekonomija životne sredine i prirodnih resursa*, savremen pristup, Datastatus, Beograd
4. Hacker S., Cain M. L. Bowman W. D., 2008. *Ecology,* Sunderland, Mass: Sinauer Associates, ISBN 0-87893-083-3.
5. http://www.pmf.ni.ac.rs/pmf/konferencije/ekofizika/staklena%20basta.pdf
6. http://www.mojafarma.rs/ Klimatske-promene/ promena.html
7. Magdalinović N., Magdalinović-Kalinović M., 2011. *Upravljanje prirodnim resursima*, Tercija, Bor
8. Smith M. R., Smith T. R., 2009. *Elements of ecology*, San Francisco: Pearson Benjamin Cummings, ISBN 0-321-55957-6
9. Schofield N. C., 2007. *Commodity Derivatives Markets and Applications,* England
10. The World Bank: *State and Trends of the Carbon Market 2006.* The World Bank published two documents, the first in May 2006 covering events in 2005 and an update in October 2006, which extended the data to the 3rd quarter of 2006.

4th International Symposium on Natural Resources Management
"Sustainable Development and Green Economy in Transition Countries"
31st May -1st June, 2014, Faculty of Management Zajecar, Republic of Serbia
www.fmz.edu.rs

CULTURAL INSIGHTS OF SUSTAINABILITY REPORTING IN SMES: AN EXPLORATORY STUDY

Donato Calace,

[1]*LUM Jean Monnet University, S.S. 100 km 18 Casamassima, BA 70010 , calace@lum.it*

ABSTRACT

Corporate social disclosure (CSD) represents the most direct expression of companies' commitment on social and environmental grounds. Through CSD, large and multinational companies succeed in improving their legitimacy, stakeholder's trust, reputation, image and reliability, creating a set of intangible assets that eventually increase their economic performance. Shifting to SME level, the involved dynamics significantly change, mainly because of the limited visibility of small and medium firms compared to large and multinational ones. This working paper intends to offer an insight on strategic and cultural motivations that drive SME non-financial reporting. Through a qualitative approach based on a pilot interview, I start to shed light on the under researched world of SME non-financial reporting, in particular addressing to Hofstede's national culture framework, in view of a future cross-country extension of this study.

KEYWORDS

SMEs, CSR, non-financial reporting, Hofstede cultural dimensions, case-study.

1. INTRODUCTION

The definitions of business accountability and success have broadened: today, firms are called to achieve environmental and social goals, as well as economic ones, raising a triple bottom line approach (Elkington, 1997). Following such "sustainability imperative" (Lubin & Esty, 2010), stakeholders ask companies to voluntarily include social and environmental elements in their decision-making and strategic processes and to be acknowledged about their non-financial performance. As "the level of CSR activities of the firms is made known to public only through the disclosures" (Kavitha & Anita, 2011, p. 45), disclosing non-financial information has become a critical activity.

CSR activities and reporting imply going beyond legal requirements and engaging in voluntary actions (McWilliams, Siegel, & Wright, 2006). It is a managerial task to determine the definition and the boundaries of company accountability, defined as the duty to provide an account or reckoning of those actions for which one is held responsible (Gray, Owen, & Adams, 1996), thereby affecting the amount of sustainability disclosures reported to stakeholders (Michelon & Parbonetti, 2010). Companies have a plenty of ways to communicate such information to stakeholders, e.g. the annual report, through the so-called "silent social account" (Gray, 1997), special publications, documents or reports, and socially orientated advertising (Kavitha & Anita, 2011). Relevant research (Michelon & Parbonetti, 2010) points out that sustainability reports are on average the preferred mean to disclose non-financial data. Corporate social disclosure (CSD) represents the most direct expression of firms' CSR and reporting-based analyses are the correct way towards the comprehension of what can be considered a socially responsible behaviour (Perrini, 2005). Indeed, today more than two-thirds of the Fortune Global 500 companies issue a non-financial report (LeBlanc, 2012), showing a growing trend that is not prompted by contingent and temporary forces (Kolk, 2003). Corporate responsibility reporting is also growing in emerging economies, in particular in the Asia Pacific area and

Latin America (KPMG, 2013). The gap between leading and lagging industry sectors is narrowing too, converting reporting in a diffused and cross-sectorial managerial practice (KPMG, 2013).

Large firms motivate non-financial reporting mainly through cost-benefit assessment (Spence & Gray, 2007). Indeed, they can leverage on intangible assets, such as legitimacy, reputation, reliability, built on the image they convey to stakeholders. If there are still uncertainties regarding corporate social disclosure business case, as the relationship between sustainability disclosures and sustainable performance is still unclear (Ullman, 1985; Clarkson, Li, Richardson, & Vasvari, 2007) because of methodological and measurement weaknesses, researchers definitely agree on the existence of a stakeholder case (Perrini, Russo, Tencati, & Vurro, 2011).

Yet, this reasoning cannot be extended to SMEs. Indeed, small and medium businesses are not "little big firms" (Tilley, 2000), "because of the intrinsic differences between large firms and SMEs" (Russo & Perrini, 2010, p. 209). For this reason, this working paper intends to analyze non-financial reporting dynamics, motivations and effects in SMEs. In particular, I chose a qualitative approach based on multiple-case studies and recorded semi-structured interviews (Yin, 2003), as CSD in SMEs is an almost unexplored domain (Chen & Bouvain, 2009) and such kind of methodology is particularly suitable where theory building is needed (Eisenhardt & Graebner, 2007).

In the next section, I present relevant literature regarding CSR and especially non-financial reporting in SMEs. Particularly, I focus on cultural dimensions affecting the dynamics of corporate social disclosure, depicting how and why they influence CSD. Addressing Hofstede (Hofstede, Hofstede, & Minkov, 2010) national cultures framework, I predict how culture drives non-financial reporting in Italian SMEs. In the methodology section, I provide details regarding the research protocol adopted to choose the business case and make the interview. Then, I discuss the consistency of the evidences from the business case with the predictions coming from Hofstede's dimensions of national culture. In the end, I draw the conclusions and present the first implications for academia and management, and especially the further work I intend to do on the basis of this working paper.

2. THEORETICAL BACKGROUND

2.1 CSR and sustainability reporting in SMEs

Corporate social disclosure, that is "the process of providing information designed to discharge social accountability" (Sutantoputra, 2009, p. 36), is commonly conceived as an activity belonging to the broader field of Corporate Social Responsibility. CSR and its sister-concepts, like corporate citizenship (Mirvis & Googins, 2006), sustainable entrepreneurship (Schaltegger & Wagner, 2011), triple bottom line (Elkington, 1997), corporate sustainability (Dyllick & Hockerts, 2002) describe why and how firms are called to respond for the environmental and social consequences of their conduct, providing explanations at institutional, organizational and individual level of analysis (Aguinis & Glavas, 2012). Mirvis and Googins (2006) include corporate "public reporting, assurance and full disclosure" as activities carried out in the most advanced stages of corporate citizenship in the "transparency" dimension, one of the seven fundamental dimensions describing this concept. Spiller (2000) includes "open communication with financial community", "reporting to provide a picture of the company's performance" and "disseminate comprehensive and clear information" in his comprehensive list of sixty business practices that companies can adopt to address business ethics and CSR. Perrini (2005, p.611) claims that "non-financial reporting has grown up together with the evolution of the concept of CSR, relying on the assumption that the former can be derived from the latter, thus meaning "social responsibility" in the sense that the company is held accountable for its actions".

Most of literature has grounded the adoption of CSR-oriented strategies in the stakeholder theory (Searcy, 2012). For this reason, corporate social disclosure finds its main theoretical antecedent referring to Freeman's (1984) original contribution: "the disclosure of financial, social and environmental information is part of the dialogue between a company and its stakeholders and it provides information on a company's activities that legitimize its behavior, educate and inform, and change perceptions and expectations" (Michelon & Parbonetti, 2010, p. 478). CSD allows stakeholders to look at a company through the eyes of management, shaping their perceptions and expectations regarding company behavior, eventually driving their consume and investment decisions (Perrini, Russo, Tencati, & Vurro, 2011).

However, the effectiveness of this theoretical framework in explaining CSR at the SME level is questioned. As Russo and Tencati (2009, p.339) suggest: "theoretical models of the relationship between large firms and CSR, such as the stakeholder theory, do not necessarily explain the CSR-SME relationship, since researchers examining CSR in large corporations may not find it possible to generalize their findings to SMEs". A stakeholder view of SMEs can work only if small and medium businesses idiosyncrasies are duly taken into account (Russo & Perrini, 2010). Considering the specific non-financial reporting practice, in large firms, the decision to issue a non-financial report is in most cases motivated through economic thinking: social and environmental reporting deliver benefits to a range of stakeholders while serving to enhance shareholder value (Spence & Gray, 2007), establishing a sort of "stakeholder case" (Perrini, Russo, Tencati, & Vurro, 2011). According to this view, CSD generates and enhances organizational legitimacy, demonstrating that a firm shares the same value system of the wider community (Michelon & Parbonetti, 2010), trust and reputation (Lamberti & Lettieri, 2009), moving from a "trust me" approach to a "tell me" one (Perrini, 2005), shareholder value creation alignment with social value creation (Chatterji & Levine, 2006), reliability, transparency and brand positioning (Perrini, Russo, Tencati, & Vurro, 2011). This is true especially for multinational, listed firms. Visibly, at SMEs level the scenario is quite different. Not by chance, there is a major size-effect in the practice of non-financial reporting: as explained by Brown, de Jong, & Levy (2009), in recent years large multinational enterprises have dominated sustainability reporting. A number of reason support the size-disclosure relationship. Firstly, larger firms are more political visible and often become the "focal point" of broader wars against social and environmental injustices (Chatterji & Levine, 2006). As a result, big companies try to reduce this pressure by various measures, like non-financial reporting (Watts & Zimmerman, 1986). Secondly, bigger firms may enjoy economies of scale and bear lower information production costs (Foster, 1986), or lower costs of competitive disadvantage resulting from disclosing corporate information (Meek, Roberts, & Gray, 1995). As a result, the extent of CSR reporting drops off rapidly as the size of the company decreases (Chen & Bouvain, 2009).

Consequently, CSR in SMEs and especially SME social disclosure need to be grounded in a new theoretical framework. First, the reduced size of SMEs makes them more subject to institutional pressure, limiting their bargaining and lobbying power. In this sense, the institutional and neo-institutional theories (DiMaggio & Powell, 1983; Selznick, 1948; Scott, 2001) offer a valid reference to explain how the national and the industry institutional environments affect the SME-CSR relationship. Social, economic, and political factors form an institutional structure of a particular environment, which, through the so-called isomorphism, induces firms to assume specific behaviors, like the disclosure of non-financial information, or, more in general, a social responsible attitude. Evidently, institutional pressures affect large firms too, but Graafland, Van de Ven and Stoffele (2003) advance that four main motivations explain difference in the reactions: visibility, adequate communication instruments, economies of scale and competitiveness. Second, SMEs are closely and firmly linked to the local communities where they operate (Russo & Tencati, 2009): "small businesses need such relations with the community to survive, whereas, in general, large firms do not. Therefore, it is the community that wants CSR from small businesses, and as a consequence small businesses pursue CSR." (Russo & Perrini, 2010, p. 211). The social capital theory can further describe this relationship. Putnam (2000, p.19) gives this notion of social capital: "whereas physical capital refers to physical objects and human capital refers to the properties of individuals, social capital refers to connections among individuals – social networks and the norms of reciprocity and trustworthiness that arise from them that can improve the efficiency of society by facilitating co-ordinated actions". Ethical issues, such as openness and trust, religious-based ethics, selected relationships with suppliers, honest dealings with employees, drive SMEs development, granting them with the license to operate in local communities (Russo & Tencati, 2009). In this way, "CSR is the outcome of the relational accumulating process through which SMEs build their social capital" (Russo & Perrini, 2010, p. 207-208). So while the stakeholder theory is more focused on concluding transactions with stakeholders, the social capital theory stresses relationship management. Third, in SMEs the role of the entrepreneur, with his capacities, knowledge and values, is central in shaping firm's strategy and practices. Only a sustainability-committed entrepreneur can balance environmental, economic and social impacts of the activity, seizing sustainable business opportunities and acting upon them in a proactive way (Spence, Gherib, & Biwolé, 2011). Sustainable entrepreneurship theory formalizes this notions, as described by Schaltegger and Wagner (2011, p. 226): "an innovative, market-oriented and personality driven form of creating economic and societal value by means of break-through environmentally or socially beneficial market or institutional innovations". According to this view, sustainable SMEs rely "on the the personal initiative and skills of the entrepreneurial person or team to realize large-scale market

success and societal change with environmental or societal innovations" (Schaltegger & Wagner, 2011, p. 226), rather than formalized procedures, CSR tools and management systems.
Indeed, empirical evidence shows that SMEs lack CSR formal tools, such as ethical codes, standards, certifications and reports, even if they carry out several initiatives, especially those significantly affecting the bottom line (e.g. reduction of resource consumption and waste reciclying) and those linked to improving legitimacy and reputation within local communities (Russo & Tencati, 2009). This leads to an informal – or "sunken", or "silent" - (Russo & Tencati, 2009) and implicit (Matten & Moon, 2008) approach to CSR, according to which CSR-related practices represent the reaction to specific pressures of the external environment and they are rarely and poorly communicated to stakeholders. Often, SMEs are even implementing responsible actions without realizing that they are part of the wider sustainability framework ("blind" CSR). The main reason behind this lies in that CSR formal practices require investments of time, resources and energy that SMEs cannot afford. The risk of potential loss originating from the failure to adopt a formal CSR tool is greater for SMEs rather than large firms, due to their limited resources. Moreover, corporate social responsibility is a complex domain, endowed with pluralistic goals, ambiguity, uncertainty, and context dominance (Searcy, 2009). It requires multidisciplinary competencies, as well as the inclusion of stakeholders' panels in its processes, creating the opposition of different mindsets (O'Dwyer, 2011). As a result, "in many corporations, people are simply not equipped to effectively pursue a commitment toward corporate sustainability" (Searcy, 2012, p. 240), and a lack of these capabilities can represent a serious impediment for the diffusion of sustainability practices, like non-financial reporting (Perego & Kolk, 2012). Finally, the very nature and the main advantage of SMEs in relation to larger firms is flexibility, achieved through weak formalization and intuitive managerial style (Julien, 1993).

2.2 Culture, CSR practices and Corporate Social Disclosure

The proposed theoretical review suggests that CSR practices and in particular CSD adoption in SMEs follow a different logic from the cost-benefit assessment that features non-financial reporting in larger firms. Although addressing different issues, the three theoretical frameworks describing the CSR-SME relationship share a common antecedent: culture, as they all relate to the system of value and beliefs that drive the activity of SMEs. "Culture influences moral values, which one would expect in turn to influence at least the issues which companies select as being worthy of report" (Chen & Bouvain, 2009, p. 302). According to Hofstede (1983), culture is the collective programming of the mind, which distinguishes the members of one group or category of people from another. Thus, it is learned through a process of social construction within the social environment (nations, families, organizations) and not inherited. Hofstede, Neuijen, Ohayv, and Sanders (1990), observed four mutually exclusive and reasonably comprehensive manifestations of culture: heroes, symbols, rituals and values. The first three are visible to observer, as they describe situations as they are and relate to words, gestures, pictures or objects (symbols), real or imaginary people (heroes), behaviors and activities (rituals) that carry a particular and precise meaning within a social context. The latter one is manifested in behaviors, and relates to situations as they should be. Values system is built during early years of childhood, through an unconscious process which determines the differences among national cultures.

Thus, culture is one of the most important determinants in national ethics, and empirical evidence found it to be significant in explaining ethical attitudes, ethical sensitivity, value system, ethics judgments, ethical decision-making and ethical perception (Ho, Wang, & Vitell, 2012). Consequently, despite the normative process behind the development of reporting frameworks assumes the existence of a set of universal values that can be applied to all business worldwide (Logsdon & Wood, 2005), as organizations providing standards and guidelines are international (e.g. GRI, UN, ISO), significant national differences remain in CSR reporting. In particular, the country where the business is headquartered determines the nature and extent of non-financial disclosure (Chen & Bouvain, 2009). Matten and Moon (2008) show that European CSR practices are more implicit compared to US ones. This is because CSR is a socially constructed concept, and thus cannot be universally defined (Dahlsrud, 2008): the culture of the nation and the culture of the firm too significantly affect the development and application of CSR within individual organizations (Gjølberg, 2009).

Hofstede (1983) states that all national cultures deal with four basic problems: social inequality, including the relationship with authority; the relationship between the individual and the group; the social implications

of having been born as a boy or a girl; ways of dealing with uncertainty and risk. The way countries find answers to these problems determine their cultural dimensions, which are measurable aspects of culture that allow comparison between nations. The original four-dimensional model of cultural differences includes four dimensions: power distance, collectivism versus individualism, femininity versus masculinity and uncertainty avoidance. Other studies addressed the national cultures topic, like the GLOBE project (House, Javidan, Hanges, & Dorfman, 2002), but they are built on Hofstede's original contribution, as it accounts for much of the cultural variability and has found wide application in different disciplines (Ho, Wang, & Vitell, 2012).

In the following part, I provide the Hofstede Centre (2013) description of each cultural dimensions, showing their link with CSR dimension and practices provided by literature:

Power distance (PDI)

"This dimension expresses the degree to which the less powerful members of a society accept and expect that power is distributed unequally. The fundamental issue here is how a society handles inequalities among people. People in societies exhibiting a large degree of power distance accept a hierarchical order in which everybody has a place and which needs no further justification. In societies with low power distance, people strive to equalize the distribution of power and demand justification for inequalities of power". Cohen, Pant and Sharp (1996) show that countries with an high PDI score are more likely to accept questionable firms' behaviors, consistently with Ringov and Zollo (2007) findings. On the other hand, Ho, Wang and Vitell (2012) claim that in a structured environment, endowed with high collectivism, high uncertainty avoidance and high masculinity, higher PDI is significantly associated with better corporate social performance, as questionable business practices against the collectivity are not tolerated. Leonidou, Kvasova, Leonidou and Chari (2013) suggest individuals in countries with high power distance tend to follow more formal rules, while in low PDI countries informal codes of ethics are preferred. Being CSR and CSD voluntary activities, based on non-compulsory practices, individuals and organizations with high PDI tend to ignore and underestimate them.

Individualism versus Collectivism (IDV)

"The high side of this dimension, called Individualism, can be defined as a preference for a loosely-knit social framework in which individuals are expected to take care of themselves and their immediate families only. Its opposite, Collectivism, represents a preference for a tightly-knit framework in society in which individuals can expect their relatives or members of a particular in-group to look after them in exchange for unquestioning loyalty. A society's position on this dimension is reflected in whether people's self-image is defined in terms of I or we". Apparently, a low IDV score should lead to a higher use of CSR practices, as collectivistic countries encourage social behavior that is determined by duty/obligation and business relationship are perceived in moral terms, like a family link (Leonidou, Kvasova, Leonidou, & Chari, 2013). On the other hand, today western countries lead the CSR trend, while eastern countries (more collectivistic) lag behind. The common association between low IDV and high PDI may explain this situations, as collectivist countries are less likely to question what superiors and executives in the company are doing (Ho, Wang, & Vitell, 2012). Moreover, companies introduce CSR practices and in particular non-financial disclosure to signal their sustainability commitment to stakeholders and to gain a differential competitive advantage (Porter & Kramer, 2011): differentiation is not desirable in collectivistic countries, where harmony and homogeneity is preferred.

Masculinity versus Femininity (MAS)

"The masculinity side of this dimension represents a preference in society for achievement, heroism, assertiveness and material reward for success. Society at large is more competitive. Its opposite, femininity, stands for a preference for cooperation, modesty, caring for the weak and quality of life. Society at large is more consensus-oriented". Strong competitiveness, greed and individual achievements characterizing masculine societies are frequently cited as drivers of unethical behaviors (Ho, Wang, & Vitell, 2012). In masculine countries, results and economic growth are the most important target: individuals and organizations achieve them with any means, even bypassing rules. Masculine society is more tolerant towards ethically questionable behaviors of individuals and organizations (Leonidou, Kvasova, Leonidou, & Chari, 2013). Conversely, feminine societies value non-financial performance.

Uncertainty avoidance (UAI)

"The uncertainty avoidance dimension expresses the degree to which the members of a society feel uncomfortable with uncertainty and ambiguity. The fundamental issue here is how a society deals with the fact that the future can never be known: should we try to control the future or just let it happen? Countries exhibiting strong UAI maintain rigid codes of belief and behaviour and are intolerant of unorthodox

behaviour and ideas. Weak UAI societies maintain a more relaxed attitude in which practice counts more than principles." High UAI reflects society law-abiding and rule-oriented behavior: norms and standards provide indications to limit risk and deal with uncertain situations. Therefore, unethical and risky behaviors are undesirable in these countries, where there are strict and binding regulations (Ho, Wang, & Vitell, 2012). High uncertainty avoidance societies tend to question unethical standards and violations made by organizations to a greater degree (Vitell, Paolillo, & Thomas, 2003) and accordingly have a greater need to be acknowledged on companies social and environmental issues.

2.3 The Italian Context

It is useful to present Italian cultural context in order to understand how cultural dimensions affect SMEs' corporate social disclosure. Considering Hofstede cultural dimensions, Italy shows a medium ranking in terms of power distance (50), thus it is "a society that believes that hierarchy should be respected and inequalities amongst people are acceptable. The different distribution of power justifies the fact that power holders have more benefits than the less powerful in society" (The Hofstede Centre, 2013). With a score of 76, Italy is an individualistic country: "for Italians having their own personal ideas and objectives in life is very motivating and the route to happiness is through personal fulfillment" (The Hofstede Centre, 2013). In masculinity dimension, Italy scores 70: "it is highly success oriented and driven. Children are taught from an early age that competition is good and to be a winner is important in one's life" (The Hofstede Centre, 2013). "Formality in Italian society is important and the Italian penal and civil code are complicated with clauses, codicils etc. In work terms high uncertainty avoidance results in large amounts of detailed planning. " (The Hofstede Centre, 2013): Italy has an high score (76) in uncertainty avoidance.

Considering the resulting italian dominant culture, institutional pressure seems to be the main driver of CSR practices and CSD in Italy. The high score in UAI suggests that formal practices, like non-financial reporting, are desirable, because reduce risks and uncertainties. On the other hand, the high scores on IDV and MAS advance that social and environmental issues are not on the top of companies'agenda. Consequently, given the moderate-high score of PDI, companies are willing to adopt CSR practices if they are enforced or strongly advocated by legitimate institutions. Indeed, the combination of PDI, IDV and MAS scores indicates that companies would ignore or at least underrate commitment in CSR practices because they are voluntary. Albareda, Tencati, Lozano and Perrini (2006) identify italian CSR system in what they call the Agora model, as Italy has a more extensive, multi-stakeholder and multi-level approach compared to UK systemic, national government-centred and business-oriented approach. In Italy, the initiative of the public government supports CSR initiatives at national and regional level, and its action is always coordinated with different social groups and business actors (Habisc, Patelli, Pedrini, & Schwartz, 2011). Accordingly, CSR practices in firms are a reaction to the institutional environment instead of a strategic decision, and remain in an implicit dimension (Matten & Moon, 2008) as an informal commitment towards collective legitimate expectations. In Hall and Soskice (2001) classification of "varieties of capitalism", Italy has an ambiguous position between liberal market economies (like UK, US, Australia, Canada) and coordinated market economies (e.g. Austria, Belgium, Japan, Netherlands). Firms in the latter cluster face greater institutional pressure to behave in a socially responsible way from strong state regulation, collective industrial organizations, NGOs and other indipendent organizations (Campbell, 2006). Oppositely, companies operating in more liberal market economies have to satisfy investors and shareholders demands for information, including in particular non-financial one.

3. METHODOLOGY

In this paper, I propose a single case study methodology based on a recorded semi-structured interview (Yin, 2003) in order to verify if the above considerations regarding CSR practices in Italy can be extended to SMEs. Although I intend to expand the sample in the definitive version of the study, as multiple-case research is more suitable in theory-building contexts (Yin, 2003), research underlines the persuasive power of a single case (Siggelkow, 2007) in particular if it is "unusually revelatory, an extreme exemplar, an opportunity for unusual research access" (Eisenhardt & Graebner, 2007, p. 27). The proposed case cannot be considered a unique research opportunity, but it follows the logic of theoretical sampling, as it is "particularly

suitable for illuminating and extending relationships and logic among constructs" (Eisenhardt & Graebner, 2007, p. 27).

In particular, I selected the company from Global Reporting Initiative (GRI) Sustainability Disclosure Database (Global Reporting Initiative, 2014), which provides non-financial reports and company data for firms submitting their non-financial reports. Today the GRI Sustainability Disclosure Database features more than 16000 reports issued by more than 5000 organizations, and the GRI itself is the most well-known and widely applied guideline for sustainability reporting and exhibits several features of an established institution, such as broad uptake and legitimacy (Brown, de Jong, & Levy, 2009).

The research protocol followed this path: I created a list of potentially interesting SMEs based on the data reported in the GRI database. Then, I established a first contact with the company, in order to identify who had the responsibility of non-financial reporting activity and arrange an interview. In the proposed case, I interviewed the CSR Manager of the company. The interview lasted about 1 hour and regarded three main themes: CSR practices in the company, motivations and effects of the reporting activity, general opinions on CSR and social reporting. The questionnaire and the transcript of the interview are available in the annexes of this paper. The interview was held in Italian, then transcribed and submitted to the interviewee for review. Finally, I translated the text in English and had it checked by a professional translator. I triangulated the findings from the interview with information coming from the company non-financial report and from the website in order to increase the validity of the findings. Interviews may lead to socially desirable answers (De Jong, Pieters, & Fox, 2010). To avoid this bias, I communicated to the interviewee that the case study use general names, preventing the identification of the company, and there were no right or wrong answers (Leonidou, Kvasova, Leonidou, & Chari, 2013).

4. RESULTS

The analyzed company, named "Alfa" from this point, is an Italian private company limited by shares established in 1939. Its core business is the manufacture of crown corks, metal and plastic caps for the bottling industry. It is headquartered in the central-north part of Italy, in Emilia Romagna. Its activity is strongly export-driven: *"Our production is mostly addressed to the international market. Indeed, more than the 50% of our products is sold outside Europe. Our commercial network is international and speaks more than 20 different languages."* (Alfa CSR Manager). According to UE (European Commission, 2013) classification, Alfa is a medium-sized firm, as it has less than € 50 million as turnover and less than 250 employee. Alfa published its first non-financial report in 2011, following the GRI G3.1 Guidelines and achieving a "B" Application Level - The "Applications Levels" (AL) system assesses the grade of disclosure, giving a score that goes from C (minimum disclosure) to A (full disclosure). Report makers self-declare their Application Level, and, in addition, they can have their self-declaration externally assured by a third party (receiving a "+" to their AL) and/or request the GRI to check the self-declaration (Global Reporting Initiative, 2011). In 2012, Alfa published a second non-financial report, increasing its disclosure by 20 indicators. The 2013 sustainability report is currently in development. Non-financial reporting is not the only CSR practice: Alfa has a Code of Ethics, an Environmental Policy document and the ISO 14001 Certificate. According to Spence, Gherib and Biwolé (2011) classification of SMEs according to their CSR, Alfa belongs to the "committed" profile.

Alfa considers CSR as a dimension intimately linked to their activity: *"Ethical values, enthused by true sustainability, inspire our business approach, they are native, inborn in it and people just follow them but are not aware of them"*. Part of these values derives directly from their business logic: *"Some topics, linked to environmental sustainability and resource saving, were a central point in our business. The steel industry is strongly endowed with the ideas of restoring and recycling raw materials"*. Recycling and waste saving is not a value per-se or because it protects the environment, but because allows cost savings, which are vital in a high-competitive industry: the masculine side of culture is evident in this statement. This logic is manifest also in the fact that CSR is considered a way to create, maintain and strengthen relationship along the supply chain: *"Many suppliers from our supply chain approached CSR topics just like us: they are starting to formalize and report their existent commitment. Most of them come from Europe, so they are in an extremely competitive environment, where the level of attention to these themes is very high. On the other side, Far-East suppliers are starting to pay some attention to these dimensions and I think that in the following years*

there will be a major evolution in this sense. Our commercial partners and clients share a high level of responsiveness to CSR. They are in direct contact with the final market, which is demanding in this direction. Our commitment has certainly valued our company". Contrary to the predictions, institutional pressure plays a more limited role than expected in CSR practices commitment: *"local and international authorities have a strong influence on our business. With our reporting initiative, we show a proactive and sensitive approach towards environmental impacts, workplace conditions, and commercial relationships. During assessments, we can thus provide data in a clear and structured way, improving our corporate image and legitimacy"*. Accordingly with the social capital theory, Alfa pays attention to the local community: *"Local communities can benefit too. Volunteering and philanthropic initiatives raise the awareness that the company is interacting in a positive way in its context. We made the report available for download on our company website, as a way to guarantee the diffusion of the information."*

Addressing the specific CSD topic, market and supply chain logic are the most important antecedent: *"We want to promote our social responsibility commitment along the supply chain, from our suppliers to the final market, which is getting more and more receptive towards these topics. Manufacturing and trading world is gaining consciousness of CSR themes, and we are trying to embrace this philosophy structuring the activities that head in this direction"*. Coherently with the individualistic trait of the Italian dominant culture, reporting is considered a chance to differentiate the company from competitors: *"We realized that the market is pushing towards sustainability and corporate social responsibility. We scanned our competitors, and noticed that they were not fulfilling this demand. I think we are among the quickest catching this opportunity"*. Transparency, however, remains a value to protect: *"Transparency is our reporting approach. We provide data, both positive and negative. Then, everyone can give his own interpretation of the data. A car can be vehicle or a trap that kills people on the highways. We are leader in our industry, we have cutting-edge manufacturing processes. Data regarding resource use and environmental impacts is not a secret. Those who have a good knowledge of our industry can take advantage of such data. We do our best to minimize our impacts and optimize the manufacturing processes. We pay a lot of attention on our human capital, we invest on training and motivation, and we invest on human resources in the long term. A set of values inspire our business, thus we do not fear negative disclosure"*. In view of that, the effort to increase the amount of disclosure is perceived as important: *"With the second report, we increased the number of disclosed indicators by 20. Our reporting is going deeper: this year we intend to disclose more indicators"*. On the other hand, the commitment on transparency is not absolute, as economic considerations always play a central role: *"We chose those indicators which were the easiest to report. We chose the indicators that required data we already had or which was relatively simple to obtain"*. This may lead to a less effective report, as "the measurements that are easiest to report are not always the most informative" (Chatterji & Levine, 2006, p. 5). Report assurance too is considered as an avoidable extra-cost, even if assured reports respond to the demand for reliable and credible information, guaranteeing that the report truly represents a company's effort and achievements (KPMG/UvA, 2008): *"We did not have a third party assuring the technical and numerical meaning of the indicators. We did not fear third parties assessment, but we decided to avoid this check because of costs. To tell the truth, we do not believe this element to be determinant"*.

On the side of report purposes and effects, Alfa considers CSD as a way to formalize and value the CSR initiatives: *"In the past, we adopted many sustainable behaviors, but we were not aware of the value of these initiatives. Often, we even did not share the results with stakeholders, we did not communicate that our company was groundbreaking in specific fields. The reporting make our commitment visible. It provides us an organic and comprehensive framework, coordinating activities that otherwise would be isolated, and eventually we would lose the value behind them. In this manner, we can effectively plan our initiative and gather them within a unique global vision"*. Reporting activity is integrated in the business, as it helps strategic planning of CSR activities, increases internal communication and coordination, drives the partner selection along the supply-chain: *"Data regarding human resources management, resources management, raw materials, energy, waste, processes efficiency are part of our management system. In the future, their importance will even increase, especially in partner selection processes. Along the supply chain, we will endorse and support those partners who will share these values with us"*.

In the end, CSD activity is allegedly not linked to a *"direct commercial advantage"*, in the interviewee opinion, it brings mainly to cost increasing. Benefits are expected in the long run, as a yield on intangible assets, related to the voluntary nature of this activity: "*In my opinion, companies should invest in this initiative even in the absence of immediate yields. It is difficult to gain on "soft", intangible, elements like this one, with no direct commercial advantage. We do not have an improvement in efficiency that allows us to*

lower prices. Frequently, this commitment leads only to cost increasing. However, it has to be considered in a frame of business supporting activities, something that pays in the long term without doubts. Being voluntary, this activity has the potentiality to provide a distinctive trait to reporting companies". The idea that companies should invest in CSD even in the absence of a clear return suggests that non-financial reporting is a practice pushed by external forces leveraging on the moderate-high score of power distance and high UAI: "*The pressure on formalization is imported. In my opinion, it comes from the consumer market. Consumers want to be acknowledged of companies' values, and these values should guarantee social and environment respect"*.

5. CONCLUSION

This working paper starts to shed light on SMEs corporate social disclosure practices, introducing an original approach based on Hofstede cultural dimensions model. CSD and CSR in general are a field dominated by large firms (Brown, de Jong, & Levy, 2009), but SMEs too are engaging in social responsible activities, even if they prefer an informal commitment (Russo & Tencati, 2009).

The stakeholder theory, which has been widely and successfully applied to describe CSR and CSD in large firms (Searcy, 2009), fails to provide a comprehensive theoretical framework to explain SME-CSR relationship (Russo & Perrini, 2010), because SMEs are not "little big firms" (Tilley, 2000). Thus, other theories, such as the institutional and neo-institutional theories (DiMaggio & Powell, 1983; Selznick, 1948; Scott, 2001), the social capital theory (Putnam, 2000) and the sustainable entrepreneurship theory (Schaltegger & Wagner, 2011), are proposed. They are closer to SME idiosyncrasies, as they consider the relationship with institutions, local communities, and the central role of the entrepreneur.

The three theories share a common antecedent: culture. Hofstede (Hofstede, 1983) conceives culture as a collective mental programming, something which is learned through a socially constructed process. His studies show that societies' value system varies at national level, determining the way individuals cope with the relationship with authority, the relationship between the individual and the group, the social implications of having been born as a boy or a girl, the ways of dealing with uncertainty and risk. His model measures these four dimensions shaping national culture (individualism, power distance, masculinity, uncertainty avoidance), allowing to predict and motivate certain attitudes and behaviors within a nation. Italian scores on cultural dimensions show that institutional pressure might be the major driver for SMEs adopting CSD practices, consistently with other studies concerning CSR and the Italian context (Albareda, Tencati, Lozano, & Perrini, 2006).

Through a single-case study methodology (Yin, 2003), based on a recorded semi-structured interview, I verify if this proposition is supported. The case analysis provides interesting results. The proposed company, Alfa, is a medium-sized business operating in the manufacture of crown corks, metal and plastic caps for the bottling industry. Alfa is a CSR-committed firm, conceiving social responsibility as a dimension strictly connected to its core business. However, the formalization of its commitment into practices, like non-financial reporting, is perceived as something extraneous, not belonging to company original culture. This is in line with the Italian dominant culture and findings by Russo and Tencati (2009). Interestingly, the main driver to adopt this practice is not institutional pressure, refusing the initial proposition of this study. Local and international authorities play a limited role in this process. Supply chain, market and business relationships, instead, seem to be the most important antecedent to formalize CSR commitment and disclose non-financial information. This finding is consistent with GRI point of view: "sustainability reporting is perceived to enhance SMEs position in the market, for instance allowing access to multinationals supply chains. Some multinationals request suppliers to report on sustainability." (Global Reporting Initiative, 2013, p. 17). Notwithstanding, commercial benefit are not indicated as an effect of report issuance, which is expected to pay in the long run because of the reputational value conveyed by its voluntary nature. The adoption of CSD seems to be imported from global markets and partners, leveraging on Italian moderate-high power distance, uncertainty avoidance and masculinity: Alfa follows a perceived global trend adopted by larger clients, engaging in a voluntary activity both to differentiate their performance and limit the fear of losing major clients. Indeed, transparency – which is the main value behind CSD – is considered important, but it is subordinated to cost saving logic.

Although some interesting findings emerge from this pilot case study, this working paper is a part of a more comprehensive research. First, I intend to add more cases to increase the validity of the outcomes and allow comparison between different situations. Second, Hofstede cultural dimensions are best employed for cross-country comparison: it would be of interest to extend the analysis beyond national borders. Third, I plan to improve the analysis of the single cases by introducing a content analysis methodology, which allows a more precise and valid comprehension of the qualitative data collected during the interviews.

ACKNOWLEDGEMENT

First, my acknowledgement goes to Professor Jane Paunkovic who introduced me to the world of organizational culture and invited me to send this work to the Symposium. I thank Professor Angelo Russo for the support and advice. I thank the CSR Manager for his interview and the feedback. A special thanks goes to Grazia Scioscia, the interpreter who reviewed the translation of the interview and checked the language of this work.

REFERENCES

Aguinis, H., & Glavas, A., 2012. What We Know and Don't Know About Corporate Social Responsability: A Review and Research Agenda. *Journal of Management*, 1-37.

Albareda, L., Tencati, A., Lozano, J., & Perrini, F., 2006. The government's role in promoting corporate responsibility: a comparative analysis of Italy and UK from the relational state perspective. *Corporate Governance* 6 (4), 386-400.

Brown, H., de Jong, M., & Levy, D., 2009. Building institutions based on information disclosure: lessons from GRI's sustainability reporting. *Journal of Cleaner Production*, 571-580.

Campbell, J. (2006). Institutional Analysis and the Paradox of Corporate Social Responsibility. American Behavioral Scientist 49 (Chatterji, A., & Levine, D., 2006. Breaking Down the Wall of Codes: Evaluating Non-Financial Performance Measurement. *California Management Review* Vol.48, No.2, 1-23.

Chen, S., & Bouvain, P., 2009. Is Corporate Responsibility Converging? A Comparison of Corporate Responsibility Reporting in the USA, UK, Australia and Germany. *Journal of Business Ethics* 87, 299-317.

Cohen, J., Pant, L., & Sharp, D., 1996. A methodological on cross-cultural accounting ethics research. *International Journal of Accounting* 31 (1), 55-66.

Dahlsrud, A., 2008. How Corporate Social Responsibility Is Defined: An Analysis of 37 Definitions. *Corporate Social Responsibility and Environmental Management* 15 (1), 1-13.

De Jong, M., Pieters, R., & Fox, J., 2010. Reducing social desirability bias through item randomized response: An application to measure underreported desires'. *Journal of Marketing Research* 47, 14-27.

Del Baldo, M., 2012. Corporate social responsibility and corporate governance in Italian SMEs: the experience of some "spirited businesses". *Journal of Management and Governance* 16 (1), 1-36.

DiMaggio, P., & Powell, W., 1983. The Iron Cage Revisited: Insitutional Isomorphism and Collective Rationality in Organizationals Fields. *American Sociological Review* 48(2), 147-160.

Dyllick, T., & Hockerts, K., 2002. Beyond the business case for corporate sustainability. *Business Strategy and the Environment*, Eisenhardt, K., & Graebner, M., 2007. Theory Building from Cases: Opportunities and Challenges. *Academy of Management Journal* Elkington, J., 1997. *Cannibal with forks*. Oxford: Capstone publishing.

European Commission, 2013. *The New SME Definition.*

Foster, G.,1986. *Financial Statement Analysis.* Englewood Cliffs: Prentice-Hall.

Freeman, I., & Hasnaoui, A.,2011. The Meaning of Corporate Social Responsibility: The Vision of Four Nations. *Journal of Business Ethics* 100, 419-443.

Freeman, R., & Edward, R., 1984. *Strategic Management: A stakeholder approach.* Boston: Pitman.

Gjølberg, M., 2009. The Origin of Corporate Social Responsibility: Global Forces or National Legacies? *Socio-Economic* R 7 (4), Global Reporting Initiative, 2011. *GRI application levels.*

Global Reporting Initiative, 2013. *Carrots and Sticks.* Sustainability reporting policies worldwide - today's best practices,.

Global Reporting Initiative, 2014, January. *Disclosure Database*. http://database.globalreporting.org/

Graafland, J., van de Ven, B., & Stoffele, N., 2003. Strategies and Instruments for Organising CSR by Small and Large Businesses in the Netherlands. *Journal of Business Ethics* 47 (1), 45-60.

Gray, R., 1997. The practice of silent accounting. In S. Zadek, & R. Evans, Building Corporate Accountability. Emerging Practices in Social and Ethical Accounting, *Auditing and Reporting* (p. 201-217). London: Earthscan.

Gray, R., Owen, D., & Adams, C., 1996. *Accounting and accountability. Changes and challenges in corporate social reporting and environmental reporting.* Hemel Hempsteard, UK: Prentice Hall.

Habisc, A., Patelli, L., Pedrini, M., & Schwartz, C., 2011. Different Talks with Different Folks: A Comparative Survey of Stakeholder Dialog in Germany, Italy, and the U.S. *Journal of Business Ethics* 100 (3), 381-404.

Hall, P., & Soskice, D., 2001. *An Introduction to Varieties of Capitalism.* In P. Hall, & D. Soskice, Varieties of Capitalism: The Institutional Foundations of Comparative Advantage (p. 1-68). Oxford: Oxford University Press.

Ho, F., Wang, H., & Vitell, S., 2012. A Global Analysis of Corporate Social Performance: The Effects of Cultural and Geographic Environments. *Journal of Business Ethics* 107, 423-433.

Hofstede, G., 1983. The Cultural Relativity of Organizational Practices and Theories. *Journal of International Business Stus* 14 (2).

Hofstede, G., Hofstede, G., & Minkov, M., 2010. *Cultures and Organizations: Software of the Mind*. McGraw-Hill USA.

Hofstede, G., Neuijen, B., Ohayv, D., & Sanders, G., 1990. Measuring Organizational Cultures: A Qualitative and Quantitative Study Across Twenty Cases. *Administrative Science Quarterly* 35 (2), 286-316.

House, R., Javidan, M., Hanges, P., & Dorfman, P., 2002. Understanding cultures and implicit leadership theories around the globe: an introduction to project GLOBE. *Journal of World Business* 37, 3-10.

Julien, P.-A. (1993). SMEs: Review and Perspectives. Paris: Economica.

Kavitha, W., & Anita, P. (2011). Disclosures About CSR Practices: A Literature Review. The IUP Journal of Corporate Governance, Vol. X, No. 1, 45-55.

Kolk, A., 2003. Trends in sustainability reporting by the fortune global 250. *Business Strategy and the Environment* 12, 279-291.

KPMG, 2013. *The KPMG Survey of Corporate Responsibility Reporting 2013*.

KPMG/UvA., 2008. *KPMG International survey of corporate sustainability reporting 2008*. Amsterdam: KPMG Global Sustainability Services.

Lamberti, L., & Lettieri, E., 2009. *CSR Practices and Corporate Strategy: Evidence from a Longitudinal Case Study*. J BE 87, 153-
Langlois, C., & Schlegelmich, B., 1990. Do Corporate Codes of Ethics Reflect National Character? Evidence from Europe and the United States. *Journal of International Business Studies* 21 (4), 519-539.

LeBlanc, B., 2012. Sustainability Rises On the CFO's "to-do" *List. Financial Executive*, 54-57.

Leonidou, L., Kvasova, O., Leonidou, C., & Chari, S., 2013. Business Unethicality as an Impediment to Consumer Trust: The Moderating Role of Demographic and Cultural Characteristics. *Journal of Business Ethics* 112 (3), 397-415.

Lepoutre, J., & Heene, A., 2006. Investigating the Impact of Firm Size on Small Business Social Responsibility: A Critical Review. *Journal of Business Ethics* 67, 257-273.

Linnenluecke, M., & Griffiths, A., 2010. Corporate sustainability and organizational culture. Journal of World Business 45, 357-
Logsdon, J., & Wood, D. (2005). Global Business Citizenship and Voluntary Codes of Ethical Conduct. Journal of Business Ethics 59,.

Lubin, D., & Esty, D. (2010). The sustainability imperative. *Harvard business review*, 2-9.

Matten, D., & Moon, J., 2008. "Implicit" and "Explicit" CSR: A Conceptual Framework for a Comparative Understanding of Corporate Social Responsibility. *Academy of Management Review* 33 (2), 404-424.

McWilliams, A., Siegel, D., & Wright, P., 2006. Corporate Social Responsibility: Strategic Implications. *J MS* 43, 1-18.

Meek, G., Roberts, C., & Gray, S., 1995. Factors Influencing Voluntary Annual Report Disclosures by U.S., U.K. and Continental European Multinational Corporations. *Journal of International Business Studies*, 3rd Quarter, 555-572.

Michelon, G., & Parbonetti, A., 2010. The effect of corporate governance on sustainability disclosure. *Journal of Management and Governance* 16, 477-509.

Mirvis, P., & Googins, B., 2006. Stages of Corporate Citizenship. *California Management Review*, Vol.48, No.2, 104-126.

O'Dwyer, B., 2011. The Case of Sustainability Assurance: Constructing a New Assurance Service. *Contemporary Accounting Research*, Vol.28, No.4, 1230-1266.

Perego, P., & Kolk, A., 2012. Multinationals' Accountability on Sustainability: The Evolution of Third-Party Assurance of Sustainability Reports. *Journal of Business Ethics* 110, 173-190.

Perrini, F., 2005. Building a European Portrait of Corporate Social Responsibility Reporting. *European Management Journal* Vol.23, No.6, 611-627.

Perrini, F., 2006. SMEs and CSR Theory: Evidence and Implications from an Italian Perspective. *Journal of Business Ethics* 67 (3),
Perrini, F., Russo, A., Tencati, A., & Vurro, C., 2011. Deconstructing the Relationship Between Corporate Social and Financial Performance. *Journal of Business Ethics* 102, 59-76.

Porter, M., & Kramer, M., 2011. *Creating Shared Value*. Harvard business review.

Putnam, R., 2000. *Bowling Alone: The Collapse and Revival of American Community*. New York, NY: Simon and Schuster.

Ringov, D., & Zollo, M., 2007. Corporate responsibility from a social-institutional perspective: The impact of national culture on corporate social performance. *Corporate Governance* 7 (4), 476-485.

Roca, L., & Searcy, C., 2011. An analysis of indicators disclosed in corporate sustainability reports. *Journal of Cleaner Production*,
Russo, A., & Perrini, F., 2010. Investigating Stakeholder Theory and Social Capital: CSR in Large Firms and SMEs. *Journal of Business Ethics* 91, 207-221.

Russo, A., & Perrini, F., 2010. Investigating Stakeholder Theory and Social Capital: CSR in Large Firms and SMEs. *Journal of Business Ethics* 91, 207-221.

Russo, A., & Tencati, A., 2009. Formal vs. Informal CSR Strategies: Evidence from Italian Micro, Small, Medium-sized, and Large Firms. *Journal of Business Ethics* 85, 339-353.

Schaltegger, S., & Wagner, M., 2011. Sustainable Entrepreneurship and Sustainability innovation: categories and interactions. *Business Strategy and the Environment*, 222-237.

Scott, W., 2001. *Institutions and Organizations*. Thousands Oaks, CA: Sage.

Searcy, C., 2009. Corporate sustainability performance measurement: Lessons from system of systems engineering. *Proceedings of the 2009 IEEE international conference on systems, man, and cybernetics*. San Antonio.

Searcy, C., 2012. Corporate Sustainability Performance Measurement Systems: A Review and Research Agenda. *Journal of Business Ethics* 107, 239-253.

Selznick, P., 1948. Foundations of the Theory of Organizations. *American Sociological Review* 13, 25-35.

Siggelkow, N., 2007. Persuasion with Case Studies. *Academy of Management Journal* 50 (1), 20-24.

Spence, C., & Gray, R., 2007. *Social and Environmental Reporting and the Business Case*. London: ACCA Research Report no.98.

Spence, M., Gherib, J., & Biwolé, V., 2011. Sustainable Entrepreneurship: Is Entrepreneurial Will Enough? A North-South Comparison. *Journal of Business Ethics* 99, 335-367.

Spiller, R., 2000. Ethical Business and Investment: A Model for Business and Society. *Journal of Business Ethics* 27, 149-160.

Sutantoputra, A., 2009. Social Disclosure rating system for assessing firms' CSR reports. *Corporate Communications: An International Journal* Vol.1, Iss.1, 34-48.

The Hofstede Centre., 2013, January. *National Culture Dimensions. Tratto da The Hofstede Centre*: http://geert-hofstede.com/dimensions.html

Tilley, F., 2000. Small Firm Environmental Ethics: How Deep Do They Go? *Business Ethics: European Review* 9(1), 31-41.

Vitell, S., Paolillo, J., & Thomas, J., 2003. The perceived role of ethics and social responsibility: A study of marketing professionals. *Business Ethics Quarterly* 13 (1), 63-86.

Watts, R., & Zimmerman, J. , 1986. *Positive Accounting Theory*. Englewood Cliffs: Prentice-Hall.

Yin, R., 2003. *Case Study Research - Design and Methods 3rd Edition*. Sage Publications.

4th International Symposium on Natural Resources Management
"Sustainable Development and Green Economy in Transition Countries"
31st May -1st June, 2014, Faculty of Management Zajecar, Republic of Serbia
www.fmz.edu.rs

THROUGH GREEN ECONOMY TO RENEWABLE ENERGY RESOURCES

Lecturer MA Diana Damevska, [1],
Anna Ivanovska M Phil[2]

[1] PhD, Business Academy Smilevski-Bass, Skopje, dijanadamevska@yahoo.com
[2] Field Coordinator and student practice, Business Academy Smilevski-Bass, Skopje, ana-ivanovska@hotmail.com

ABSTRACT

Green economy is an economic strategy based on sustainability and economic growth that allows better living conditions. Green economy respects and protects the environment, encourages social connection and quality of life and ensures long-term sustainability of the economic growth. Green economy is a resource-saving and environment-friendly economy with low resource consumption, less environmental pollution and creation of high added value products. It is characterized by a significant increase in investment in economic sectors. Concerning energy,it is directed towards greener energy supply, creating renewable energy and low carbon emission and reducing environmental risks. Green economy rapidly develops from theoretical and global level to a national and practical level. Its implementation depends on new ideas concerning challenges and opportunities aimed at development increase, job creation and poverty reduction.

KEYWORDS

Green economy, economic growth, renewable energy resources

1. INTRODUCTION

"Sustainable development is not an abstract concept - it is a roadmap that shows how to act responsibly on a national level. Climate changes demand a need for ecological innovative approaches in order to support economic development. "

George Ivanov
President of the Republic of Macedonia

Green Economy is an economy that results in improving human well-being and reducing inequalities for a longer period, reducing the impact of the significant environmental risks and ecological scarcities and aims at a better life for the future generations. It achieves sustainable economic growth respecting and protecting the environment. The use of green economy depends on the opportunities and challenges offered. Decision makers such as Ministers of the Environment, Transport Planning and Finance are the main pillars that need to make the correct decisions. The business community has also a major role and should motivate "green" investments with new ideas, opening opportunities for small and medium enterprises as well as for the citizens (UK National Allocation Plan 2008 –2012).

This will create new, "green" jobs, it will reduce poverty and will also create a method for sustainable environmental protection. It will mean a new opportunity for progress and sustainable economic growth. Green growth means promoting economic growth and development without further contribution to climate changes, environmental degradation and unsustainable use of natural resources. Encouraging investment in renewable energy, greater inclusion of renewable energy resources in energy consumption as well as

increasing energy efficiency are the main strategic objectives of each country. The use of renewable energy resources gains importance in terms of environmental protection. "Greening" the Macedonian economy, above all, means more efficient use of energy in all the sectors that consume energy. Dealing with waste, recycling and energy production from renewable energy resources in Macedonia are almost in infancy. Investments in "green" industry are no longer considered avant-garde, but European trend and a real need (Green Growth and Climate Change in Macedonia, 2012).

2. THROUGH GREEN ECONOMY TO SUSTAINABLE ECONOMIC GROWTH

In the analysis of the economic development of Macedonia, the World Bank stressed that the country will achieve better results in dealing with the global crisis and economic growth, if more attention is given and measures are taken to stimulate and support the green economy.

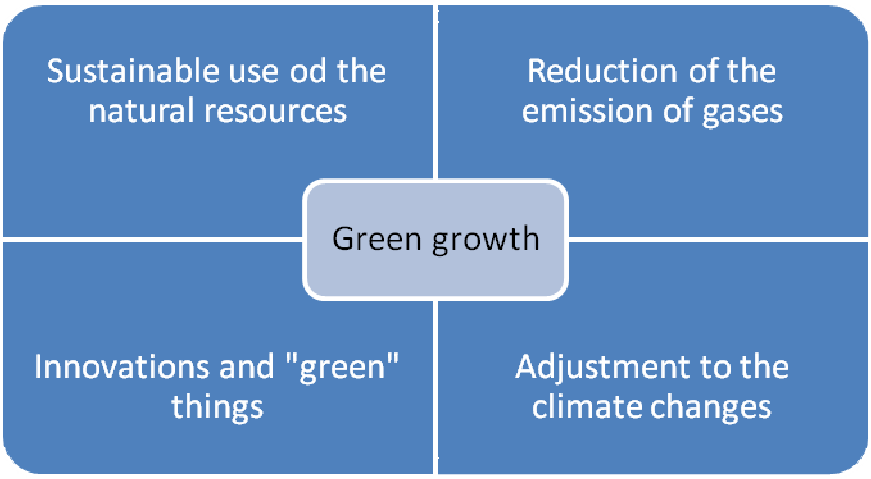


Figure 1. Elements of sustainable green growth
Source: Green growth and climate in Macedonia

Green economy and sustainable growth begin with the sustainable use of natural resources. Natural resources are necessary for economic activity development and the process called production. But despite renewable natural resources such as forests and fisheries, we are concerned with natural resources that are not renewable. Energy, mineral deposits, clean air and possibility for their sustainability are becoming more challenging for Macedonia and the other countries as well. Innovations are the key segment we should focus on (Green Economy, Small Business-INFO, 2011.).

They can contribute to creation of opportunities for production with less depletion of natural resources on one hand, and production inputs values that are favorable to the environment on the other.

Using low -carbon technologies and low pollution technologies is the main driving force for creating "green" economic growth. Special emphasis should be put on adaptation towards climate conditions as a factor that influences the creation of sustainable economic growth .

Each country should rationally consider in order to see how to adapt the adjustment needs into decisions about infrastructure elements with long life expectancy, for example the hydroelectric power plants .

The combination of the four elements that provide a balance between greening and growth depends on the country. Each country has its own characteristics that make it different. The location, forests, hydropower potential and fossil fuels position each country differently in the creation of green growth.

But its growth depends on the policies that are leading in each country and should be directed towards the implementation and application of strategies for renewable energy and energy efficiency.

Macedonia faces dual challenge in achieving long-term economic development and reducing climate changes. The program implemented in this direction covers wide effort including studies, analysis, and training. It also includes the following aims: an estimation of the economic costs and benefits of the transition to greener growth, taking into account the projected climate changes and establishing the priorities into the implementation of the activities identified in the National Strategy for Sustainable Development (http://www.kapital.com.mk).

3. RENEWABLE ENERGY RESOURCES AS A PRECONDITION FOR ECONOMIC AND ECOLOGICAL SUCCESS

"Greening" the Macedonian economy, above all, means more efficient use of energy in all the sectors that consume energy.

The expected growth of any economy, so the Macedonian, expanded international trade and tourism development, lead to increased overall demand for electricity to 1.6 percent per year for households and 1.7 percent per year for non-residential buildings that will lead to overall increases of 48 or 51 percent by 2050. As a significant problem in our economy is air pollution by fine particles that cost the economy 253 million per year or 3.2 percent of GDP last year. Annually, about 1,350 lives are lost as a result of the pollution of the air with fine particles.

Air pollution is a significant problem in certain locations in Macedonia as highly urbanized and industrialized centers such as Skopje, Bitola (energy), Kavadarci (metallurgy) and Miladinovci (refining crude oil) significantly contribute to poor air quality in these areas.

Industrial and energy production is concentrated in a few locations in Macedonia: Bitola, Kavadarci, Kicevo , Skopje and Tetovo. These large sources are to be the focus of efforts to reduce much of the air pollution (http://www.voveles.com)

.

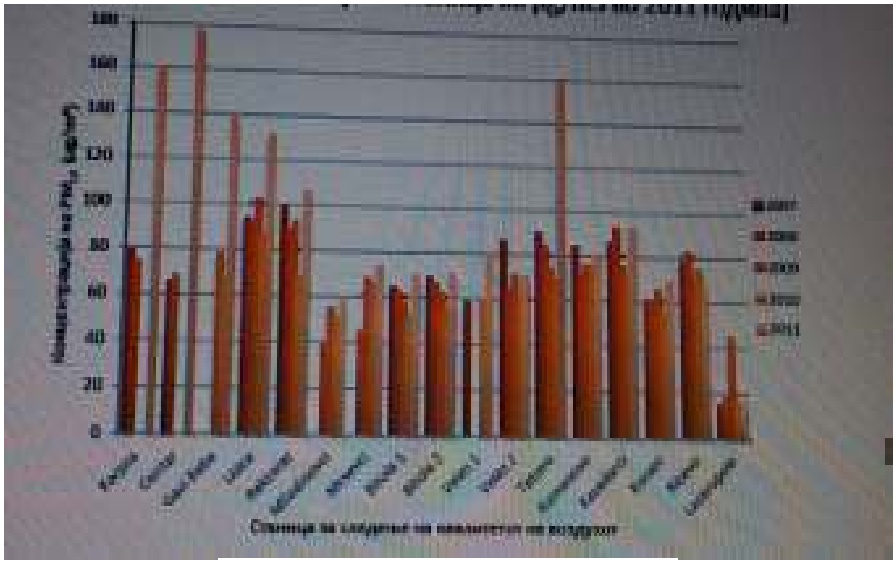


Figure 2. Ambient concentrations of PM10
Source: Ministry of Environment and Physical Planning, 2012

To understand the effort that must be invested to implement this kind of transition, in this paper we have made a research in the Limited Liability Company Prizho, Bitola. The way they work is skillfully performed

and use of renewable energy sources is a prerequisite for creating economic and environmental success (Smith M. R., Smith T. R., 2009).

The company Przho, Bitola was formed in 1982 with its core business maintaining and servicing motor vehicles. Today, the company has expanded its core business and has its showroom vehicle, auto market, Karting and own motel. The company is owned and managed by one person and currently has 15 employees, tending to further increase the number of employees.

Figure 3. Przho, Bitola

Following the need to use electricity, but also following the need to reduce costs, the company introduces the idea of using the machine, Brenner GIERSCH. The machine is of German origin and is within the area of maintaining and servicing vehicles. It is of high quality, tested and environmentally approved (http://www.ceprosard.org.mk).

.

Figure 4. GIERSCH GmbH - Brenner und Heizsysteme

It provides economic savings and environmental protection, burning the waste oil that is replaced at regular service of all vehicles. If we start from the fact that every family of four has at least two vehicles we can assume how much the company is involved in adopting the use of cleaner technology in the role of reducing the risks in the environment (http://www.kapital.com.mk).

At the same time, while using the Brenner, the company applies the green growth strategy. Burning waste oil is a renewable energy resource. Waste oil is stored in a separate tank which comes through filters to Brenner. The Brenner itself has a heater that heats and then lights the oil at a temperature of 140 degrees.

Thus, through the elements the Brenner owns, namely motor, fan, safety valves, monometer, regulators and probes, the oil burns. This creates thermal energy used to heat water for radiators and boilers for various needs of the company.

Following this principle, heat energy is produced and while conducting economic savings, this creates the opportunity for reduced spending of scarce and limited natural resources which practically makes them available for other use.

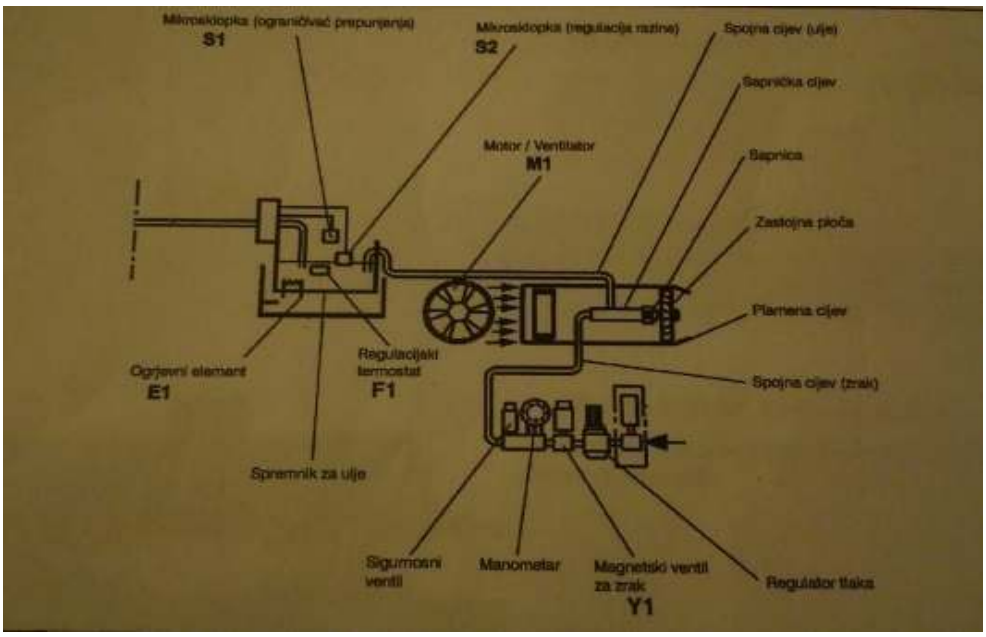


Figure 5. Principle of operation, Brenner- G, GIERSCH
Source: Technical information and instructions for use

"The reduced losses and increased efficiency are key components of the strategy implemented by the company because this strategy not only protects the environment but also returns investment that creates sustainable growth", says the business owner (Green Growth and Climate Change in Macedonia, 2012).

Dealing with waste, recycling, energy production from renewable energy resources in Macedonia are almost in infancy. Macedonia should soon catch up with the global trends and follow European and regional practices when it comes to "green" economy.

The "green" economy and energy efficiency should be seen as a huge potential driving force of the economy. Investments in "green" industry are no longer considered avant-garde, but European trend and a real need.

4. CONCLUSION

Green economy is a resource-saving and environment-friendly economy with low resource consumption, less environmental pollution and creation of high added value products. It allows creating new "green" jobs, reduces poverty and creates sustainable environmental protection. "Greening" the Macedonian economy, above all, means more efficient use of energy in all the sectors that consume energy. Innovations are the key segment we should focus on. They can contribute to creation of opportunities for production with less depletion of natural resources on one hand, and production inputs values that are favorable to the environment on the other. Using low -carbon technologies and low pollution technologies is the main driving force for creating "green" economic growth.

To understand the effort that must be invested to implement this kind of transition, in this paper we have made a research in the Limited Liability Company Przho, Bitola. The way they work is skillfully performed

and use of renewable energy sources is a prerequisite for creating economic and environmental success. Investments in "green" industry are no longer considered avant-garde, but European trend and a real need.

REFERENCES

Program for analytical and advisory support, 2012. Green *Growthand Climate Change in Macedonia.*
Small Business-INFO, 2011. *Green Economy*.
http://www.kapital.com.mk;
http://www.voveles.com;
http://www.ceprosard.org.mk

4th International Symposium on Natural Resources Management
"Sustainable Development and Green Economy in Transition Countries"
31st May -1st June, 2014, Faculty of Management Zajecar, Republic of Serbia
www.fmz.edu.rs

SUSTAINABILITY MODEL OF CORPORATE GOVERNANCE AND CORPORATE SOCIAL RESPONSIBILITY IN SERBIA

Darjan Karabašević,

Faculty of Management Zajecar, darjankarabasevic@gmail.com

ABSTRACT

Corporate sector and companies at the present time increasingly realize the importance of quality implementation of corporate governance and corporate social responsibility with the aim of changing their way of doing business to increase efficiency and hence competitiveness. Multinational companies in their daily activities and business operations pay more attention to sustainable models of corporate governance and corporate social responsibility. Author of this paper pays special attention to the sustainable model of corporate governance and corporate social responsibility as the imperative of modern way of doing business. The central theme of this paper is to review the corporate governance and corporate social responsibility as well as their importance for the company. This paper will investigate and question the appropriate sustainable model of corporate governance in terms of improving business environment and improving of company's efficiency.

KEYWORDS

Corporate governance, corporate social responsibility, sustainability.

1. INTRODUCTION

Corporate governance as one of the modern forms of governance represents the system by which over companies are managed, controlled, supervised and monitored, with aim of better efficiency, effectiveness and achieving better development functions in the market.

More common reason for increasing focus and implementation of corporate governance system in daily operations is primarily a very complex and dynamic market, cruel competition, turbulent economic conditions on the one hand and the desire to achieve better development functions on the market on the other.

According to the report of Adrian Cadbury corporate governance is defined as "Corporate governance is the system by which companies are directed and controlled". In this way, corporate governance is defined as a set of mechanisms through which the company operates when the property is separate from management. (Cadbury, 1992)

In a situation of increasingly dynamic market, increasing competition, more demanding customers and turbulent economic conditions, there was a need for efficient management and control of the organization in the form of sustainable model of corporate governance.

Tracking changes in the environment, adapt to these changes, performing fast, efficient and effective changes in business in the accordance with the amended and increasingly demanding market, are not possible without the use of modern concepts of business, responsibility to the community in the form of corporate social responsibility and governance based primarily on sustainable model of corporate governance and corporate social responsibility.

Corporate social responsibility (CSR) is a concept within which the companies integrate social interests and challenges related to the environment and your business to interact with all stakeholders ie. interested parties on a voluntary basis. (Smart Kolektiv, 2006)

Bearing in mind that topics such as corporate govemance and corporate social responsibility are discussed a lot in the world, the same topics are gaining greater importance when there are difficult business conditions when companies and organizations are trying to improve their business.

In this context, the central theme of this paper is to review sustainable models of corporate governance and corporate social responsibility in Serbia.

2. CORPORATE GOVERNANCE

Effectively set and applied corporate governance would help the company to better protect their interests and their property, simultaneously increasing the value of the company and making it more attractive to the investors and potential strategic partners. Corporate governance also establishes a clear framework for defining and achieving corporate goals.

Corporate governance according to the definition of Serbian Chamber of Commerce is a set of rules and behaviors that determine how companies are managed and how it is controlled. It's kind of a mix of legislation, rules prescribed by the general laws of companies and voluntary practices themselves of companies. (Privredna komora Srbije, 2012)

Corporate governance allows the company more easily and efficiently conduct of its business, to better attract the necessary human and financial resources in order to provide continuity in business as well as long-term sustainable development, while taking into consideration the interests of owners and other stakeholders who have an interests in business operations of the company.

Such as large multinational companies whose operations are transparent through quarterly reports, good corporate governance should certainly provide timely and accurate reporting in terms of ownership, financial ratios, achieved results, and all relevant material facts relating to the company itself. It involves a public presentation of important and relevant parameters with respect to the Company's financial and operating results, benefits to members Managing Board, substantial ownership of shares etc. Multinational companies usually tend to practice presenting reports on a quarterly basis, while at the beginning of the year they present a comprehensive report for the whole last year.

Below, in the figure 1. is shown the basic functions that underlie role of corporate governance.

Figure 1. The role of corporate governance

Corporate governance aims at the micro level through its actions to provide:

• maximization of shareholder value and simultaneously increasing the value of the company.

• protect the interests and rights of shareholders with respect to of effective control over the financial and operating activities.

• High transparency in the business reporting, which involves the timely and accurate reporting.

• Professional, efficient and responsible management.

At the macro level, the importance of corporate governance is also enormous because the corporate governance facilitates the formation of "healthy", efficient and competitive company, a variety of these companies make the national economy wealthier and more prosperous.

3. CORPORATE GOVERNANCE IN SERBIA

Corporate governance has enormous importance, especially for economies in transition, where it is the transition from one system of planned economy to a free market system, ie. changes in way of economy from a socialist to a capitalist. The transition process is not easy, however, only the introduction of adequate corporate governance at the microeconomic level, offers a chance for companies to further develop and acquire a better market position.

Corporate sector is based on private property and corporate governance. Privatization was a key factor for the formation of such sector in Serbia. It was created through the privatization of public companies that are managed on the basis of self-employed persons. In the first step, socially owned companies have transformed into joint-stock companies, and in the second step is performed their privatization. This process is not brought to the very end, because there are still a number of social enterprises that are not privatized. On the other hand, in the existing corporate sector, 20 percent of the capital is still in a public or state-owned. (Labus, 2007)

According to Miroljub Labus, privatization was a key factor for the development of the corporate sector with corporate governance in the process of privatization of public property. The aim of privatization was to change the ownership structure created by the successful conduct of companies that are primarily competitive, efficient, profitable and ready for competition.

Corporate governance contributes to improve and increase the confidence of potential investors in the company, that provides the company so much needed better conditions for securing of financial resources and easier access to capital markets. Bearing in mind that the capital market in Serbia is still fragile, the cost of borrowing through loans is still high, most of loans through which companies borrow money is indexed in foreign currencies which makes it difficult and directly affects the company's operations, primarily due to possible losses due to devaluation / depreciation of the currency and exchange rate losses.

Serbia has made a progress in 2004 in terms of institutionalization of segment that concerns the companies, corporate sector and consequently corporate governance, then Serbia adopted the Law on Companies, which is supposed to regulate corporate law and therefore corporate governance, despite well-written law that is according with OECD guidelines, the crucial problem remains the application of the law in practice. During the 2011 the new Law on Companies, which entered into force on 2012. unlike the previous law, new law had a novelty that can be seen in the annual report of a joint stock company, which must include a statement on the implementation of the corporate governance code whose contents is prescribed by the law.

Considering that the companies in Serbia realize the importance of corporate governance, there have been made and some steps in that regard, then, the Assembly of the Serbian Chamber of Commerce adopted in the 2005. Code of Corporate Governance, as the 2012th entry into force of the new Law on Companies, Serbian Chamber of Commerce in accordance with certain statutory changes 2012th adopted a new Code of Corporate Governance. Since that in 2012 entered into force of the new Law on Companies, Serbian Chamber of Commerce in accordance with certain statutory changes 2012 adopted a new Code of Corporate Governance.

Corporate governance can be defined most simply as a set of rules, principles and behaviors whose application establishes good corporate governance.

Code of Corporate Governance of Serbian Chamber of Commerce aims to become an effective tool for improving the system of corporate governance in the companies such as joint stock companies and limited liability companies in Serbia. (Privredna komora Srbije, 2012)

4. CORPORATE SOCIAL RESPONSIBILITY

Being socially responsible does not only mean fulfilling legal obligations, but also to go further than mere compliance with the law and to invest more in human capital, the environment and relations with stakeholders. (COMMISSION OF THE EUROPEAN COMMUNITIES, 2001)

In modern business, companies are not only recognized for its operating results and market position, but also by its properties, in terms of responsibility to the community, dealing with employees and business partners, care for the environment and sustainable development.

All this can be marked as a social responsibility, which is becoming increasingly important parameter in evaluating a company. Poor rating for social responsibility has a direct impact on the decline in the company's image, which is ultimately reflected in weaker operating results.

Positive image means that the company cherishes quality and fair relationships not only with customers but also with employees, partners and the community. Sustainable development implies a balance of influence on the development of economic and social plan and the environment, points to the impact of current actions on future generations. Corporate social responsibility is the basis of sustainable development of each company. (Karabašević, 2012)

The European Commission proposes the following definition "Corporate social responsibility (CSR) is about companies having responsibilities and taking actions beyond their legal obligations and economic/business aims. These wider responsibilities cover a range of areas but are frequently summed up as social and environmental – where social means society broadly defined, rather than simply social policy issues. This can be summed up as the triple bottom line approach: i.e. economic, social and environmental" (http://europa.eu/rapid/press-release_MEMO-02-153_en.htm)

By analyzing the content of the current definition of corporate social responsibility, the very notion of corporate social responsibility is most often associated three main aspects, ie. the dimensions of activity as follows:

• Social aspect: Acting of CSR to the society, companies contributes to a better society by being aware of their activity on the community and the impact that their operations have on the community.

• Economic aspect: Acting of CSR aims to improve the company's image and to improve the profitability of the company.

• Aspects of the natural environment: Acting of CSR aims that company's business takes place in the natural environment and to also develop in a sustainable way.

Below, in the figure no. 2 can be seen aspects of CSR, whose activities are realized through the social dimension, the dimension of the natural environment and economic dimension.

Figure 2. CSR dimensions

In addition to operating results and financial indicators, the company with CSR activities shows that it is also important and socially responsible business through giving strong support to employees, the environment and society.

5. CORPORATE SOCIAL RESPONSIBILITY IN SERBIA

In Serbia Philanthropy and CSR are not fully developed, partly because of the recent introduction of a free market economy, and partly because of the strong traditional family support structures, which previously made formal philanthropy unnecessary. This has been reinforced by the current financial crisis. (Addarii & Rattenbury, 2009)

Mainly, corporate social responsibility was an activity reserved only for large multinational companies, however, because of importance of corporate social responsibility and understanding of its role in the overall business, more and more small and medium-sized enterprises (SME), which in accordance with its capabilities also introduce the concept of corporate social responsibility. The small and medium enterprises in Serbia, unlike those in the EU are at the very beginning of the CSR activities.

In order to draw the attention of the public and to raise awareness of the growing importance of corporate social responsibility and the importance of the CSR for both the company and society, Smart Kolektiv in 2008 initiated the establishment of the Business Leaders Forum which aims to promote sustainable development model of CSR in Serbia, point out the benefits that derive from the same as at the corporate level and at the national level.

Below, in the figure no. 3 shows the members of Business Leaders Forum. Analyzing CSR activities of Business Leaders Forum, can be concluded that in their CSR activities most represented areas are:

- Education
- Environment
- Culture and other areas of CSR that are less represented.

Figure 3. Members of Business Leaders Forum (http://www.fpl.rs/o_nama.127.html)

Corporate social responsibility in Serbia is not at the level of developed economies, the reason is delayed transition, ie. changes in way of economy that has not yet been finalized. In Serbia, the first activity in terms of corporate social responsibility launched by large multinationals across all markets in which they operate must be socially operated in accordance with the actions of its parent company and its management guidelines for sustainable development of corporate social responsibility.

There are efforts to the issue of corporate social responsibility to additionally promote and institutionalize. Government of Serbia in 2009 adopted a strategy of developing and promoting corporate social responsibility in the Republic of Serbia for the period from 2010 till 2015 subsequently, the Government of Serbia on the proposal of the Ministry of Labour and Social Policy, adopted the Action Plan for the implementation of Strategy of the development and promotion of CSR, which was previously adopted.

In the unfavorable financial environment, companies are reducing their activities in terms of corporate social responsibility however; maybe corporate social responsibility is one of the options that is available to the companies to amortize the impact of adverse financial environment and crisis.

6. CONCLUSION

With the beginning of the privatization process in Serbia comes to the creation of corporate sector, corporate governance therefore corporate social responsibility. After 2001, there was an acceleration of the privatization process which has not been completed, according to the official statistics every third contract was terminated in privatization. In the coming period to improve the Serbian economy it is necessary to solve this burning problem.

Completion of the initiated process of privatization would have a positive impact on the development of corporate governance and corporate social responsibility in the context of clearly defined ownership structure

of the companies. Economic theory and practice clearly showed that only clearly defined ownership defined within the company can contribute to the development of sustainable models of corporate governance and corporate social responsibility.

Serbia for improving corporate governance in state-owned enterprises should take advantage of the positive experiences from the private sector and companies in private ownership and that experiences to apply in state-owned enterprises and in the public sector. Professionalization and effective corporate governance in state-owned enterprises would provide greater transparency in its operations in order to distinguish between the role of the owners and the regulators, easy decision-making process, a concrete action strategies and easier defining goals.

Serbia has made certain steps toward corporate governance as well as to corporate social responsibility in terms of the adoption of specific legislation, strategies and action plans, however, despite the adoption of specific legislation and acts, is crucial importance to apply all adopted acts.

The accession of Serbia to the European Union, adapting its related legislation to acquis of the European Union, Serbia will significantly have to reorganize its public sector. Main focus will be on business transparency, corporate governance and corporate social responsibility.

REFERENCES

Cadbury, A., 1992. *Report of the Committee on the Financial Aspects of Corporate Governance*. London.

Smart Kolektiv, 2006. *Pojmovnik društveno odgovornog poslovanja.* Beograd.

Privredna komora Srbije, 2012. *Kodeks korporativnog upravljanja.* Beograd.

Labus, M., 2007. *Korporativni sektor u Srbiji: Narodni kapitalizam ili tajkunizacija.* Beograd.

COMMISSION OF THE EUROPEAN COMMUNITIES, 2001. *GREEN PAPER Promoting a European framework for Corporate Social Responsibility.* Brussels.

Karabašević, D., 2012. *Specijalistički rad.* Fakultet za menadžment, Zaječar,

Addarii, F., Rattenbury, B., 2009. *Understanding and Empowering Civil Society in the Western Balkans.*

http://europa.eu/rapid/press-release_MEMO-02-153_en.htm (27.03.2014)

http://www.fpl.rs/o_nama.127.html (31.03.2014)

4th International Symposium on Natural Resources Management
"Sustainable Development and Green Economy in Transition Countries"
31st May -1st June, 2014, Faculty of Management Zajecar, Republic of Serbia
www.fmz.edu.rs

PERFORMANCE MANAGEMENT IN FUNCTION OF DEVELOPMENT OF COMPANIES

Darjan Karabašević[1],
Ana Stanujkić[2]

[1]*Faculty of management Zajecar, darjankarabasevic@gmail.com*
[3]*Independent researcher,ana.stanujkic@gmail.com*

ABSTRACT

Technological changes, development, and the speed of new achievements have made it necessary for companies to adapt their way of doing business to new trends in achieving their goals. Any company that aspires to have a better position on the market, while maintaining competitiveness, should be focused in their daily processes to performance management and excellence in their work. In order that company could in long-term and with high-quality way to manage performance, one of the requirements is that objectives are defined, both individual and corporate. Objectives should at any time be well placed, measurable and transparent.
The author of this paper will pay special attention to performance management and performance monitoring-tracking in order to ensure the long-term development of the company.

KEYWORDS

Performance Management, Performance tracking, SMART goals.

1. INTRODUCTION

Economic environment in which companies operate today, imposes the need to find new models to maintain competitiveness and to achieve better competitive position. In order for a company the best possible way to manage its activities, development and design of their business prerequisite is that it must be used in its operations strategic management.

Strategic management occupies an important role when it comes to performance management, and can be defined as a process in which are managed all company resources at all levels, internal and external, stakeholders in order to develop business, achieve competitive advantage and manage their performance.

In the new and significantly changed conditions, there is no single rule of conduct of the participants in the market game, in this case, the management plays a key role where has the task of thorough analysis to identifies the critical factors of the business and its strategy to adapt to the circumstances.

For the operation of the company in an increasingly competitive environment, it is necessary to have well-defined strategy at all levels, vision, mission, knowledge, flexibility of management for all possible potential situations.

Management at all times should have a fast mode and response to changes in the market, they should not allow to awaits the change and to adapt to, but that they anticipate and create quick solutions and ways of operating.

Performance management and management by objectives is a process that is designed in a way that is strongly linked to the strategy of the company objectives and individual performance, with the aim to meet the key performance indicators (KPI).

The success of performance management depends largely on the interconnectedness of the company as well as the providing and receiving of quality feedback in order to all levels, horizontal and vertical.

2. PERFORMANCE MANAGEMENT

In the process of creating a company business policy, one of the most important goals that need to be defined, is the goal which is related primarily to the increase of corporate profitability and the maximization of profits in the long term. In order to achieve business policy at the beginning, it is necessary to define the key objectives that must be met and pursued. Long-term key goals should be implemented in the development strategy of the company.

Performance management is a natural process of management that contributes to the effective management of individuals and management teams in order to achieve high levels of organizational performance.(http://www.mngcentar.com/InternetOfficeSite/Education/Courses/ArticleContent.aspx?articleID=56b9a432-a0e9-42f8-a3f1-7b7533d97fc9)

Performance management is identified in the three key stages:

In the first phase, ie. phase of planning and setting goals determines the key objectives (individual and company's) , determines the competencies that are needed to meet the goals, sets the minimum standard that is required in the process of meeting the objectives and determine the level of development required to achieve the same.

In the second phase, ie. phase of progress monitoring and inspection of goals, is a phase in which control is executed to monitor progress of meeting the defined goals, identifies if there are difficulties in meeting objectives, checks whether the fulfillment of the objectives of implementing in the manner as defined in first phase.

In the third stage, ie. phase of the evaluation and assessment compliance and fulfillment of the objectives determined by the percentage of fulfillment of given goals and the way in which goals are achieved with a view to setting goals for the future avoid the weaknesses of the previous process.

Below, in the figure no. 1 shows the performance management cycle that takes place in three main phases.

Figure 1. The Performance Management Cycle

Performance management is a process of communication between managers / supervisors and employees who perform throughout the year. The basis of performance management lies the communication process, which includes clarification of expectations, setting objectives, identifying goals, providing feedback and assessment results.

3. MANAGEMENT BY OBJECTIVES - MBO

Management by objectives is one of the key principles of strategic management and it has established by Peter Drucker creator of modern management. According to Peter Drucker, Management by objectives is a tool for integration of organizational objectives (profit growth) with the individual needs of managers (salary, promotion).

The most important characteristics of management by objectives (MBO) are:

• is directed to the results (the product of the system) and not to the activity (a process of the system);

• develops through a process of corporate planning, translating common objectives into individual objectives of managers;

• aims to increase the performance of managers. (Drucker, P. The Practice of Management, Heinemann 1955).

Management by objectives is a task that determines the direction and conduct of the company in the future. According to the time frame in which goals are defined, there are usually divided into short, medium and long term. Short-term goals are set in a time frame for fulfillment of one year, medium-term goals have time frame until five years and long-term goals have a deadline to meet for over 5 years. Companies are increasingly defining their goals on the SMART model.

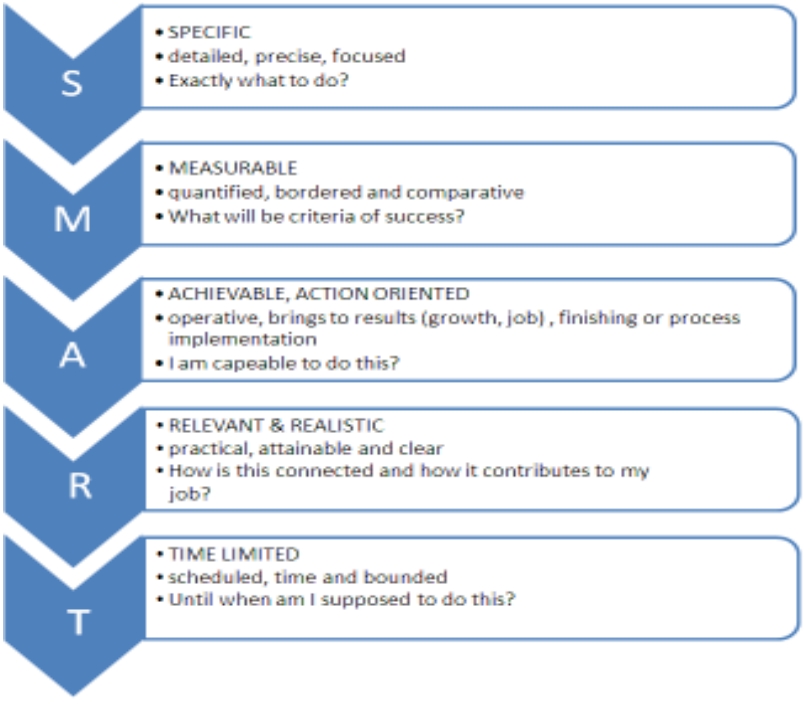


Figure. 2 SMART matrix of setting goals

Figure. 2 shows the SMART matrix of defining goals.

SMART model means that every goal that is set must be:

• Specific - the goal must be specific to one key result, for this reason he has to answer questions like: What exactly? What we want to achieve? ...

• Measurable - the goal must be measurable and so structured to give us a clear picture of the achieved results and the degree of their objective, because how we will monitor the achievement of our goal if we do not know where we are?

• Achievable - goal should be challenging but still achievable. Goal should not be too easy and simple, and should not be impossible to achieve it.

• Relevant - the goal must be relevant, realistic and. possible, goal should contribute to the achievement of the company's strategy, vision and mission.

• Time limited - there must be a deadline for achieving goals, the achievement of each goal only makes sense if the objective is defined in time-frame

The objectives, from defining to the achievement, can be divided into general and specific, general objective is the ultimate goals that we want to achieve, and the specific objectives are goals that help us to achieve our common. ultimate goal.

4. PERFORMANCE TRACKING

Monitoring of performance takes a very important role in achieving the company's goals, if there are difficulties in achieving the goals, with track performance through key performance indicators (KPI) may prevent certain problems and troubleshoot in the same time in order to meet targets that could smoothly continue. Key performance indicators are important for managers, teams, and even the company and show progress in achieving goals.

Performance measurement is the process for collecting and reporting on the achievements of the individual, group or organization level. It may involve comparisons with strategic objectives, and whether the results are in line with what is planned. The process of performance measurement requires the use of statistical and other quantitative models to determine the results. Since it is impossible to measure all achievements of the organization at the same time, especially as some parameters can be measured directly, while others are estimated with observing, assessment of performance is usually done by comparing the models (benchmark). (http://www.oirs.fon.rs/data/MEPS/BSCosnove.pdf)

With Performance-tracking can be controlled ward team, staff and is based on objective standards, unlike the frequent subjective evaluations. Performance tracking included defining the standard and performance criteria for employees and measure the performance in comparison to standard. In this way, are identified the employees who realized, exceed or lag behind the set standards or goals.

Performance tracking provides daily, weekly and monthly data, which can help managers to maximize the potential of employees with a the aim to increase performance of employees to a higher level.

Figure 3. Role of Key Performance Indicators (http://www.activegarage.com/role-key-performance-indicators-successful-business-organizations)

Figure. 3 shows the role of KPIs.

Some of the benefits of performance trakcing and KPIs:
- Objective rather than subjective evaluation
- Easy and timely access to the actual level of performance
- Facilitates proactive management of potential employees
- Facilitates monitoring of performance through KPI and the level of achievement goal…

3. CONCLUSION

New directions for the development of economy and society, strong competition both at local and global levels have caused the rejection of the traditional ways of doing business, and that conditioned creative work environment that encourages people to exchange ideas, opinions and knowledge. In these conditions, performance management, and performance tracking or monitoring is becoming increasingly important. In today's business environment it is crucial and necessary to predict the future and to set goals such as profit, business development, staff development, corporate image, etc.Conditions for development, permanent survival of the company and maintaining competitive advantage is to set goals that are motive for visioning and out of the box thinking about the future. Setting key goals of the company should follow a defined long-term strategy development. Every company must have a mission and vision of their business, where the company will be placed for a year, where they will reside for several years, only in this way will always be one step ahead of others. Management based on objectives is a method used to evaluate the success of an organization or program , bearing in mind that the degree of success of achieving the goals. This method of management includes all activities consciously directed towards a meaningful and valid achieving organizational goals and objectives that are set with project or strategy.

REFERENCES

http://www.mngcentar.com/InternetOfficeSite/Education/Courses/ArticleContent.aspx?articleID=56b9a432-a0e9-42f8-a3f1-7b7533d97fc9 (30.04.2014.)

Drucker, P. 1955. *The practice of Management*, Heinemann.

http://www.oirs.fon.rs/data/MEPS/BSCosnove.pdf (30.04.2014.)

http://www.activegarage.com/role-key-performance-indicators-successful-business-organizations (30.04.2014.)

4th International Symposium on Natural Resources Management
"Sustainable Development and Green Economy in Transition Countries"
31st May -1st June, 2014, Faculty of Management Zajecar, Republic of Serbia
www.fmz.edu.rs

THE KEY CHALLENGES OF THE TRANSITION COUNTRIES: GLOBALIZATION AND SUSTAINABLE DEVELOPMENT

Dalibor Miletić, assistant professor[1]
Petar Veselinović, professor[2]
Mlađan Dimitrijević, M.Sc[3]

[1] *Faculty of Management, Zajecar, dalibor.miletic@fmz.edu.rs*
[2] *Faculty of Economy, Kragujevac, pveselinovic@kg.ac.rs*
[3] *The Student Centre, Kragujevac, dimakg@sbb.rs*

ABSTRACT

After The World War II, there was a significant expansion of the impact of globalization all around the world. The globalization has contributed to the creation of new markets, establishing new competitive relationships, but also to intensifying the problems of sustainable development. Problems of sustainable development with its weight burden both developed countries and countries in transition.
Accelerated processes of globalization and economic integration have contributed to raising awareness that there are limits to growth. It became clear that the principles and manner of exercise of globalization require the creation of a new model of development of the global economy. A new model of development should be based on respect for equality, poverty reduction, efficiency of use of natural resources and the integration of economic, environmental and social considerations into decision-making process.

KEYWORDS
Transition countries, globalization, sustainable development, social development, economic development

1. INTRODUCTION

All world economies are faced with significant changes which are the result of several factors. The key generator of changes is the globalization process. The effects of globalization are reflected in an enourmous increase of the new products and services availability and exchange, significant increase in mobility of foreign investments, movement of people and especially international competition. The final result of globalization is change of power in the market.

The most prominent trend of business today is the increasing globalization of markets and services worldwide. Contemporary economic trends in the world economy, and especially the developments within regional integrations, become more and more dynamic and forward directed thanks to coordination of economic policy in international economic regional integrations. The significance of international activities of each national economy, and especially in small countries, is undoubted and at the same time key factor of development and growth in the contemporary conditions.

The process of globalization has further sharpened the existing differences in development on a global scale. The rich become richer, the poor even poorer. This problem is especially pronounced in the transitional countries which try to adjust their economic systems to the contemporary business conditions. As one of the basic development priorities of transitional econonomies, the sustainable development has imposed itself and

it represents one of the key elements in formulation and implementation of development policies in the world. In addition, it includes harmonization of economic, social and environmental requirements.

The development priority of the transitional countries is the long-term concept of sustainable development which includes continuous economic growth, but such that, in addition to economic efficiency and technological progress, also provides the reduction of poverty, long-term quality utilization of resources, improvement of quality of life and preservation of environment. Serbia, as the country in transition, has experience which has been in many ways burdened by numerous delusions, negative results, obsolete approaches and inefficient solutions. In the upcoming period, in order to complete the process of Serbian transition, it is necessary to achieve sustainable development in globalization environment.

2. GLOBALIZATION OF BUSINESS AS THE GLOBAL PROCESS

Intensive changes of the global economy, which happened in the last decade of the 20th century, completely altered the environment in which national economies functioned. The process of globalization is in the center of these changes. Economic relations of all economies around the world are conditioned by the development and application of modern information-communication technologies.

Having a large number of issues which are imposed by globalization and its actions, it is very difficult to define globalization. The most general definition of globalization would be that globalization is homogenization of national economies into a single economic system. It is, before all, the result of strong technical-technological progress and it includes equalization and homogenization of products, quality, environmental standards, convergence of income levels and quality of life globally.

One of globalization definitions is the definition by Dolan, saying: Globalization refers to the process of gradual elimination of economic borders accompanied by an increase of the international trade and transnational interactions. (Milovanović, Veselinović, 2009, p. 19)

Multitude of possibilities to define globalization points out different aspects of globalization and different relationship towards globalization. However, one must point to a single common denominator which links all possible term definitions, and that is the recognition of intensification of relations between individuals, organizations and institutions on a global scale.

It can be said that globalization includes necessary, technology-based process which strengthens economic and political, but also scientific, cultural and social relations between people from different countries and regions. Globalization is of economic nature in essence, and it refers to fast integration of economies worldwide through production, trade, financial flows, exchange of technology and intercultural movements.

Although globalization is aimed at creation of a single world market, it also brings some very significant negative consequences, especially for underdeveloped countries of the world. Thus, for example, most of the trade is carried out within three integration groups – regions (NAFTA, European Union, Asian Union), and not between the countries which belong to those different integration groups. Some research shows that OECD member countries would two and a half times rather buy goods in their own countries, than in some other countries. It means that most of the trade is carried out within three regions, and not between these regions, which suggests that there are still significant differences in prices of the same products in different countries.

Nevertheless, the biggest objection to globalization is that it has been rated as detrimental to workers. Saying „there will be more work“ carries with it a reduction of wages. Workers can no longer have much influence on working conditions, and their negotiating power is declining. On the other side, most of the investments go to rich countries. Thus, for example, 81% of America's investments went abroad to the countries that had high incomes, and less than 1% went to the countries where wages were low, although wages paid by the multinational companies in the countries with low to middle level wages are averagely 1,8 to 2 times higher than average wages in those countries. Out of all above listed shortcomings of the globalization, the most painful problem is already mentioned gap between rich and poor. (Vesić, 2009, p. 233)

However, main objection to globalization is that not all countries have benefited from it, but some actually lost a great deal, especially those that were against globalization. This is all the more so since the countries that have adopted globalization are faced with the trade liberalization problem.

In addition to globalization, it is necessary to mention the process of transition. These two processes represent the most significant processes of the contemporary world. The first is really a global process, while the other is present in post-socialist countries. Both, however, belong to complex and contradictory processes, but to processes of long duration as well. They are also mutually connected, especially when it comes to the impact of globalization on the content of the transition process. (Milovanović, Veselinović, 2009, p. 378)

Globalization process has imposed the necessity of economic results achievement, especially in the countries in transition. In the 21st century, no economic result is considered successful, if it is contrary to the concept of sustainable development. The sustainable development implies finding a balance between social development, economic progress and environmental protection. No economic result is considered successful, if it is contrary to the concept of sustainable development.

3. CONCEPT OF SUSTAINABLE DEVELOPMENT

Sustainable development represents modern development concept, which at the same time respects and includes three key dimensions - economic, environmental and social. Last several decades this concept is widely used both in the strategic documents of the business world, and in the macroeconomic policy at the level of state institutions.

The literature offers a great number of different definitions, meanings and interpretations of the concept of sustainable development. The use of this term became common when the people's awareness on the existence of the global environmental problems was raised. However, there is no definition of the sustainable development concept which is generally accepted.

Although literature, domestic and foreign, dealing with sustainable development offers more definitions of what this term and process includes, for the purpose of this paper we can single out (as operational) definition given in the National Sustainable Development Strategy of the Republic of Serbia. Thus, sustainable development is defined as long-term concept ...that... includes sustained economic growth which, in addition to economic efficiency, technological progress, larger number of cleaner technologies, innovativeness of the entire society and corporate social responsibility, provides poverty reduction, better long-term use of resources, improvement of health conditions and quality of life, reduction of pollution to levels bearable by the environmental factors, as well as prevention of new pollutions and presevation of biodiversity. (Government of the Republic of Serbia, 2008, p. 1)

Most simply put, sustainable development represents a development path which ensures that welfare per capita does not decrease in the long term. This means that the concept of sustainable development should be accepted as a process in which there are constant changes in the relationship between social, economic and natural systems and processes.

Also, that is the long-term process which requires carefully led and gradual development policy, because the challenges faced by the mankind at the global level are very complex. Some of the challenges on the path to achieving sustainable development are: establishing new environmental awareness, raising accountability (of people, corporations, state government), involving science in addressing current environmental protection problems. (Jovanović, Radukić, Petrović-Ranđelović, 2011, p. 53)

The essence of the concept of sustainable development is ethical principle, i.e. care for heritage. This means that the quality of life of future generations must not be lower than the quality of life of present generation. This idea is most promoted by the sustainable development definition formulated by the World Commission on Environment and Development at the Brundtland conference in 1987. At this conference, sustainable development was defined as: "development which meets the needs of the present generation without endangering possibilities of future generations to meet their needs." (World Commision on Environment and Development, 1987, p. 43) There are several characteristics of the sustainable development concept which derive from this definition, and the most important are: equality, ethics and efficiency.

Within the globalization terms, it is very difficult to achieve the sustainable development concept. In that context, significant limitations are present in the transitional countries. Having in mind that transition itself means going from one to another, generally better, state of the state, it should be very clear that the process of transition leaves long-term consequences for sustainable development.

4. GLOBALIZATION AND SUSTAINABLE DEVELOPMENT RELATIONSHIP

Debates on sustainability of development have been encouraged by the growing concern of the global community in terms of degradation of environment and built-in weaknesses of traditional models of development that supported the industrial modernization of the Third World countries during the 1970's and 1980's. The question of how human social and economic activities would comply with the regenerative capacity of the global environmental system was in the focus of these discussions. That is why the interest for the sustainable development concept has increased in the light of globalization process.

Problems that come with the globalization process and sustainable development challanges are the subject of extensive literature. However, discussions about those problems consist of numerous contradictions and discrepancies. Primarily, as a rule, they have been treated as independent and mutually separated problems. Priority which was given to solving problems related to globalization process and reducing problems of sustainable development, as one of the most significant aspects of the globalization process, encouraged some researchers to express doubt about validity of assumption of the absence of a relationship of mutual dependence and interdependence of these two phenomena. Today we face a dilemma whether there is compatibility between globalization and sustainable development, and if there is not, can these two trends be made compatibile.

Along with an accelerated pace of economic growth and contributing to overall global output, globalization can distort prospects in terms of economic prosperity in certain countries, sectors or industries. Such a marginalization of economies and people can result in excessive depletion of non-renewable resources and environmental degradation.

There is a high level of mutual correlation and interdependence between globalization and sustainable development. Basically, factors that drive globalization are also the driving force for sustainable development. For example, modern communication technologies contribute to accelaration of changes, diminishing the importance of traditional control mechanisms, while increasing transparency and opportunities for achieving global management. They can improve access to relevant information, enable access to new knowledge and facilitate implementation of new activities. Trade liberalization policies, which are the foundation of globalization, help reduce the gap between rich and poor countries, by accelerating economic growth rate. (Jovanović, Radukić, Petrović-Ranđelović, 2011, p. 77)

The assessment of the overall impact of globalization on the development is a very complex task, considering that the complexity of this phenomena hinders the adoption of uniform conclusions. Depending on determining factors, development impacts of globalization can be ranked from very positive ones to very negative ones. However, it should be noted that globalization offers new possibilities for achievement of numerous development benefits, especially those which are of essential significance for implementation of sustainable development goals.

Positive globalization impacts on sustainable development include: (Jovanović, Radukić, Petrović-Ranđelović, 2011, p. 78)

1. occurence of social organizations, which have big impact on shaping the activities of governments and powerful multinational corporations, increasing their accountability for undertaken activitiesby implementation of high standards in areas such as environmental quality, labor standards or human rights;
2. development of the responsible corporate management concept based on the business activities management model, in a transparent way, enabling essential participation of all stakeholders in the decision-making process, but also establishing clear mechanisms of responsibility for the undertaken activities;
3. voluntary involvement of the private sector in accepting principles and standards of responsible corporate behaviour in accordance with the sustainability goals;
4. raising awareness on the significance of human rights and right to sustainable development

Superficially viewed, one my have an impression that globalization, besides being a necessity in modern conditions, has only positive effects and/or that they prevail. The very fact that there are numerous movements worldwide which fight against globalization processes suggests that this phenomenon must be approached with caution and must be paid scientific attention. (Aranđelović, 2008, p. 356)

Negative impacts of globalization on sustainable development reflect in: (Jovanović, Radukić, Petrović-Ranđelović, 2011, p. 79)

1. deepening of the gap between industrial, developed countries and developing countries, as well as in an increase of social differences within countries,
2. concentration of economic and political power in the hands of those who have capital for investment and access to political decision-making process,
3. expanding the range of economic policy effects, and especially multilateral economic regulations and norms to the national decision-making area, thereby putting into question traditional notions of national sovereignity and stregthening dependence on the outside development factors;
4. starting mass protests of antiglobalists worldwide, who carry clear message: economic growth must be built-in into social and environmental development, and become the topic of harder national and international legislative standards and accountability

5. SUSTAINABLE DEVELOPMENT OF THE TRANSITIONAL COUNTRIES: SERBIAN EXAMPLE

In the beginning of the third millenium, Serbia started the process of transition with over a decade later than all other former socialist countries. Expectations were high in terms of believing that the transition proces would bring economic progress. In support of this is the fact that the last decade of the 20th century was the lost decade for the Serbian economy in the development sense. The word 'crisis' is the mostly used word for decades when it comes to Serbian economy.

The key features of the Serbian economy for a long time have been: internal instability, hyperinflation, reduction of standard of living, disintegration of Yugoslavia, wars in the region and NATO aggression. The listed factors had negative effects on Serbian position in the international exchange. However, Serbia had much better chance for quick and successful transition than other countries. Unfortunately, Serbia became the most difficult case of transition in the region.

In the beginning of the transition process, Serbia had very weak starting position, but it can be said that after year 2000, there was some qualitative shift toward macroeconomic stabiliztion. In addition, implementation of numerous reforms enabled basic performances of the market economy. "In the period 2001-2008, the economy made strong growth, macroeconomic stability was established, liberalization of prices and forign trade was implemented, significant progress in the reform of the tax system, labor market and social sector was achieved, as well as in the implementation of structural reforms, especially in the privatization of companies and consolidation and privatization of the banking sector. Basic goals of the economic policy were maintenance of the macroeconomic stability and achievement of the high economic growth rate. There has been significant progress towards completing a stimulating environment for business." (State Office of Development, 2009, p. 18)

After 2008, problems in Serbian economy started to grow. We can show the characteristics and features of Serbian economy in the period of transition based on the key macroeconomic indicators in period 2001 - 2013.

Table 1. Basic macroeconomic indicators in Serbia 2001 – 2013

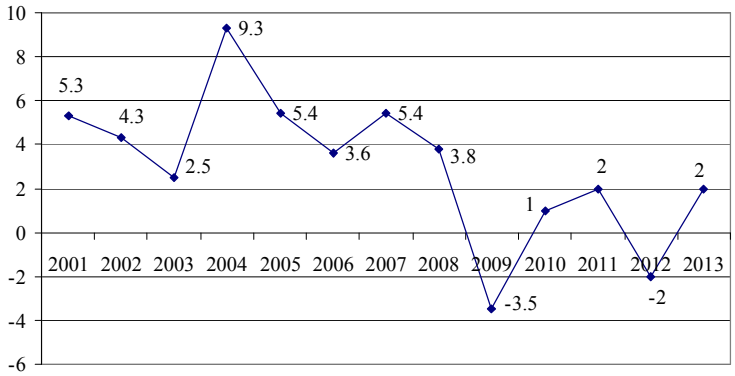
Indicator	2001.	2002.	2003.	2004.	2005.	2006.	2007.	2008.	2009.	2010.	2011.	2012.	2013.
GDP, mil.€	12.821	16.028	17.305	19.026	20.306	23.306	28.468	32.668	28.883	29.023	32.993	29.932	31.629
GDP per capita, €	1.709	2.137	2.313	2.549	2.729	3.144	3.385	4.445	3.945	3.981	4.543	3.967	4.134
GDP – growth rate	5,3	4,3	2,5	9,3	5,4	3,6	5,4	3,8	- 3,5	1,0	2,0	-2,0	2,0
inflation, %	40,7	14,8	7,8	13,7	17,7	6,6	11,0	8,6	6,6	10,3	7,0	12,2	2,2
Unemploy ment according	/	13,3	14,6	18,5	20,8	20,9	18,1	13,6	16,1	19,2	23	23,9	20,1

to survey													
exports, mil. €	1.922	2.202	2.441	2.832	3.608	5.102	6.432	7.429	5.961	7.393	8.439	8.836,8	14.374
imports, mil. €	4.759	5.957	6.586	8.623	8.439	10.643	13.951	16.478	11.505	12.622	14.449	14.782,3	18.024
deficit in mil. €	-2.837	-3.755	-4.144	-5.792	-4.831	-5.360	-7.519	-9.049	-5.543	-5.228	-6.010	-5.945,6	-3.650
Foreign debt, mil. €*	10.968	9.402	9.678	9.466	12.196	14.182	17.139	21.088	22.487	23.786	24.338	25.721	25.842
FDI, net, mil. €	184	500	1.194	774	1.250	3.323	1.821	1.824	1.373	860	1.514	136,9	643
Value of € vs. dinar	59,71	61,52	68,31	78,89	85,50	79,00	79,24	88,60	95,89	105,5	104,6	113,13	114,33

Source: http://www.nbs.rs/internet/latinica/80/index.html, www.nbs.rs/export/sites/default/internet/latinica/80/ino_ekonomski_odnosi/SEOI_spoljni_dug.xls, http://www.mfin.gov.rs/UserFiles/File/tabele/2014%20februar/Tabela%201%20Osnovni%20makroekonomski%20indikatori.xlsx

Based on the presented data, it can be clearly noted that Serbian economy achieved progress in the initial years of the transition process, which was later slowed down by the global financial and domestic crisis. In order to have better insight in achieved results, we will also show these presented data graphically. The following chart shows Serbian GDP growth rate in transition period.

Chart 1. Serbian GDP growth rate in transition period 2001 - 2013

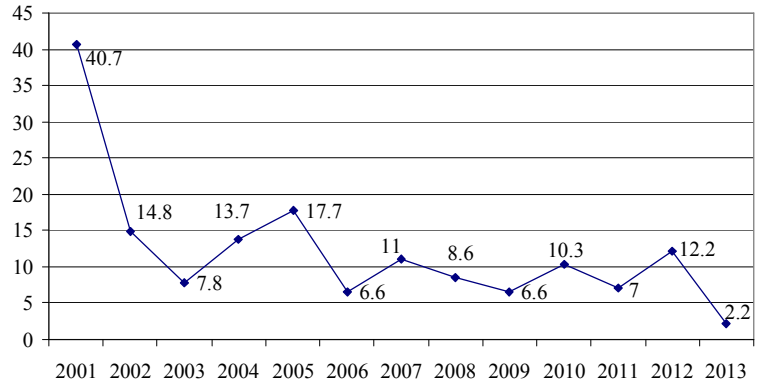


Source: Original chart based on available data from Table 1.

Based on the presented chart, it can be clearly noted that Serbian economy achieved average GDP rate of 4,95% in the period before the global financial crisis, and after the crisis began, until 2013, average GDP rate of -0,1% was achieved. During the entire period of transition, the average GDP rate was approximately 3%. Besides, there has been no realistic new economic growth from 2009 to 2014, and GDP has not reached the pre-crisis level. The achieved economic growth in the period of transition was not sufficient for the revitalization of Serbian economy, especially having in mind well-known problems of the late 20th century.

One of the biggest global economic problems of the 21st century is definitely the problem of inflation. The following chart shows inflation rate trends in Serbia in the period of transition.

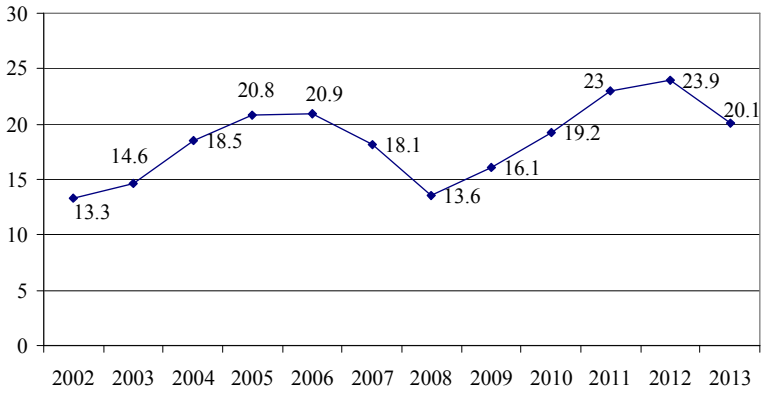
Chart 2. Inflation rate trends in Serbia in the period of 2001 to 2013



Source: Original chart based on available data from Table 1.

Based on the presented chart, it can be clearly noted that the Serbian economy has a chronic problem with inflation. Although the hyperinflation happened in Serbia two decades ago, inflation problem is still present. During the observed period, there was a reduction of inflation and that trend was especially present in 2013 when the inflation was only 2,2%. However, one can say it is a good statistics, but bad situation in reality. The following chart shows unemployment rate trends in Serbia.

Chart 3. Unemployment rate in Serbia from 2001 to 2013



Source: Original chart based on available data from Table 1.

The transition process took its greatest toll from Serbia in the hardest way: number of employed was drastically reduced, and number unemployed was drastically increased. Privatization, as a part of transition, for the most part contributed to higher unemployment. As it can be clearly noted from the presented chart, Serbia had the lowest rate of unemployment in 2008, while it grew significantly afterwards and reached the level of 23,9% in 2012.

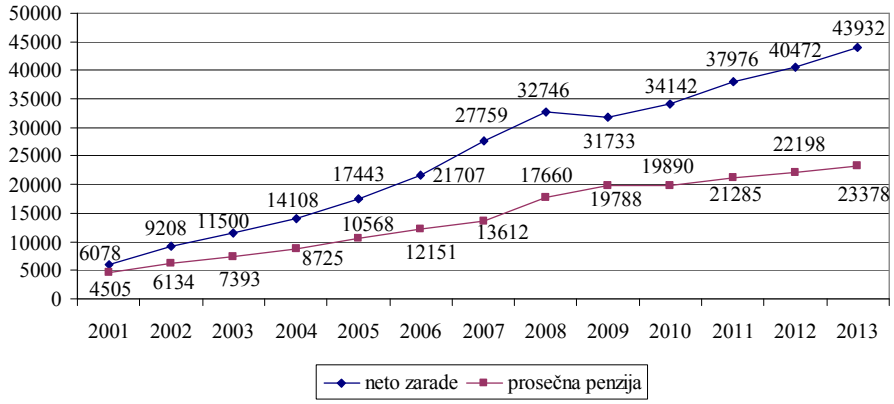
Economic reforms in transition period were not in the function of increasing the number of employed, but they helped unemployment grow. It is impressive that we achieved the increase of GDP while unemployment incresed at the same time as well! Besides, both global financial and domestic crisis had an impact on closing down businesses, which resulted in higher unemployment. At the end of January of 2014, according to the National Employment Office, there were 788.712 unemployed persons, and 906.270 of them were looking for a job. (National Employment Office, 2014, p. 11)

The industry has carried the greatest burden of the global financial crisis. Since the beginning of the crisis, approximately 180.000 workers lost their jobs, while at the same time there was an increase in the

number of employees in the public sector. According to the official data, approximately 780.000 employees work in the public sector. During the crisis years, many state agencies were established and now nobody knows exactly how many agencies there are. In Croatia, for example, there are 47 agencies, while it is estimated that there are between 131 and 170 agencies in Serbia!

Grim picture of unemployment is completed by the picture of employed, approximately 1.700.000 of them in Serbia. Out of that number, approximately 50.000 of them do not recive salaries, some 35.000 employees earn less than minimum wage, and approximately 650.000 employees do not get paid regularly. The following chart shows average net salary and pension trends in Serbia.

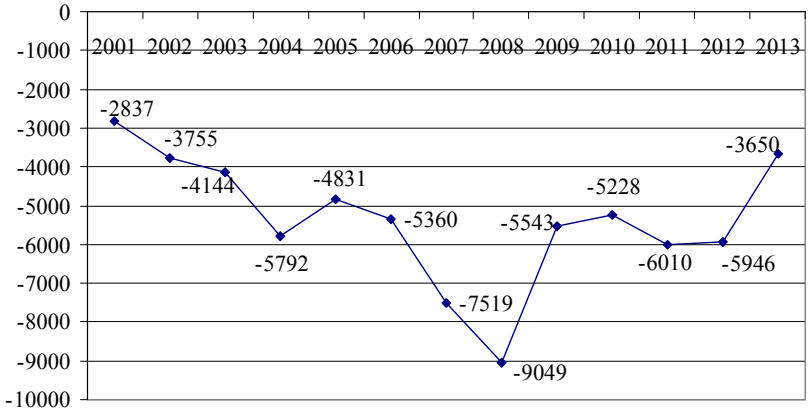
Chart 4. Average net salaries and pensions in Serbia from 2001 to 2013, in dinars



Source: Original chart based on available data from the Ministry of Finance website, www.mfin.gov.rs/UserFiles/File/tabele/2014%20februar/Tabela%201%20Osnovni%20makroekonomski%20indikatori.xlsx, date of access 10.04.2014.

Presented data clearly indicate that there was an increase of net salaries and pensions in Serbia in the observed period. However, that increase was not sufficient because we are still at the very European bottom when it comes to level of salaries and pensions. Unfortunately, transition had detrimental impact on the standard of living of Serbian population. In addition to that, ratio of employed vs. unemployed persons has reached the value of 1,2:1 which is not sustainable in the long term. What also suggests the bad performance of Serbian economy is the deficit of the balance of payments.

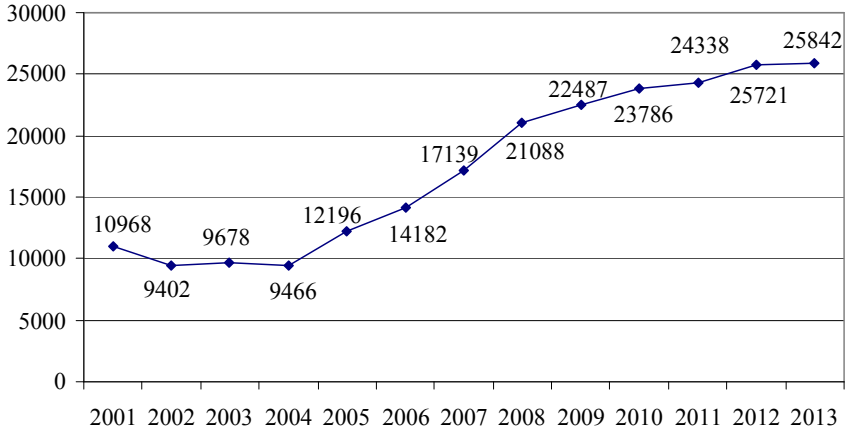
Chart 5. Deficit in Serbia from 2001 to 2013, in millions of EUR



Source: Original chart based on available data from Table 1.

Transition period also marked significant increase of deficit of the balance of payments, and it reached the largest value in 2008 when it was more than 9 billion euros. After that, there was some reduction and the deficit was approximatelly 3.6 billon euros. The reason for this reduction is not in Serbian economy, as we have already seen, but, due to the effects of the global financial crisis, there was a reduction in the volume of trading on the global level, whic resulted in reduction of imports and exports. The following chart shows Serbian foreign debt.

Chart 6. Serbian foreign debt from 2001 to 2013, millions of EUR



Source: Original chart based on available data from Table 1.

Transitional period was characterized by dramatic increase of foreign debt. At the end of 2013, Serbia had 25,8 billions of euros of foreign debt, which is the increase of approximately 2,7 times compared to 2004. According to opinion of some economists, Serbia has become credit-dependent like a drug addict. Unfortunately, loans were not invested in the real sector and construction of new and reconstruction of existing infrastructure. Borrowing of enormous funds was not in the function of achievement of economic growth and development, and Serbia is now in a serious debt crisis. The seriousness of the situation is confirmed by the statements of many officials pointing out the need to start the so-called "belt-tightening", because the possibility for getting new loans abroad is significantly lowered.

The beginning of the third millennium, besides transition, was marked by a shift in economic policy. Economic development is no longer based on changeable, but on non-changeable goods. In another words, industrial production and investments in industry were unsuccessfully replaced by the tertiary sector and investments in the area of finances, transport and telecommunication. Thus, we had stimulated the development of the sector whose products and services cannot be sold outside of our country. In addition, many big exporters have failed in the storm of privatization.

Despite the fact that all of the governments during the transition period were for quick and dynamic economic development of Serbia, the applied models of economic growth were inadequate. Structural changes and increase of competitiveness were missing, while the economic development went to the opposite directon with serious long-term consequences for the most important development indicators.

6. FINAL CONSIDERATIONS

Transition to the market economy proved to be necessary in order to achieve greater economic efficiency in development and provision of sustainable growth and development of Serbian economy. Intensifying the transition process created conditions for involvement environmental issues into the new model of economic development, and using the experinces of some progressive transitional countries provided the possibility of avoiding some of potential environmental problems.

Slow transition of Serbian economy is characterized by insufficiently efficient process of privatization, as well as very low level of investment into the private sector. In accordance with that fact, basic problem of the Serbian economy is reflected in insufficient level of activity, which represents the structural source of inflation. Strategy of development, based on the wider concept of sustainable development, is the solution to the present problem – finalization of the transition process and such allocation of resources which respects economic, social and environmental goals. Basic idea of this new strategy is the transition from a resource-driven to investments-driven economy.

In the context of overall transitional and reform processes, Serbia should build its development on the principles of sustainable development. Sustainable development in that context requires strategic management of economic reforms in order to create prerequisites for designing such development model which will contribute to quality meeting socio-economic needs of people, and at the same time eliminate or minimize negative effects threatening environment and exhausting natural resources. This is because the sustainable development issues and problems are additionally complicated during the transtion process.

Key problem faced by the decision-makers in the transition process comes down to a question: how to find effective and efficient way to provide answers to key transition challenges, both in terms of building new institutional and social system, and in terms of the implementation of the privatization process, while maintaining a balance between the requirement for achieving the objectives of socio-economic development and the requirement for maintaining the environmental balance.

Only by applying continuous monitoring of success of implementation of necessary institutional and structural transformation, and monitoring of effects achieved by the implemented reform measures in the area of environment, the process of transition can effectuate in accomplishment of the essential goals of the socio-economic transformation, while preserving and improving environment and natural resources.

All anlyses indicate that Serbia is still behind other progressive transitional countries in terms of building the market economy which would function in a sustainable manner. "It means that the Republic of Serbia needs sustainable economic development based on the increase of the group of key economic indicators (growth of GDP, employment, foreign trade, competitiveness and exports, investments, standard of living) while reducing economic burden based on foreign debt, as well as achievement of continous macroeconomic stability, better quality of life, environmental conditions and general welfare of society." (Government of the Republic of Serbia, 2008, p. 6)

REFERENCES

Aranđelović, Z.,2004, *Nacionalna ekonomija,* Ekonomski fakultet, Niš, Srbija.

Jovanović, S., Radukić, S., Petrović-Ranđelović, M., 2011, *Teorijski i institucionalni okvir održivog razvoja*, Ekonomski fakultet, Niš, Srbija.

http://www.mfin.gov.rs/UserFiles/File/tabele/2014%20februar/Tabela%201%20Osnovni%20makroekonomski%20indikatori.xlsx, datum pristupa 05.04.2014.,

Milovanović, G., Veselinović, P., 2009, *Globalizacija i tranzicija*, Ekonomski fakultet, Kragujevac, Srbija.

Nacionalna služba za zapošljavanje, 2014, *Mesečni izveštaj: Nezaposlenost i zapošljavanje u Republici Srbiji*, Beograd, Srbija.

http://www.nbs.rs/internet/latinica/80/index.html, datum pristupa 05.04.2014.

www.nbs.rs/export/sites/default/internet/latinica/80/ino_ekonomski_odnosi/SEOI_spoljni_dug.xls, datum pristupa 05.04.2014.

Petrović – Ranđelović, M., Miletić, D., 2011, Održivi razvoj srpske privrede u uslovima tranzicije, Naučni skup: Institucionalne promene kao determinante privrednog razvoja Srbije, Ekonomski fakultet, Kragujevac, Srbija, str. 187-197.

Republički zavod za razvoj, 2009, *Izveštaj o razvoju Srbije 2009*, Beograd, Srbija.

Vesić, D., 2009, *Specifični oblici upravljanja ljudskim resursima*, Institut za međunarodnu politiku i privredu, Beograd, Srbija.

Vlada Republike Srbije, 2008, *Nacionalna strategija održivog razvoja*, Beograd, Srbija.

World Commision on Environment and Development, 1987, *Our Common Future*, Oxford University Press, Oxford, England.

4th International Symposium on Natural Resources Management
"Sustainable Development and Green Economy in Transition Countries"
31st May -1st June, 2014, Faculty of Management Zajecar, Republic of Serbia
www.fmz.edu.rs

SUSTAINABLE DEVELOPMENT IN FUNCTION OF THE REDUCTION OF POVERTY AND SOCIAL EXCLUSION

Dalibor Miletić, assistant professor[1]
Krunislav Sovtić, professor[2]
Dragoslav Stefanović, general manager[3]

[1] *Faculty of Management, Zaječar, dalibor.miletic@fmz.edu.rs*
[2] *Faculty of Management, Zaječar, krunislav.sovtic@fmz.edu.rs*
[3] *Stefkom, Soko Banja, info@stefkom.rs*

ABSTRACT

In accordance with the needs of people and nature, the contemporary world has to a great extent become faced with the necessity of the global responsibility for development. Sustainable development has become one of the key elements of the formulation and implementation of development policies in the world. Sustainable development can be said to be oriented towards the making of the models which qualitatively satisfy citizens' social-economic needs and their interests, and at the same time eliminate or significantly reduce the impacts that represent a threat or damage to the living environment and natural resources.
In the recent years, there has been a tendency that, together with making attempts to achieve sustainable development, globalization has contributed to the deepening of the gap between the rich and the poor, not only amongst developed and underdeveloped countries but also amongst certain social strata inside states and regions, including the richest parts of the world. As a transition country, Serbia is making attempts to achieve sustainable development together with reducing poverty and social exclusion.

KEY WORDS

Sustainable development, poverty, social exclusion, economic development.

1. INTRODUCTION

The twentieth century will be remembered as a century in which there was an increase in social and political violence together with the culmination of the war events, unprecedented in the history of civilization. For those very reasons, social inequalities reached unsurmised relations at the beginning of the third millennium. Poverty is one of the biggest problems encumbering all countries of the world irrespective of the development degree they may have reached.

Poverty can be said to stand for a multi-dimensional phenomenon since, due to its nature, it encompasses several aspects. The following ones can be quoted as the key aspects of poverty: an impossibility of employment, an inadequate approach to social protection, educational, health and communal services as well as an impossibility of satisfying the basic living needs.

The problem of poverty has not circumvented the Republic of Serbia, either. The global financial crisis as well as the unfinished process of transition have only contributed to the intensification of the problem. When Serbia is in question, poverty can be said to have been sampled in a multidimensional way, together with its multidimensional emergence. What is also present is the fact that, due to poverty in place, people are mainly socially excluded.

Social exclusion is a process by means of which individuals as well as social groups become squeezed out of economic, political, cultural or social life. As a consequence of such exclusion, the inhabitants are

deprived of their equal right or possibilities of educating themselves, medical treatment, employment, taking part in political, cultural and social activities. Together with the poverty problem, the problem of social exclusion additionally endangers the Serbian population.

Having in view the fact that we are speaking about the key problems of the population of the 21st century, they can be reduced or rather eradicated if the real causes that have led to their emergence are gained an insight into. If Serbia wants to increase the quality of living, then it is necessary that the strategies and measures should be introduced so as to reduce the level of the poverty and social exclusion of the most exposed population categories. This paper exactly aims to gain an insight into the basic causes responsible for poverty and social exclusion in Serbia, as well as the determination of the measures and activities necessary for these problems to be solved. Apart from that, the paper will show that both the state and non-government organizations, as well as individuals themselves who belong to some of these population categories, have a significant role in fighting poverty and social exclusion.

The Republic of Serbia has signed the Stabilization and Association Agreement and has applied for membership in the European Union, so the questions related to the measures of social inclusion and the reduction of poverty will become a compulsory component of the policy of integration into the European Union in the period to come. The poverty reduction strategies themselves should answer the question of how poverty will be reduced.

2. THE KEY CAUSES OF POVERTY AND SOCIAL EXCLUSION

From the traditional point of view, poverty was created as a combination of unfavorable historical circumstances, which, independently of the quality and people's behavior, conditioned a low income and poverty. The national tradition differentiates the causes of the emergence of poverty and differently treats them, too. The causes can be classified into several main groups:

- Poverty as fate – as the consequence of the effect of a force majeure, it is difficult to eliminate or it is almost never eliminated. It is a force majeure that prevents one to achieve positive results, or escape poverty (privation).
- Inherited poverty is frequently a national tradition as well. This type of poverty was very much present with the Serbs and it can freely be said to have made the major part of all the poor in Serbia that has been reduced with the passage of time.
- There are numerous personal causes of poverty and the national tradition classifies them in the following manner: lack of occupation, irresponsibility, laziness, prodigality, alcoholism and gambling. There is no understanding for this type of poverty because individuals are the ones to blame for such a condition and for that reason they should not be helped because it is a waste of time; they themselves should do their best to cope with the situation which they are facing.

The general reasons for poverty are the consequence of natural catastrophes, economic crises or political events (wars, loss of privileges and position, state robberies). These reasons for poverty are usually of temporary character and are related to persons affected by some of the mentioned events (The Government of the Republic of Serbia, 2003, p. 7).

There are several key reasons explaining poverty: a fall in production and income, mass unemployment, a growing inequality in the distribution of incomes, which is particularly contributed to by the private sector and a stratum of highly-educated employees whose qualifications are highly demanded. These two population strata have incomes which are high above the average. The next factor is a growing inequality between the regions and the villages and the city. Ultimately, the pension fund stands for yet another substantial encumbrance even though pensions are in the majority of the cases insufficient for one to live because of growing costs (apart from regular pensioners, there are also those pensioners who have been unable to find another job for themselves after their firms, where they already had irregular incomes, collapsed). (Bogićević, Krstić, Mijatović, 2003, pp. 38-42)

The concept of social exclusion is interwoven with a broader understanding of poverty. In some people's opinions, social exclusion stands for a contemporary approach to poverty. Not only does it include material or monetary poverty but it also includes the social, cultural, political and other forms of poverty. (Veselinović, Mićić, Miletić, 2012. p. 306)

Social exclusion is mainly referred to when research is done into endangered social groups such as children, the young, the old, the unemployed, the disables and Roma people. Material poverty, a social or spatial inequality (discrimination) and unemployment are some of the most important aspects of social exclusion. The term of social exclusion appeared for the first time in the European Social Charter in 1989. In 1996, the European Union introduced a new right – Right to the Protection from Poverty and Social Exclusion.

Social exclusion is a process that weakens the connections between an individual and the community, and those connections can be economic, political, sociocultural and spatial. The more features according to which a person is excluded the more vulnerable the person becomes.

Poverty and social exclusion point at deprivation in one's satisfying one's different living needs. Poverty is defined from the aspect of an individual and a household, whereas social exclusion is defined from the aspect of a society and an individual's integration into the social community. Some people, however, think that social exclusion is a more contemporary concept, which is more comprehensive because – apart from economic – it also takes into consideration the other forms of social deprivation.

The key differences between poverty and social exclusion are accounted for in the table below.

Table 1. Poverty and social exclusion

	Poverty	Social exclusion
Aspect	An individual	The society
Characteristics	Single dimensionality	Multidimensionality
Perspectives	Statistical process-situation	Dynamic process
The basic concept	Low incomes as a form of inequality	Limited social participation
Dimensions of inequality	Vertical and distributive	Polarized (from outside to inside) and participative
Indicators	Income-related (material)	Economic, social, cultural, political (immaterial)

Source: Šućur, 2004, p. 227

In order to measure poverty, countries use the poverty line suitable to their development level, social norms, and values. When poverty is assessed on the world scale, the selected poverty line must be the same for all the countries and expressed in the common unit of measure.

The World Bank used two international poverty lines for a long time: the lower line, at the level of 1 USD and the higher line at the level of 2 USD per person per day. Only recently has the extreme poverty line been lifted from 1 to the level of 1.25 USD per day, which corresponds with the standards of the poorest countries in the world. The line of 2 USD per day is still applicable for the regions and countries with incomes at a middle level (World Bank, 2010). Poverty exposes people to a big risk of social exclusion.

The concept of social exclusion is relative in its nature: individuals are socially excluded in relation to others once they have become excluded from what is considered to be the minimal living standard of the state which they live in. In the broadest sense, what both poverty and social exclusion have in common is the deprivation of fundamental rights, the non-existence of a possibility of employment, the unavailability of health protection services, social services and education as well as inappropriate participation in social life.

A multidimensional approach to both concepts, especially to social exclusion, requires an integrated policy. Social exclusion does not always mean a lack of income. The discrimination and segregation are also deeply rooted forms of social exclusion. Taking into consideration all the complexity and significance of discrimination as a factor of social exclusion, a clear difference should be made between different aspects of discrimination. (UNICEF, 2007, str. 12)

- Social discrimination – it is depicted in the historical inheritance of the marginalization of ethnic minorities which is manifested through poverty, inequality and the existence of prejudices;
- Institutional discrimination – it is evident in that the authorities systematically avoid respecting the rights of specific groups in the population;

- Direct discrimination – even when the public services are available to them, socially and culturally deprived people do not manage to come closer to them because of an individual's discrimination.

Of course, different types of exclusion can appear simultaneously and create an extremely difficult position for the excluded as well as for the institutions that are supposed to help them. It can be said that there are three main types of social exclusion, which basically differ in the depth of the root and the permanency of the effects: (Cvejić, Babović, Pudar, 2011, pp. 114-115)

- Conjunctive exclusion is exclusion with the roots in the current conditions in an economy and a society. This can be unemployment caused by the transformation of the economy, poverty caused by such unemployment or the effects of an economic crisis, as well as cultural and political discrimination of a particular group caused by recent historical events (e.g. refugees). Such exclusion can be reduced by a general development policy; however, it can also be relatively easily targeted with the policy's specific measures.
- Complex exclusion is the one with the roots deeply into the structural position of a particular person or group. This position is formed through deeper historical movements and is probably reproduced inter-generationally in the same family or group environment so that it takes cultural markers impacting the formation of a strong group identity and a feeling of belonging to a group. This type of exclusion usually includes multiple deprivation and several forms of exclusion, such as: low education, poverty, discrimination. The position of Roma people in Serbia or agriculturalists with small farms (especially women playing the role of assisting members of the family on a family estate) are examples of such exclusion. Such exclusion poorly reacts to general development trends, it is difficult to deal with and requires complex policy measures and a lot of resources (time, money, people, knowledge).
- Specific exclusion is the one which is socially constructed around one particular characteristic that makes a person or a group different from others (some form of disability, homosexual preferences or age). This type of exclusion is very much dependent of the cultural environment (which is the slowest one to change) and requires an equal amount of intervention into the community as it does into the activism of persons excluded.

Of course, different types of exclusion can simultaneously emerge and create an exceptionally difficult position of the excluded as well as for the institutions supposed to provide them with assistance.

3. INDICATORS OF POVERTY AND SOCIAL EXCLUSION IN SERBIA

How poverty is measured is very important because without poverty measuring the results of its reduction would be impossible to monitor. The most ordinary ways to measure poverty are grounded on the level of income available or a household's consumption. Information about an income or consumption is obtained through appropriate researches into the representative population sample, when the members of a household are asked about the particularities of their consumer habits and the sources of their income. Such researches are carried out in the majority of countries.

In order to calculate the poverty rate, especially for transition countries, the indicators founded on consumption are used for the most part and for several reasons.

The first reason is that a household's consumption is more balanced if compared with income, given the fact that in many transition countries there used to be or there still is an irregularity in paying out salaries, as it has been the case in Serbia in the past several years.

The second and maybe the most important reason is that surveyed interviewees usually tend to hide or reduce their income generated from illegal or semi-legal activities, which they do not when it comes to consumption originating from an income earned in such a way. A great scope of the grey economy in transition countries qualifies consumption as a more adequate measure of poverty.

The third reason is that natural consumption, especially in rural areas, is an important component in the nutrition of the population, and it is not a standard component of income expressed in money. (Tomić, 2007, p. 157)

When poverty is measured in Serbia, the absolute line of poverty is applied, which represents consumption necessary for one to satisfy one's minimal living needs. The poverty line consists of: 1) the line

of food – consumption necessary for satisfying the basic needs for food (the line of extreme poverty), and 2) other expenses of a household (clothes and footwear, hygiene, education, health, transport).

So, the total line of poverty is defined in two steps. It is determined as the total consumption of a household whose food consumption corresponds with the minimal consumer basket. The poor are those whose consumption is below the defined national absolute poverty line. That line differs from one country to another by the structure of the consumer basket. For the purpose of making an international comparison, it is converted into the USA dollar of the same purchase power.

The most frequently used indicators of poverty in Serbia are as follows: 1) the index (coefficient or rate) of poverty – (PO), 2) the depth (gap) of poverty – (P1) and 3) the intensity of poverty – (P2).

When Serbia is concerned, each citizen who is not rich can be said to be poor because the so-called middle class has practically disappeared. To support this, we can state the fact that Serbia spends 43.4 kg of meat per capita annually, whereas the European countries' average is 85 kg. This assertion is also corroborated by the data on the movement of the EUR exchange rate, net salaries and average pensions.

Table 2. The movement of average salaries and pensions

	Net salaries	Average pension	EUR exchange rate	Salaries in EUR	Pensions in EUR	Salaries/Pensions
2001	6,078	4,505	59.71	90.025	75.45	1.35
2002	9,208	6,134	61.52	149.69	99.71	1.50
2003	11,500	7,393	68.31	168.34	108.23	1.56
2004	14,108	8,725	78.89	178.84	110.60	1.62
2005	17,443	10,568	85.50	204.01	123.60	1.65
2006	21,707	12,151	79.00	274.77	153.81	1.79
2007	27,759	13,612	79.24	350.33	171.78	2.04
2008	32,746	17,660	88.60	369.59	199.32	1.85
2009	31,733	19,788	95.89	330.94	206.36	1.60
2010	34,142	19,890	105.50	323.63	188.53	1.72
2011	37,976	21,285	104.64	362.92	203.41	1.78
2012	40,472	22,198	113.72	355.89	195.20	1.82
2013	43,932	23,378	114.64	383.22	203.93	1.88

Source:
www.mfin.gov.rs/UserFiles/File/tabele/2014%20februar/Tabela%201%20Osnovni%20makroekonomski%20indikatori.xlsx

On the basis of the demonstrated data, it can clearly be observed that, in the transition period, there was an increase in net salaries and average pensions, both in RSD and in EUR. Statistically observed, the net salary is 7 times as high and the average pension is 4 times as high at the end of 2013 if compared with 2001. However, the ratio between the net salary and the average pension is 1:1.88 at the end of the observed period.

Since 2002, poverty in Serbia has been measured and analyzed on the basis of data obtained by conducting Surveys on the Living Standard (SLS). All the way to 2001, there was no official line of poverty – the minimal consumer basket was rather defined relating to a four-member household, which, actually, represented the line of poverty. (Bogićević, Krstić, Mijatović, 2003, p. 13)

The first SLS (2002-2003), expertly assisted by the World Bank, enabled the creation of the Strategy for the Reduction of Poverty in 2003. The continuity of measuring poverty was realized by the creation of the second SLS (2007). In that manner, the monitoring of the phenomenon of poverty in Serbia was enabled.

Since 2007, the statistics of poverty in Serbia has been based on the data obtained from the Survey on the Consumption of a Household (SCH). Starting from the COICOP classification, the consumption of a household is defined as a sum of expenses for food and other current expenses, which is inclusive of the products bought, own production and gifts. The SCH provides us with the so much needed continuity in monitoring data on poverty. Such an analysis was in force all the way to the adoption of the Survey on Incomes and Living Conditions (SILC), which is applied by the EU member countries.

During 2013, the Survey on Incomes and Living Conditions was carried out for the first time. The goal of the research was to collect data in order to compute the indicators of poverty, social exclusion and living conditions.

On the basis of the results obtained, it is possible to make the following conclusions: (The Statistical Office of the Republic of Serbia, 2013, p. 1)

- The rate of the risk of poverty was 24.6% in 2012. Those persons are not necessarily poor, but they are only exposed to a higher risk of being poor.
- The threshold of the risk of poverty (the relative poverty line) was 13,680.00 dinars on average per month for a single-member household in 2012. The threshold of the risk of poverty for a household with two adults and one child of up to 14 years of age is 24,624.00 dinars, whereas for a four-member household with two adults and two children of up to 14 years of age, is 28,728.00 dinars.
- Observed according to age, persons under 18 years of age are the ones to be exposed the most to the risk of poverty (30.0%). The rate of the risk of poverty is the lowest with persons older than65 years of age (19.5%).
- The rate of the risk of poverty is the highest with persons belonging to the households consisted of two grown-up persons with three or more supported children (44.4%) as well as with single-parent families with one child or more supported children (36.2%).
- Depending on the labor status, when persons of 18 years of age and older are concerned, unemployed persons (48.7%) are the ones to be exposed to the risk of poverty the most whereas the rate of the risk of poverty is the lowest with employed people working for an employer (6.4%). With self-employed persons, this rate amounts to 38.3%. The rate of the risk of poverty is 14.5% with pensioners.

At the end of 2013, the Statistical Office of the Republic of Serbia published for the first time the results of the research conducted through the Survey on Incomes and Living Standards. On the basis of this research, it is possible to analyze the indicators of the living conditions at the European level. We will account for the rate of the risk of poverty in Serbia and the comparison with other European countries.

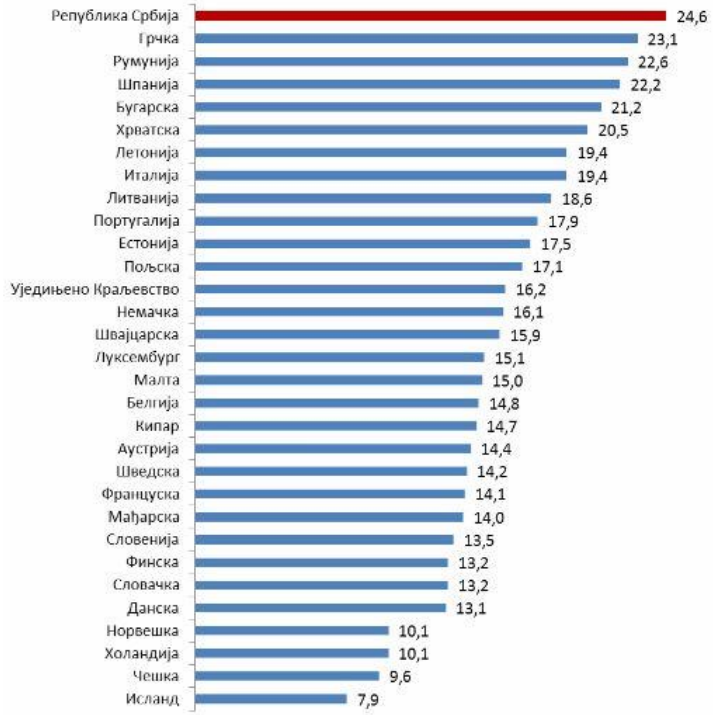


Figure 1. The rate of the risk of poverty in 2012, a comparison with other European countries, %
Source: The Statistical Office of the Republic of Serbia, 2013, p. 4

On the basis of demonstrated data, the rate of the risk of poverty in Serbia in 2012 was 24.6%, which ranks us at the very top in Europe. According to the same report, the threshold of the risk of poverty is 13,680 dinars per individual per month. There are 42.1% of persons in the Republic of Serbia who are exposed to the risk of poverty or social exclusion.

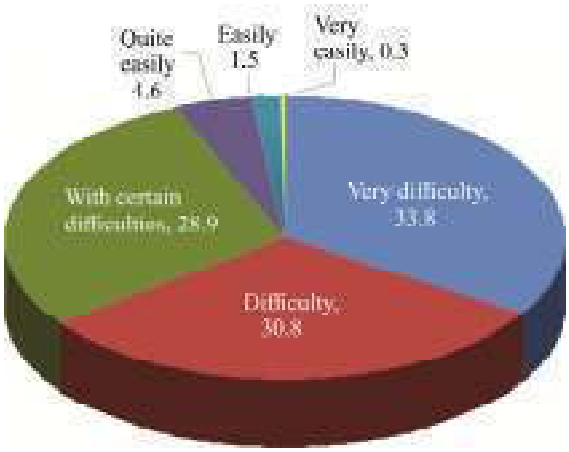


Figure 2. The rate of subjective poverty, (a possibility for a household to "make ends meet"), %
Source: The Statistical Office of the Republic of Serbia, 2013, p. 4

On the basis of the demonstrated data, we can clearly observe that over 64% of the population in Serbia have significant difficulties in surviving at the monthly level. The financial burden to the budged of a household with respect to the costs of living stands for one of the significant indicators of highly pronounced poverty and social exclusion.

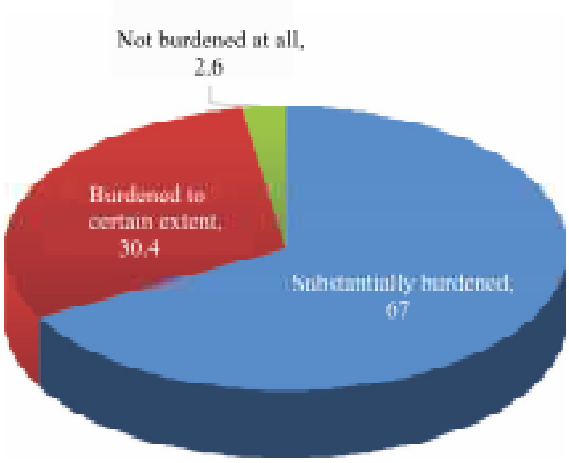


Figure 3. The financial burden to the budged of a household with respect to the costs of housing, %
Source: The Statistical Office of the Republic of Serbia, 2013, p. 3

On the basis of the demonstrated data, we can clearly observe that the household budget of over 2/3 of the population in Serbia is to a significant extent burdened with the costs of housing. This data is indicative of the highly pronounced but unsolved problem of the housing of a larger part of the population.

The statistical data accounted for above indicate that poverty and social exclusion are problems that are rather pronounced in Serbia in the third millennium. Having in view the fact that the suppression of poverty is a priority goal of each and every state and the world as a whole, as well as Serbia's commitment to the EU membership, Serbia is being faced with a serious task to find a solution to or at least mitigate the problems that have accumulated in this field.

4. MEASURES FOR THE REDUCTION OF POVERTY AND SOCIAL EXCLUSION

Over half a century, the crisis has been a burden to the Serbian economy. Given the fact that the problems that have emerged due to the domestic crisis have been intensified by the impact of the global economic crisis, theoretically at least, the crisis is in the focus of the interestedness of the political authorities, various institutions, labor unions as well as the overall social public. It is more than clear that Serbia used to have enough problems which the global crisis has additionally put a burden on. As the crisis has not been prevented, the only one remaining possibility is the efforts dedicated to finding a solution to the consequences arisen. The crisis can be said to first of all and for the most part have left significant consequences with respect to the workforce market.

The commitment of the international community to reduce poverty at a global level is determined by the adoption of the Millennium Development Goals, which have served as the foundation for the adoption of appropriate national documents in many countries, including Serbia as well. Apart from that, the national strategies for the reduction of poverty, which are complied with the Millennium Development Goals, have also been adopted.

The development priorities of the Republic of Serbia are defined by the two mutually complementary processes – the process of approaching the EU and the process of the application of the Strategy for the Reduction of Poverty (SRP). A better quality of the living of the Serbian population is the common goal of these processes, and at the same time they represent a means of achieving it. In 2003, Serbia joined the countries which had already adopted the Strategy for the Reduction of Poverty.

More than ten years after the adoption and application of the Strategy, it is reasonable to ask ourselves what the results of its implementation are. The Strategy has not fulfilled its basic objective. Poverty in Serbia has not been reduced, as it was anticipated by the Strategy. In support of this, there is also a fact that the number of the unemployed has increased. In this context, the young and vulnerable groups are particularly endangered.

Young people have particularly been affected by the economic crisis in Europe, which is accounted for by a high rate of unemployment in the population of younger people. According to the data of the Statistical Office of the Republic of Serbia from April 2013, the rate of the unemployment of the young in Serbia, in the age group of 15 to 24, was 49.7%. The rate of the unemployment of young people in the European Union was 23.2% in June, as is shown by the Eurostat data.

Table 3. The unemployment of the young in the EU and Serbia in 2013, %

EU 28	23.7
Spain	55.7
Greece	58.6
Slovenia	22.7
Croatia	49.9
Serbia	51.2

Source:
http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&language=en&pcode=tipslm80&plugin=0,
The Statistical Office of the Republic of Serbia

The demonstrated data are clearly indicative of the fact that the unemployment of young people is one of very serious problems of not only Serbia but the larger part of the EU. Slovenia has the lowest rate in comparison with the EU average whereas all the other presented countries have a far higher unemployment rate among the young. According to this indicator as well, Serbia is at the very top in Europe.

Young workers are the future of the economy and the state. The long-term unemployment of young people is a significant limitation to the achievement of economic growth. That, however, can also have negative consequences with respect to the demographic future of the nation, too, as well as the political fate.

Our practice has shown that very frequently we ourselves have no wish to find solutions to problems so it is likely to expect that the EU will encourage us to have this problem solved by means of its instruments.

The social vision of the EU imposes the solution of the problems of the young as a priority, which is also provided for by the adopted Strategy for Young People between 2010 and 2018, which anticipates offering equal possibilities to young people in education and on the labor market as well as the promotion of active citizenry and social inclusion for all young people. Besides that, the Europe 2020 Strategy also includes a support to young people in getting jobs.

The planned saving measures of the Government of the Republic of Serbia are not in compliance with the proclaimed goal of reducing poverty and reducing social inclusion. All the measures that have been applied in the recent years have implied classical measures ranging from subsidies for employment to employers, a support to self-employment, additional education and trainings all the way to public works.

The current condition of the Serbian economy is indicative of a need for the initiation of a permanent, institutional and equal dialogue. To support this assertion, we may list at least four key reasons for it: (Stojiljković, Mihailović, 2010, p. 66)

1. In a situation when there is the ruined economy and the destroyed and impoverished society, social dialogue is the best manner for the country to leave the zone of a high social and political risk and to finally firmly step onto the road leading towards democracy and prosperity.
2. The lack of social dialogue and honest readiness to conduct such a dialogue on equal basis can generate an uncontrolled explosion of social dissatisfaction, a sway of social demagogy and populism and a defeat of democratic, reforming forces.
3. An open and broad social dialogue is the best possible road to reaching an agreement which is more than needed of the direction, pace and balanced distribution of costs and profits from transition changes.
4. It is necessary for Serbia to adapt its labor, labor-union and social legislation and have such legislation harmonized with the normative-institutional framework and practice of a social dialogue in the European Union countries.

Because it encompasses the goals and measures directed towards the prevention or recovery of social risks which can appear in different fields of social life, at a practical level, the social policy also includes different sectoral policies: social protection; employment; education; public health; the urban, rural and regional aspects of the reduction of poverty; the ecological aspect of the reduction of poverty.

Having in view the fact that unemployment had been increasing as well as in order to solve this urgent problem of the Serbian economy, the Government of the Republic of Serbia adopted a new National Strategy for Employment for the Period from 2011 to 2020 in 2010. According to the Strategy, the support to the opening of new jobs in small and medium-sized enterprises and the stimulation of entrepreneurship will be the priority activities that should contribute to an increase in employment.

The Strategy was brought in the time when the global economic crisis was deeply rooted and when the macroeconomic indicators significantly deteriorated. The Strategy defines the long-term policy, goals and priorities of employment. The basic goal of the policy of employment is to establish an efficient, stable and sustainable trend of the growth of employment and to bring the employment policy as well as the institutions of the labor market in full compliance with the accomplishments of the EU in the Republic of Serbia by the end of 2020. (The Government of the Republic of Serbia, 2011, p. 9)

When Serbia is concerned, the basic directions of the reduction of poverty would be as follows:

- an increase in the possibility of employment;
- efficient social protection;
- efficient public health protection;
- a better position of pensioners and old people;
- education with the goal of reducing poverty;
- a reform of the tax system in the function of opening new jobs;
- the regional, rural and urban aspects of the reduction of poverty;
- the ecological aspects of the reduction of poverty.

In the forthcoming period, it is necessary that we reduce poverty and social exclusion, which is only possible if we ensure that: there is a far bigger growth of the GDP, that inflation is at a lower level, that export is far more voluminous, that the share of public consumption in the GDP is reduced. It can be concluded that in order to achieve the defined priorities and successfully apply the measures anticipated by

the Strategy for the Reduction of Poverty there must be readiness and a wish on people's part to take the role and responsibility for a better quality of life in their respective communities.

In order for fighting against poverty and social exclusion at the national and the global plans to be successful, there is a need for a political will and partnership amongst the main actors in that process. The creation of favorable conditions for the reduction of poverty within the national frameworks depends on many segments of the society: the state and the private sectors, civil society institutions, poor and all other categories of the population. Apart from domestic factors, an important role is also played by international institutions that offer their financial aid in fighting against poverty.

By strengthening institutions, export potentials, by bringing the payment balance and the budget of the state in balance, it is possible to achieve a dynamic and sustainable economic growth, which – as it has become evident in many countries – is an important factor for the reduction of the number of the poor and socially excluded persons, on assumption that there is a relatively balanced distribution of the benefits of the achieved growth.

5. CONCLUSIVE CONSIDERATIONS

Poverty is one of the biggest problems of the contemporary world. Significant progress has been made in the 21st century, but all of that definitely remains in the shadow of increasing famine and privation. The existing contradiction makes the world less understandable and nice. Unfortunately, in the world we live in, we can see people queuing for little food, on the one hand, although there are people who can buy a lot on the moon, on the other. Such a distribution of income should make influential people ask themselves how this is to be overcome.

The influence and the power, however, do not exist separately from one another, so, people who are in a position to solve this problem do not find time to do so because they are in a constant rush for earning money. Yet, it cannot be said that there is no wish on the part of the state to have this problem at least mitigated if it cannot be found a solution to. People are poor and unhappy, which makes the state which is the home country of those people insufficiently nice.

The beginning of the 21st century brought Serbia an encouraging economic growth, which was stopped by the global financial crisis. Apart from that, the global crisis has also stopped a positive and encouraging trend as well – the trend of the reduction of poverty. The Serbian economy cannot praise itself for having huge funds that would contribute to an ordinary man's suffering less because of the existing crisis. The drastic reduction of all the economic indicators has had a reflection on the consumer basket of the ordinary man.

In the transition period, the Government of the Republic of Serbia used to praise itself for the results achieved in the field of the reduction of poverty – there were fewer and fewer poor people from one year to another. The official data on the number of the poor, however, have always been less than the data presented by the EU. The state frequently published unrealistic data either due to insufficiently well conducted researches and surveys or because there was an excessive desire to be better and more successful in the eyes of the EU.

The reduction of poverty represents an economic problem of a structural character, whose basic feature is that mistakes in this field happen quickly while there is slowness in solving them. Only in the long run is it possible to define the goals and solve the problem of poverty. However, this does not mean that short-term moves are not needed, first of all, to preserve chances for a long-term action.

Serbia has set as its long-term strategic development goal its full membership in the European Union. For the goal set in this way to realize, all the institutional capacities must fully be committed and engaged. Exactly for that reason, Serbia has adopted the Strategy for the Reduction of poverty, which has had certain results, but it seems not to have been of an applicable nature in the newly-emerged conditions. Solving the problem of poverty in Serbia demands that all the actors in the society should take part in the implementation of this Strategy.

In order to reduce poverty, it is crucially significant that partnership relations be developed between all parties interested in having this problem solved, in the first place the Government, the profit sector, non-government organizations, the media, representatives of local self-governments and all citizens. The education of the endangered and marginalized groups and their inclusion in the processes of making

decisions on the issues of life would also have an impact on the more comprehensive gaining of an insight into the status of these categories of the population and on providing them with an adequate help.

REFERENCES

Bogićević, B., Krstić, G., Mijatović, B., 2003, *Siromaštvo i reforma finansijske podrške siromašnima*, Centar za liberalno-demokratske studije, Ministarstvo za socijalna pitanja, Beograd, Srbija.

Cvejić, S., Babović, M., Pudar, G., 2011, *Studija o humanom razvoju – Srbija 2010 Izvori i ishodi socijalnog isključivanja*, UNDP, Beograd, Srbija.

http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&language=en&pcode=tipslm80&plugin=0, datum pristupa 19.03.2014.

www.mfin.gov.rs/UserFiles/File/tabele/2014%20februar/Tabela%201%20Osnovni%20makroekonomski%20indikatori.xlsx, datum pristupa 10.03.2014.

Republički zavod za statistiku, 2013, *Anketa o prihodima i uslovima života*, Saopštenje br. 366, Beograd, Srbija.

Stojiljković, Z., Mihailović, S., 2010, Stanje socijalnog dijaloga u Srbiji posle dvadeset godina tranzicije, Radnička štampa, Beograd, Srbija.

Tomić, V., 2007, Siromaštvo i socijalna isključenost – osnovne definicije i indikatori, Sociološka luča I/2, Trebinje, Bosna i Hercegovina.

Veselinović, P., Mićić, V., Miletić, D., 2012, Serbia – zone of poverty and social exclusion, *Ekonomika poljoprivrede*, br. 2, Institut za ekonomiku poljoprivrede, Beograd, Srbija, str. 305-308.

Vlada Republike Srbije, 2003, Strategija za smanjenje siromaštva u Srbiji, Beograd, Srbija.

Vlada Republike Srbije, 2011, Nacionalna strategija zapošljavanja za period 2011.-2020. godine, Beograd, Srbija.

Šućur, Z., 2004, Socijalna isključenost: Pojam, pristupi i operacionalizacija, *Revija za socijalnu politiku*, Vol. 35, No. 1-2, Pravni fakultet, Zagreb, Hrvatska, str. 45-60.

UNICEF, 2007, Raskinuti lanac isključenosti: Romska deca u Jugoistočnoj Evropi, Beograd, Srbija.

World Bank, Development Economics Research Group, (2010). *Living Standards Measurement Study,* Washington, dostupno na: *http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/0,,contentMDK:22510787~pagePK:64165401~piPK:64165026~theSitePK:469382,00.html*, datum pristupa 20.03.2014.

4th International Symposium on Natural Resources Management
"Sustainable Development and Green Economy in Transition Countries"
31st May -1st June, 2014, Faculty of Management Zajecar, Republic of Serbia
www.fmz.edu.rs

GREEN ECONOMY- RISKS AND CHALLENGES OF SUSTAINABLE ECONOMIC GROWTH

Dragica Stojnović[1],
Biljana Ilic[2]
Bojan Đorđević[3]

[1] *Faculty of Managament, Zajecar, dragica.stojanovic@fmz.edu.rs*
[2] *Faculty of Managament, Zajecar, biljana.ilic@fmz.edu.rs*
[3] *Faculty of Managament, Zajecar, bojan.djordjevic@fmz.edu.rs*

ABSTRACT

Facts that every eighth man in the world is starving, that we are daily exposed to the energy crisis, that the gap between rich and poor are growing up, make question: how to achieve sustainable economic growth? The next question is: how to provide enough food and to protect the environment? The answers are in the concept of green economy, which is based on the belief that economic growth and concern for the environment can go together. The aim of paper is to create awareness about the challenges of transition and economic aspects of the implementation of the green economy.

KEYWORDS

Green economy, green growth, sustainable development, environment.

1. INTRODUCTION

Striving for global economic growth the living standards of millions of people around the world is raised. However, at the same time striving for economic growth and actions connected with increase in consumption had a devastating impact on the global environment. Decades in which the new value and wealth created on the principles and the use of traditional economic models, have failed to deal with the phenomena of social marginalization and excessive consumption of resources. Climate change, economic and energy crisis require radical socio-economic changes in the world, and it aimed at encouraging the so-called "green economy".

Green economy implies the widespread use of renewable energy sources with low carbon dioxide emissions. In practice, green economy means the Protection of Nature in all aspects of life ranging from eco-fashion, eco-shoes over to eco-building materials. The facts point to the importance of the use of this concept and the UN estimates that over the next 20 years, energy investments exceed $ 350 billion. Studies show that green economy can provide 15 to 60 million new jobs, where for example in the EU around 15 million people are working in areas that directly or indirectly participate in some form of a green economy. That data clearly states, that each country must create the conditions for further development of the green economy, because it is a fact, that it becomes an obligation rather than a choice. (Sućeska at al., 2013).

In one way, green growth, means a step backwards, ie. return to the UN Conference on Environment and Development held in Rio in 1992. when the environmental sustainability of economic growth and development was the center of attention. However, on the other hand, green growth is a step forward,

because it is a practical and flexible approach that will contribute to the implementation of sustainable development in all its dimensions: economic, environmental, and social. A large number of countries, including the European Union, following the model of green growth, taking into account national specificities. To successfully communication with Europe and with the world Serbia should share their basic values and commitments, and to keep own national economic identity. Green growth (in the context of sustainable development) is a good choice for Serbia and solid bond that is linked to the rest of the world. (Jovanović-Gavrilović and Minić, 2012).

2. CONCEPT OF GREEN ECONOMY

After World War II, the global economy, that is facing with its worst economic crisis, turns to the new sources of growth, which should be carried out in a time of economic recovery. As the dominant framework for addressing was key global challenges, there's a new concept - green economy concept. In fact, in preparation for the UN Conference on Sustainable Development in 2012, known as Rio +20, the Green Economy is featured as one of the two central themes that will be the focus of this great event. The concept of a green economy developed the 80 years of the twentieth century, can help countries in the way of achieving sustainable development. The green economy is seen as an economy in which economic decisions and innovation allow the company for efficiently use resources, improving the welfare of people in an inclusive way, while preserving the natural systems that sustain us. It should be noted that there are several other definitions, which reflect the different opinions about the relationship between the green economy and the broader concept of sustainable development.

The United Nations Environment Programme (UNEP) defines the green economy as "an economy that leads to improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcity". (UNEP 2010) The European Union, however, believes that a green economy is one "that generates growth, creates jobs and eradicates poverty by investing in natural capital and the preservation of natural capital on which depends the long-term survival of our planet." Taking into account the presented facts, it can be said that the concept of green economy involves widespread use of renewable energy sources, increasing the number of jobs and investment in so-called green industries. Simply, a green economy can be considered an economic activity that is performed with low carbon dioxide emissions, through which resources are spent efficiently and that is socially inclusive. In particular way, this implies a new mode of production and new ways of relating to our environment. Taking into account the presented facts, the green economy is not directed against economic growth, on the contrary, it should be a new impetus to the growth and generator of new, decent jobs, as well as the necessary strategies to reduce existing poverty. Based on the fact , that the goals of environmental sustainability and economic progress irreconcilable , there is growing evidence that greening the economy does not reduce income generation also does not affect fewer employment opportunities (UNEP, UNCTAD, UN-OHRLLS, 2011).

Many sectors related to the green economy in the world in number of examples show, that with them, it can make great investments and great economic growth and employment. The key to achieving favorable conditions for the transition to a green economy, and in this respect may be more to do, primarily through the creation of enabling environment and policy issues. When we talk about the concept of a green economy, another myth burdens aspirations to create. In fact, we often hear that this is a luxury that can only allow to the richest countries, and that's just the way the rich countries want to limit the development of undeveloped and leave them in a state of poverty. Against this perception, today it can be find a number of examples in different sectors in developing countries, which show that the transition to a green economy, something that to this country brings great benefit and it can be largely replicated in all parts of the world. In this way, the concept of green economy suggests new opportunities for future growth in the world by reducing the pressures on the environment (United Nations Enviroment Programme, UNEP 2011). As already mentioned, the Green Economy is a concept where the yield growth and employment must be carried out through the investment, thereby reducing carbon emissions and pollution, improving energy efficiency and efficient use of resources and prevents the loss of biodiversity. Thus, the model for the green economy (Government Republic of Mozambique, 2012):

- ***Efficient*** - where economic growth is separated from the life and physical energy;

- ***Sustainable*** - that means strengthening non exhaustion of natural, human and social capital, infrastructure, resilience to natural disasters, climate change and economic instability:
- ***Equal*** - means significantly smanjujenje inequality in the distribution of wealth, income and opportunity, and guarantee the benefits of growth for present and future generations of mankind.

The fact that business processes are the dominant source of pressure on the environment suggests that companies should play an active role in protecting the environment. I like to employ a key prerequisite of social security, so the protection of the environment has become a prerequisite for leading business companies worldwide. In this way, environmental awakened the public a chance of profit-oriented companies to develop "green" business planning. Environmental pressures have forced the public have accelerated the transformation of the evaluation of managerial success, which, in addition to the usual management performance based on profit growth, and incorporates long-term component of the ability to develop teams and the business environment, companies are focusing on environmental issues, with a high ecological employee morale and production of so-called the green product.

3. GREEN ECONOMY AND SUSTAINABLE DEVELOPMENT

At the start, most interpretations of sustainability are taken from the consensus that was reached by the World Commission on Environment and Development (WCED) in 1987, which defines sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs "(WCED 1987). Therefore, sustainable development is a complex concept that includes a component of environmental protection, social component as well as the economic component (Figure 1). (National development planning toward Green economy; policy initiatives, 2011).

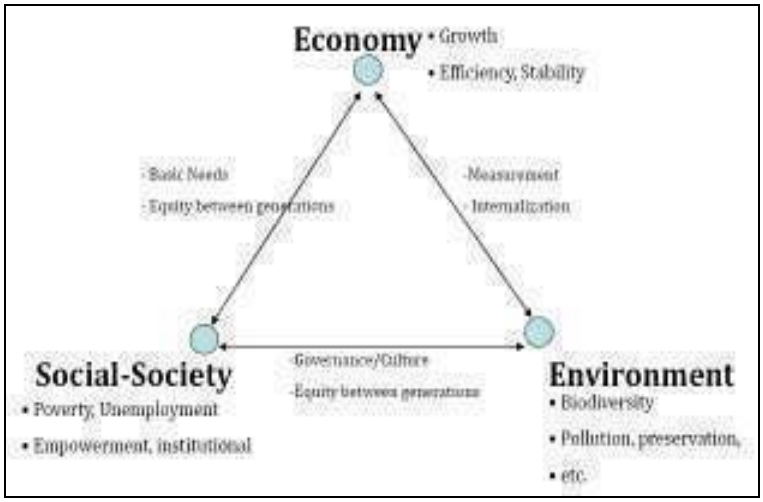


Figure 1. Components of sustainable development
Source: National development planning toward Green economy; policy initiatives, 2011

In general, economists are satisfied with this broad interpretation of sustainability because it is easily translated into economic terms: increasing prosperity today should lead to a reduction in welfare tomorrow. In other words, future generations should have the right to at least the same level of economic opportunity - and so at least the same level of economic well-being - which is available to current generations. As a result, economic development today must ensure that we do not leave future generations worse off than today's generation. Or, as some economists have expressed succinctly, wealth per capita should not decline over time (Pezzey, 1989). According to this view, the total stock of capital used by the economic system, including natural capital, determines the full range of economic opportunities, as well as well-being, which is available

to current and future generations. Accordingly, the company must decide how best to use the total stock of capital and thus increase current economic activity and prosperity.

However, the economy is not only the total stock of capital, but also its composition, especially if today's generation spend one form of capital to meet its current needs. For example, the sustainable development of a good deal of interest has been running concern that economic growth could lead to a rapid accumulation of physical and human capital at the expense of over- exhaustion and degradation of natural capital. In addition, the main concern is that the irreversible depletion of the world's supply of natural resources present path of development will have adverse consequences for the enjoyment of future generations. One of the first study to establish connection between this capital approach to sustainable development and the green economy is a book draft green economy out in 1989 (Pearce et al., 1989). The authors argue that because of today's economy having a bad effect on the depletion of natural capital to ensure growth, sustainable development is unattainable. However, the green economy that values property of the environment, makes a policy of pricing and regulatory changes to translate these values into market subsidies, also adjusts the extent of GDP for environmental losses which is crucial for the well-being of present and future generations.

As the highlight of the authors of the green economy, the main issue in the capital approach to sustainable development is whether the replacement of various forms of capital - human capital, physical capital and natural capital - possible. Very conservative opinion can claim to be a natural component of the total capital stock must be preserved intact, as measured by physical terms. However, this can be compromised in practice, especially in the context of developing countries, if natural capital is abundant while the physical and human capital must be developed to meet other human requirements. This type of substitution reflects the unfortunate reality that the creation of physical assets - roads, buildings, and machinery - often requires the conversion of natural capital. While the replacement of natural capital and other forms of capital are often unavoidable, there is often tool for increasing efficiency. There is also growing recognition of ecological thresholds to limit the exchange to a minimum level required for the welfare of the people. If we take into consideration everything, the shift towards a green economy must become strategic plan economic policy for the achievement of sustainable development. What's really important are the needs of the planet and current and future generations depend on the functioning of ecosystems, with or without additional financial resources, technology transfer and new forms of global governance (Sawyer, 2011). Keeping this in mind, we can make the question: Is the green economy replaces the concept of sustainable development? The concept of a green economy does not replace sustainable development, but is now growing evidence that achieving the goals of sustainable development largely depends on changes in the economic sphere. Decades in which the new value and wealth created on the principles and the use of traditional economic models have failed to deal with the phenomena of social marginalization and excessive consumption of resources, and today we are still usually far from achieving the Millennium Development Goals. Sustainability remains a first-rate long-term goal, but additional efforts must be directed towards the realization of the concept of green economy if it wants to reach that goal.

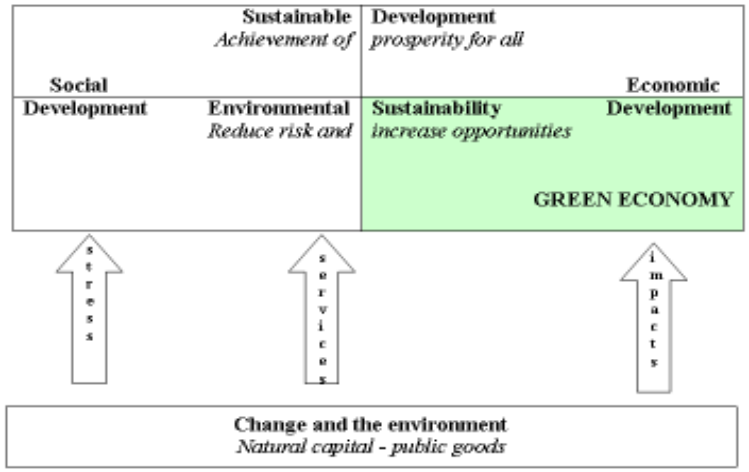


Figure 2. Green economy in the context of sustainable development and environmental sustainability
Source: own source

It can be concluded from the figure 2, that sustainable development is an umbrella concept and magnificent paradigm that links the economy, society and environment, within which the strategy of green growth can be considered as an appropriate framework of policies. Considering that facts, it is clear that the green economy is something much more specific than sustainable development. The principles of sustainable development are related to long-term trends, while green economy combined aspirations to create new opportunities that will lead to more robust economic recovery in the short term with the introduction of new, environmentally efficient sources of economic growth in the long term.

4. GREEN ECONOMY – RISK AND CHALLENGES

There are many challenges and obstacles faced by developing countries when their economies are turning towards development paths that care about the environment. On the one hand, this should not stop them from trying to urgently engage environmental elements into economic development. On the other hand, it is necessary to identify and recognize the different obstacles and take measures of international cooperation in order to enable and support efforts towards sustainable development. Consequently, it means setup of conditions that enable countries, especially developing countries, to move towards a green economy. However, the delegations of developing countries have expressed worry that the concept of "green economy" can be misunderstood or used out of context, and that the promotion of this concept may lead to useless or negative development, which must be avoided. (Khor, 2011). When we talk about the concept of a green economy and transition countries to it, it must be borne in mind that there are certain challenges and risks:

- The ***first risk*** is that the "green economy", "define or operationalize the one-dimensional way, which would be taken out of the fact that it is built into the framework of sustainable development, and promote the purely" environmental "way (without fully considering the dimensions of development and equality) and without taking into account the international dimension, especially its negative effects on developing countries. Such situation, if the concept of a green economy gain in importance, while the concept of sustainable development flinch, can causes loss of use of a holistic approach to sustainable development with an imbalance between the three pillars.
- ***Another risk*** is to accept the approach of "the same size for all, '" according to which all countries are treated in the same way. This would lead to failure of either the environment, or the development of both. Levels and stages of development of the countries should be fully taken into account, as well as the priorities and conditions in developing countries. The principle of common but differentiated responsibilities must be respected and operationalize. Thus, when taking into account the different principles, policies and objectives, developing countries must provide adequate flexibility and special treatment, such as benefits, compensation for milder obligations, and providing finance, technology and capacity building.
- ***The risk of the use of the environment for the protection of trade -*** There is a risk to the environment, and thus the "green economy", "the state can not inappropriately used for the protection of trade, and especially the developed countries may use this as a principle or concept to justify unilateral trade measures against products from developing countries. One example are the proposals or plans to impose "carbon tariffs on" or "tax adjustment of borders, '" the products on the basis that they produce illicit carbon emissions during the manufacturing process, or the fact that the exporting country has no control shows that the standard importing country considers appropriate. Developing countries strongly oppose such trade measures, which are considered protekcionaškim. This would punish developing countries that lack the financial resources and access to technology for low emissions, and thus undermine the principle of common but differentiated responsibilities.
- ***Attempt to gain access to the market under the guise of environmental protection*** - Another risk is that the environment is abused as a covert way to promote the country's access to their goods and services to the markets of other countries. There is a fear that the concept of a green economy can be used as a cover for commercial interests. For example, developing countries have expressed concern at the WTO that some developed countries are trying to get them to abolish tariffs on many products for which proponents claim that "the products of the environment.

- ***Treatment of subsidies -*** Another concern of many developing countries is that some developed countries provide to their companies large subsidies for research and development (R & D) environmentally sound technologies. This puts developing countries at a disadvantage in particular because they lack the financial resources to provide the same subsidy as well as developed countries. Due to this unfair imbalance in subsidies, developing countries and their companies would be in a competitive situation even worse if you have to cut tariffs on environmental products. Developing countries are also concerned because the government subsidies for research and development marked as "non-taxable subsidies" (means the permissible) in the WTO Agreement on Subsidies and thus allow countries with the resources to provide huge subsidies to their business, and thus provide them with a competitive advantage while most developing countries there is no such resources for research and development.
- ***Environmental standards -*** Another potential problem is the adoption of environmental standards for products, developing countries that are unable to meet these standards face the prospect of losing the export. This approach to developing countries should provide them with the resources and technology to improve their technology and environmental standards, and not to punish them. You need the full and effective participation of developing countries in establishing international standards because many important standards currently 'globalized' "standards of developed countries and provide support to developing countries to comply with such standards.

Bearing in mind presented facts, it can be said that the commitment to building a green economy pose challenges. (Janneh, 2011). Although the transition to a green growth path may enable leap dirty and inefficient technologies, there are more fundamental dilemmas how to fight, including a set of adaptation and reliance on the track. Radical changes would require the conduct of the government, companies and consumers and would be paired with sufficient financial resources if this approach failed. In other words , to make sure that the green economy contributes to structural transformation, we need to overcome some of the challenges. It would also mean the provision of compelling vision for a green economy, promoting green growth, determining key priority sectors and to establish a framework for coordination at the national and international level. If the green economy is to initiate a process of structural transformation, it is necessary that all actors convey a clear vision of what it requires and what it takes to achieve it. Having on the mind the challenges of the green econom, we can make the question: Why we need a green economy? Figure 2 gives the (National development planning toward Green economy; policy initiatives, 2011):

Figure 3. Benefits of green economy
Source: National development planning toward Green economy; policy initiatives, 2011.

Creating awareness about this concept is an important and necessary first step in fulfilling this important claim, just as it would be necessary to highlight its potential contribution to the growth and structural transformation.

5. GREEN GROWTH AS A PROCESS OF STRUCTURAL CHANGES

Green growth and green economy were subject to various definitions, but one that is currently used by international organizations have much in common. Green growth seeks to combine economic and environmental pillars of sustainable development in a unique intellectual and political planning process, which reshapes the very essence of the development model so that it is capable of simultaneously produces a strong and sustainable growth. (Samans, 2013). Consequently, green growth aims to foster economic growth and development while ensuring that natural resources are used sustainably and continue to provide the resources and environmental services on which the growth and prosperity depend. (World Bank, 2012).

The concept of green growth comes from the Asian and Pacific region. The Fifth Ministerial Conference on Environment and Development (MCED) held in March 2005. Seoul, 52 governments and other stakeholders in the Asia Pacific region have agreed to move from the rhetoric of sustainable development , and go through the "green growth". To do this, we adopted the Ministerial Declaration (Initiative Network for Green Growth in Seoul) and the Regional Implementation Plan for Sustainable Development. This triggered a broader vision of green growth as a regional initiative of UNESCAP 's, where he is seen as a key strategy for achieving sustainable development and the Millennium Development Goals (especially the second and seventh relating to poverty reduction and environmental sustainability). Access to green growth, which was adopted by the MCED sought to harmonize economic growth and environmental sustainability, while improving environmental efficiency economic growth and improve the synergy between the environment and the economy. Like the green economy, green growth has attracted a lot of attention as a possible way out of the present economic slack season as a result of the financial crisis from the 2008th year. They also include definitions of key international actors involved in green growth (Cameron and Stuart, 2012):

- **UNESCAP:** growth that emphasizes environmentally sustainable economic progress to foster low-carbon, socially inclusive development.
- **OECD:** fostering economic growth and development while ensuring that natural assets continue to provide the resources and environmental services on which well-being of mankind depends.
- **World Bank:** growth that is efficient in the use of natural resources, whether in terms of reducing pollution and environmental impacts, and flexible in that it takes into account natural hazards and the role of environmental management and natural capital in the prevention of natural disasters.
- **Global Green Growth Institute (GGGI):** Green growth is a new revolutionary paradigm of development that supports economic growth while at the same time provides climatic and ecological sustainability. It focuses on addressing the root causes of these challenges while providing the necessary creation of channels of distribution of resources and access to basic goods for the impoverished.

Taking into consideration the presented facts, it could be concluded that green growth has the potential to achieve the economic and environmental goals and to create new sources of growth through the following channels (OECD, 2011):

1) ***Productivity.*** Subsidies for greater efficiency in the use of resources and natural assets, increase productivity, reduce waste and energy consumption and use of resources in the best possible way**.**
2) ***Innovation.*** Opportunities for innovation, driven by policy and framework conditions that enable new ways to solve environmental problems.
3) ***New markets.*** Creating a new market by stimulating demand for green technologies, products and services, also creating the potential for job creation.
4) ***Trust.*** Increases investor confidence through greater predictability and stability over how the state cope with major environmental issues.

5) ***Stability.*** More balanced macroeconomic conditions, reduced price volatility of resources and support fiscal consolidation through, for example, reviewing the composition and effectiveness of public spending and increase revenue through the price of pollution.

When we talk about the green growth, the most important fact is that green growth policies put the accent on areas where touching or overlapping economic interests and environmental protection, and in that way trying to find such a framework for the best options for development. This strategy of green economic growth, contribute to sustainable development so that it can create a better policy framework necessary for the achievement of sustainable Development. Green growth model promotes cost-effective and efficient way of resources leading sustainable production and consumption choices. In other word, green growth will help developing countries to achieve sustainable development.

6. CONCLUSION

The concept of green economy is being promoted as a tool that can help countries on the path of achieving sustainable development. The world was an eyewitness to the fact that economic growth, although it lifted millions of people out of poverty, was often conducted at the expense of environmental and social aspects and does not provide the benefit of everyone. Decades with new value and wealth created on the principles and the use of traditional economic models were not succesfull, to deal with the phenomena of social marginalization and excessive consumption of resources. It is necessary to ensure that economic growth provides benefits to society and the environment in eny way. Sustainability remains a first-rate long-term goal, but additional efforts must be directed towards the realization of the concept of green economy if we want to rich the target. The tripartite structure of sustainable development (social, economic and environment), green growth policy regulating, where economic interests can be used as a vehicle to promote good environmental management and social equality, it suggest the best options for development. If we want our future to be safer, the economy needs to change so that human well-being is achieved, but without the accompanying destruction of the ecosystem of which the well-being largely depends. The strategy of green economic growth, contribute to sustainable development, so that they can create a more progressive policy framework necessary for the achievement of sustainable development.

REFERENCES

Abdoulie J. 2011. Green Economy: Opportunities and Challenges to Africa. The African Executive Issue 343 16-23 November.

Cameron, A. and Stuart C., 2012. A guidebook to the Green Economy, Issue 1: Green Economy, Green Growth, and Low–Carbon Development – history, definitions and guide to recent publications, Division for Sustainable Development, UNDESA August 2012).

Government Republic of Mozambique, 2012. Towards a green economy - Roadmap for a Green Economy in Mozambique: accelerating sustainable economic, social, and environmental development.

Jovanović-Gavrilović, B., Minić, N., 2012. Zeleni rast kao generator za prevazilaženje krize. *Economic Analysis* 45 (1-2), pp. 19-31.

Khor, M. 2011. Risks and Uses of the Green Economy Concept in the Context of Sustainable Development. *Poverty and Equity* 9, Research Papers 40.

OECD, 2011. Towards green growth

Pezzey, J. 1989. Economic analysis of sustainable growth and sustainable development. Enviromental Department Working paper no. 15, Enviromental Department, The World Bank, reprinted as J. Pezzey, Sustainable concepts: an economic analysis, World Bank Enviroment Paper 2 1992.

Pearce, D., Anil, M., and Barbier, E. B., 1989. *Blueprint for a Green Economy*, London: Earthscan.

Samans, 2013. Green Growth and the Post-2015 Development Agenda: an Issue paper for the United Nations High-Level Panel of Eminent Persons.

Sawyer, D. 2011. Green economy and/or sustainable development? *Política Ambiental*, *Green economy: challenges and opportunities* 8 pp. 36-43.

Sućeska, M., Hanić, A., Baranenko, E., 2013. Zelena ekonomija kao ekonomija budućnosti. *Ecologica* 20 (70), pp. 199-203.

UNEP, 2010. Green Economy Developing Countries Success Stories. UNEP, Geneva.

UNEP, UNCTAD, UN-OHRLLS, 2011. Why a Green Economy Matters for the Least Developed Countries. and papers prepared by UNCSD Secretariat for the Rio+20 Conference including A/CONF.216/PC/6 and A/CONF.216/PC/1ited Nations Enviroment Programme.

United Nations Enviroment Programme – UNEP, 2011. Towards a Green Economy: Pathways to Sustainable Development and Poverty in the Run-Up to Rio 2012, pp. 24–26.

World Commission on Environment and Development (Brundland Commission) WCED, 1987. *Our Common Future*, Oxford: Oxford University Press.

World Bank, 2012. Inclusive Green Growth: The Pathway to Sustainable Development, 2012, World Bank, Washington, DC.

National development planning toward Green economy; policy initiatives Presented at The National Training Session – LEAD Associate Training Cohort "Green Economy: Exploring Path to Vibrant Future" Jakarta, 24 May 2011 Available at: http://www.bappenas.go.id/files/5213/5098/7117/green-economy-lead__20111117131747__0.pdf

4th International Symposium on Natural Resources Management
"Sustainable Development and Green Economy in Transition Countries"
31st May -1st June, 2014, Faculty of Management Zajecar, Republic of Serbia
www.fmz.edu.rs

THE IMPACT OF CULTURAL DIMENSION ON THE INTERNATIONALIZATION PROCESS OF THE ITALIAN SMES

Gianpiero Menza[1]

[1]*Lum Jean Monnet, Casamassima Italy*

ABSTRACT

In this catastrophic Italian scenario Small and Medium Enterprises (SME)still represent a significant part of the Italian GDP, due to is dynamism and flexibility it still represent a source of economic growth.
SME constitute the dominant form of organization of the company and they ensure almost the 80% of employment, and mostly of these company are ran by family members.
In this scenario, where companies are oppressed by a system that does not work efficiently and by one of the highest corporate taxation system, SMEs have been looking for new possibilities to expand their business abroad, and by now Internationalization is considered an important means of enhancing SMEs' long-term growth and survival.
SMEs face a number of major internal barriers for international development due to their limited endowment of resources and capabilities to meet the challenges of the global environment.
Given that companies are more and more looking to go beyond the national borders, not always the intention and practice is followed by success, indeed research shows that the determinants that might influence the firm strategy and performances to pursue and internalization process are the family management, human capital, and foreign ownership.
The paper through an extent analysis of other work will analyze the factors that influence Italian SME underling few aspects and trying to study if the Italian dimensional culture can have an impact on the management of SME.

KEYWORDS

Small and Medium Enterprises, management, dimension of culture

1. BACKGROUND

Beyond the entrepreneur and the management team, other individuals play an important role in the success and growth of SMEs (Barret and Mayson 2008). Employees' knowledge and skills are valuable resources and growth and the survival of the firm depends on the endowment of qualified personnel.
Italian SMEs have been relying mostly on competences and endowment of the entrepreneur but the ownership is the only one able to influence the internalization process. Companies are made by human capital that through the coordination of management achieve is competitive advantage.

The process of internalization is driven many companies to face problems that did not expected before. As international markets become increasingly integrated and interdependent, virtually all firms, irrespective of size, industry or country of origin, are required to develop a strategic response to international competition.

SMEs need to become increasingly aware of the importance of internationalization as a possible pattern of growth which can improve their profitability and chances of survival (Morgan and Katsikeas 1997). Global competition might also be considered as a threat. Since SMEs are no longer protected from foreign competition, they have to go international in order to remain competitive in their local markets. The first step of internationalization is generally the export (Johanson and Vahlne 1977), and is the most common

foreign market entry mode among SMEs, given the lower business risk and resource commitment compared to joint ventures and foreign direct investments.

Unfortunately the internalization for SMEs is not smooth process, and obstacles and constraints can hinder a firm effort to become international Katsikeas and Morgan (1994) identify four groups of barriers: external, operational, internal and informational barriers. Zou and Stan (1998) divide export barriers into internal factors (export strategy, managers' perceptions and attitudes, the firm's characteristics and competences) and external factors (industry characteristics, and foreign and domestic market characteristics). SMEs activities are considered constraints compared to multinational companies that have more resources to invest in this process.

Bloodgood ,Westhead, Dhanaraj and Beamish, through a resource based view explain the influence that certain resources like Management skills and experience are considered crucial factors for internationalization (Ibeh 2003)

However, not only the entrepreneur and the management team, but also SMEs' human resources play an important role in affecting the internationalization process. The lack of qualified personnel has been found to be a relevant internal resource barrier to exporting (Rabino 1980)

SMEs generally experience a lack of export specialists and difficulties in hiring specialized human resources (Ortiz et al. 2008). One of the possible solution to overcome at the problem related to the lack of competencies always balancing the interests of the family and the business is to recruit more outsiders (individuals not belonging to the family owning the majority of the shares of the business) to their boards, family firms may obtain a variety of advice, skills and resources, including strategy development and control and networking (Gabrielsson and Winlund 2000)

The involvement of family members in management might be considered as much resource as constraint for the company willing to enter in an international market, in other words the presence of managers from outside the company might result as positive effect for an internalization process.

International development can turn into failure if the desire of family members management has a general tendency not to delegate authority and power to professional managers and just to keep for them self the control on all critical roles inside the firm.

If the reluctance to delegate authority is also associated with greater risk aversion and focus on conservatism could be an explanation for the greater focus on domestic markets in firms where family-based management prevails.

Firms with strong interest and with a precise internationalization strategy with higher commitment to foreign expansion can consider to recruit external adviser or director, as they provide access to advice, expertise and competencies (Johannisson and Huse 2000).

Gallo and Sveen (1991) agreed that family might be challenged by internationalization, which pushes the firm to change its objectives, culture, structure, and strategy. One of the reasons why family business initiate their process of going global is because the more local culture does not allow them to recruit managers or employees already with an international mindset due to a lack of international experience.

2. DISCUSSION

SMEs run by family can be different based on the family commitment inside the company. Involvement of a family in ownership and/or management is the key factor around which definitions of family business revolve. A greater family involvement in management may result in a greater cohesion and shared strategic vision within the management team (Ensley and Pearson 2005) and, consequently, in fewer conflicts compared to non-family managerial teams. Research shows how organizational culture of family business is more stable, conservative pursuing often defensive strategies (Chrisman, 2005).

One of the important and controversial questions in studies has been the understanding whether a family businesses are different from nonfamily businesses in terms o entrepreneurship and risk propensity. The existing literature predominantly describes family businesses as structures with less propensity for risk compared to other types of business and, as such, not very entrepreneurial. Agency theorists suggest that managers become more risk-averse as their ownership increases.

In family SMEs ownership and management are quite often the same thing, with low separation between them. Managers in these companies invest most of their wealth in the firm. Most or the decision are made by

the ownership that can decide when is the right moment for them to invest for example in innovation or internationalization initiatives. Entrepreneur mainly focus on the local market or national one, with seizing their opportunities to national boundaries. The reason why they do not pursue international growth strategies is also because they do not really monitor the international market place, and the consequences of this is the lack of integration of local and global strategies to defend the own market or to develop it.

Graves and Thomas show that family businesses have less access to managerial resources than nonfamily businesses increasing the gap of internalization. Other analyses support the opposite view. Some research describes family businesses as examples of highly entrepreneurial organizations, in which family ownership and management support risk taking (Aldrich and Cliff 2003).

Another relevant barrier to a process of internalization is number of variables that influences decision when you are operating in a foreign country, such as language, culture, behavior of customers and suppliers, ethical standards; some of these issues oblige companies that want to go global to recruit the right people with the right skills. (Rabino 1980; Pinho and Martins 2010).

Human capital is considered strategic to identify and exploit business opportunities in other countries, that's why from a resource based view perspective human resources are more important than financial resources at the first stage of the internationalization.

SMEs also experience difficulties in hiring specialized human resources (Ortiz et al. 2008). In small firms, constraints in terms of human resources make the task of identifying and operating in foreign markets more problematic

Therefore not only financial issues but also human capital has critical importance as a resource for internationalization. Human capital can be defined as consisting of education, experience, skills

These factors are important in managing the challenges of international development and understanding different ways of doing business. Furthermore, the role of human capital is also significant regarding being competitive in terms of technological change and innovation

When the SME is developing into an international market, the role of the entrepreneur in defining strategies and orientating growth paths is still of great importance (Lamb and Liesch 2002).

The decision of going global for a SMEs depends on the interest and from the potential opportunity seen by the owner of the company, the possibility to pursue the idea is must be followed and realized by human resource internal at the organization or eventually recruited for this specific goal. The increasing number of activities due to the involvement of the firm in in foreign markets will increase number of clients, suppliers etc consequently the firm will need more qualified people to manage this growth.

Researchers such as Gedajlovic and Shapiro affirm that the identify of ownership (companies, banks, institutional investors, executives) plays an important rule into the SMEs, indeed it will help to understand the strategy and performance of the firm as long the ownership effects significantly the objects of the company. Tihany find a significant relationship between institutional ownership by professional investment funds and international diversification in a sample of large US firms. George et al. (2005) show that shareholders such as venture capitalists, banks and institutional investors in general positively affect the scale of international activities undertaken by SMEs.

The internationalization of a firm involves not only sales, production and resources located abroad, but may also concern the financial side, the type of investor a firm attracts. It has been shown that the two aspects are separate and do not necessarily correlate (Hassel et al. 2003). However, foreign ownership signals a greater knowledge of the international environment and may be indicative of a wider view of markets too

The research went through an extensive review of cultural aspects that influence the process trying find possible solution to these obstacles, the second part of my review is to analyze if the culture of Italian Entrepreneur can have an impact on the internationalization process and if the choice are led by cultural aspects. This analysis it was made through an Hofstede Model, it can help us to identify why other entrepreneurs from other countries like Germany or Spain are different than Italian and can have an easy or more difficult transition when decide to go International.

The model include 5 dimensions:

1) Power Distance Index

2) Individualism vs Collectivism

3) Masculinity vs Femininity

4) Uncertainity Avoidance

5) Long Term vs Short term Orientation

1) Power distance index

Hofstede define the Power Distance Index as the degree to which members of organizations within a society accept that power is unequally distributed. High PDI indicates a strong need for independence, adaptability, and caution; on the contrary high PDI reflects the need for dependence, certain degree of moderation, and desire to preserve a detached attitude Hofstede and Bond (1984). Based on Hofstede (1980) considerations, PDI can be predicted with quite high level of precision on the basis of some key elements: 1) the latitude of the countries ; 2) its population; 3) its wealth.

When a country has a higher latitude (then colder) a larger population, and is richer, according to Hofstede, it will have a lower PDI. Hofstede (1991) also observes that countries where a romance language is spoken (Spain, Portugal, Italy, France) have a medium-to-high PDI, while countries speaking a Germanic language (Germany, England, Holland, Denmark, Norway, Sweden) have a low PDI. Based on these consideration Italy should be a Lower Power distance country.

2) Individualism versus Collectivism

Based on Hofstede model Italy is considered a half way between collectivistic and Individualistic, high IND implies that people have time to themselves and freedom to plan their own work. Their work is stimulating and provides them with a feeling of personal achievement. On the other hand, collectivism means that people have opportunities for learning and development, good physical work conditions, and are able to use their skills and abilities at work. The variations in this index differ in the three countries. In the case of Spain, the index is noticeably higher than Hofstede's figure, Germany's index is exactly the same, while Italy's index is lower than Hofstede's.

3) Masculinity index

Based on Hofstede (1991) a society is masculine when the roles between the sexes are clearly separate: men are supposed to be energetic, tough, and more interested in material success, whereas women tend to be more modest (they do not show off as much), more delicate, and more concerned with quality of life.

Junco and Santos (2009) demonstrate how in a feminine culture tend to resolve their conflicts via compromise and negotiation, instead in a masculine society, entrepreneurs prefer to resolve more with working harder to achieve the goal, "live to work" (Hofstede 1991). Chorn 1995 decribes the different impact of masculine and feminine roles into business management highlighting the benefits of having feminine values in the organization, Chorn support the idea that it will be a valuable contribute to improve business strategies.

4) Uncertainty avoidance index

Hofstede (2003) defines this as the degree to which organizations in a society feel threatened by the unknown, the uncertain, and the ambiguous.

The indexes are higher than Hofstede's figures, except for Italy's, which is lower. As Hofstede (1991) says, uncertainty avoidance should not be confused with risk avoidance. Risk tends to be expressed as a probability (percentage) that a particular event will occur. Uncertainty is not linked with any probability, and when expressed as risk, it ceases to be a source of anxiety. More than reducing risk, uncertainty avoidance aims to reduce ambiguity. People from countries with a high AVI tend to worry more, be more emotional, aggressive, and active, as in the case of Spain and Germany. Entrepreneurs with these cultural values try to avoid uncertainty and ambiguity. They try to provide structure to their organizations and relationships, which allows them to clearly interpret and predict what is happening. Paradoxically, Hofstede (1991) says these people are ready to take on risky behavior with the aim of reducing ambiguity.

5) Long-term orientation index

A Society with high long term index are more oriented in preserving, saving money, foster virtues, restricting their spending.

Based on the research made by Garcia del Junco and Garco (2009) -The Italian entrepreneurs have a low AVI and a high long-term orientation index which would suggest that the Italians' long-term orientation probably drives them to show little concern for uncertainty avoidance.
Instead countries like Germany and Spain have a high AVI but low long-term orientation. Hofstede and Bond (1984) find that among the values of long-term orientation compared with short-term orientation, the predominant values were perseverance, austerity, sensitivity for social relationships, and fulfillment of commitments undertaken and the Italian entrepreneurs coincide with this. On the other hand, the German and Spanish entrepreneurs tend to need more reliability and personal stability, and they expect greetings, favors, and gifts to be reciprocated.

3. CONCLUSION

Through a qualitative analysis of other authors I tried to evaluate some aspects that influence the internalization of Italian SMEs.
From the analysis I could identify that management competencies and Human resource skills play an important role when a company decide to go work not only into a domestic market.

One of the key success for internalization process is to consider also managers with an international experience in order to fully exploit the possibilities that the global market offer. The shift from the domestic to international market represent an investment for the firm and it must be handled with the right competencies in order not have as result a negative effect in both markets. International marketplace is a natural competitive environment and the competencies hold by family members managers might be not sufficient to be successful. Research shows how the presence of external managers into firm management has positive effect on the firm strategy and profit, such as the presence of foreign shareholders can be an important source of knowledge of foreign markets, international experience, professionalism, and business network that

An international approach will bring a company to change the organizational structure, culture, and operating systems, and through the help of external managers with some authority it will help to foster an new and competitive way to do business.

On one hand family culture can constitute a strength of a firm due to benefits in terms of long-term orientation and the appreciation of values such as commitment, cohesion, sense of duty and devotion to work, on the other hand opening up the business to nonfamily members is critical for enhancing its capability to respond effectively to the challenges of international competition.

Limitations

The main limitation of this work is that the study involves only three countries: Germany, Italy, and Spain. It must also be taken into account that although the current study uses Hofstede's (1991) studies as a reference, and they are indeed very scientifically solid, his studies were carried out at the end of the 1960s. It would be better to compare data from a more recent analysis with data obtained from my qualitative research. In conclusion my suggestion for future works it might be to identify several area with several variables that is possible to compare in order to understand why other countries face less problems and are more successful in the Internalization process.

REFERENCES

Aldrich H, Cliff J.2003. The Pervasive Effects of Family on Entrepreneurship: Toward a Family Embeddedness Perspective, *Journal of Business Venturing,* 18(5), 573 - 596.

Barrett, R., and Mayson, S. 2008. *International Handbook of Entrepreneurship and HRM*, Cheltenham: Edward Elgar.

Chrisman, N.R. 2005. Full Circle: *More than just Social Implications of GIS. in Harvey, F.* (special issue editor) Cartographica 40(4) 23-35.

Gabrielsson, J. &Winlund, H. 2000. Boards of directors in small and medium-sized industrial firms: The importance of board member activity and working style on board task performance. *Entrepreneurship and Regional Development,* 12(4)

Hassel A. at al, 2003. The Changing Multi National Firm, *Journal of Management Studies, Special Issue:* Volume 40, Issue 3, pages 705–723, May 2003

Hofstede, G. 1991. *Cultures and Organizations:* Software of the Mind. London, UK:

Johannisson, B. And Huse, M. 2000. Recruiting outside board members in the small family business: an ideological challenge, *Entrepreneurship and Regional Development,* 12(4)

Johanson J, Vahlne JE, Internationalization process of firm - model of knowledge development and increasing foreign market commitments, *Journal of International Business Studies* 8(1): 23-32 1977

Kevin I., Ibeh N. 2003. "On the internal drivers of export performance among Nigerian firms: empirical findings and implications", *Management Decision,* Vol. 41 Iss: 3, McGraw-Hill.

Morgan R, Katsikeas C. 1997. "Theories of international trade, foreign direct investment and firm internationalization: a critique", *Management Decision,* Vol. 35 Iss: 1

P. Lamb and P. W. Liesch, 2002, Re-framing the relationships between market commitment, knowledge and involvement, *Management International Review,* 42 (1): 7-26.

Pinho, C. J., & Martins, L. 2010. Exporting barriers: insights from Portuguese small-and medium- sized exporters and non-exporters. *Journal of International Entrepreneurship,* 8(2010): 254-272. http://dx.doi.org/10.1007/s10843-010-0046-x

Rabino, S. 1980. An examination of barriers to exporting encountered by small manufacturing companies, *Management International Review,* 20 (1), 67-73

4th International Symposium on Natural Resources Management
"Sustainable Development and Green Economy in Transition Countries"
31st May -1st June, 2014, Faculty of Management Zajecar, Republic of Serbia
www.fmz.edu.rs

THE ROLE OF ACADEMIC SPIN-OFFS IN ENTREPRENEURIAL INNOVATION AND REGIONAL DEVELOPMENT: THE APULIA CASE" AND A FOCUS ON THE EXTERNAL ENVIRONMENT, ESPECIALLY THE ROLE OF THE ORGANIZATIONAL CULTURE

Ivano De Turi[1]

LUM Jean Monnet University (Bari, Italy), deturi@lum.it

ABSTRACT

In a recession context, characterized from a slowing down of the productive activity and from an increment of the unemployment rate, regional development policies of local authorities should consider initiatives apt to stimulate enterprise creation. This paper focuses on the role of academic spin-offs in generating entrepreneurial opportunities for regional development. After an introduction about the importance of networks among universities for technology transfer and development of academic spin-offs and definition of relevant literature on entrepreneurship and processes of identification, evaluation and exploitation of entrepreneurial opportunities to create new business, the paper moves to the analysis of the enabling conditions for promoting the birth of new academic spin-offs. In particularly, we investigate how business innovation could take place from patents and research at the university level, in order to contribute to the economic development of a region. Academic spin offs represents an important mechanism for technology transfer from universities and research institutions to real economy. The paper highlights the results obtained in Apulia Region, which started in 2007 a network called "Rete ILO Apulia" (where ILO stands for Industrial Liaison Office), with the aim of putting together the efforts of Apulia universities and research institutes (ENEA and CNR), providing them a set of resources and capabilities for technological transfer and entrepreneurial innovation. The main hypothesis of the paper is that the sustainable growth of academic spin offs in this region contributed to the development of the Apulia area and entrepreneurial innovation.
A further deepening of the paper, concerns the impact of organizational culture in the external environment (key variable of the model of the paper) to provide an additional tool for reflection, for future developments, as such an analysis may pose highlight aspects of favorable and unfavorable to the development of these phenomena and thus makes it possible to plan more targeted and conscious actions.

KEYWORDS

Organizational culture, external environment, entrepreneurial innovation, regional development

1. HIGHER EDUCATION AND GLOBAL COMPETITIVENESS

Higher education plays an increasingly critical role in the economic competitiveness of local, state and national economies and is the basis for continuous innovation (Lane & Johnstone, 2012). The many economic impacts of universities are specific and sustained, both for a direct impact in strengthen workforce skills and indirect impact on the symbiotic relationship of campus and surrounding communities (faculty, staff, student, visitors, companies, public administration, and so on). The university is focused on two core activity: higher education and scientific research activities related and inseparable. Other tools that, by virtue of Technology Transfer, to be evaluated are the patent, the creation of new business activity and joint research between universities and industry. These instruments have a certain logic connected to the time of development, the objectives and targets reference. The role of the network among the universities in a regional area has been central for regional development and networking, especially for shared commitment to playing a transformative role in the regions. Through educational and research contributions to regional economic, social, cultural and environmental development, this network could play an important and distinctive role in advancing the regional prosperity, productivity and identity. As key sources of knowledge,

research and innovation, professional skills and regional development capacity, the member universities play a central role in building strong regions. Regional strength drives national success.

2. THE IMPORTANCE OF EXTERNAL ENVIRONMENT TO PRODUCE ENTREPRENEURIAL OPPORTUNITIES

What I have just outlined is a key element at the base of a larger argument in terms of entrepreneurship, specifically in the context of entrepreneurial opportunities and their determinants. In this field, Schumpeter offered one of the major contributions in terms of entrepreneurship and managerial skills, in 1934. In Schumpeter's model, the key to economic development is represented by the profit belonging to the entrepreneur in relation to innovation made.

The Schumpeter"s work was taken up and deepened in numerous studies, identifying the entrepreneur as a person who takes advantage of opportunities to become competitive imbalance agent equilibrium (Kirzner, 1973), describing the different types of entrepreneur in relation to innovations (Abernathy & Clark, 1985), clarifying the main sources of entrepreneurial opportunities (Drucker, 1985). Opportunities, for Shane, are objectively given, ones that individuals can seize by generating business ideas that are interpretations "of how to recombine resources in a way that allows pursuit of that opportunity" (Shane, 2012). An essential role, in entrepreneurship theory and research, is covered by the external environment. The concept of external environment is intended to include those forces and elements external to the organization's boundaries that affect and are affected by an organization's actions as well as more general economic, sociocultural, political-legal, and technological forces which provide the broader context for the organization's operations (Covin & Slevin, 1991). Several scholars have developed theories and conducted research that demonstrates the inseparability of the external environment from the entrepreneurial process. In this sense it is possible to understand how the different environmental conditions can encourage or hinder entrepreneurial activity (Bruno & Tyebjee, 1982) and as they affect the impact of fiscal and regulatory environments (Kent, 1984), noting that political-legal forces can have a great impact on the pervasiveness and success of new ventures (Covin & Slevin, 1991). About environmental factors, particular attention was paid to government policies such as subsidies, public funding and policies that support firms, characteristics of local contexts such as the presence of infrastructure and active investors, the role of innovation in the social context, cooperation between industry, universities and research institutions, the possibility of interacting with actors from other backgrounds (Lerner, 1999; Fini, Grimaldi, Marzocchi, & Sobrero, 2012).

3. THE ACADEMIC SPIN-OFF AS A DRIVE FOR INNOVATION

If we consider the growth of this phenomenon at the international level we see that these actually grow faster where there is a relational context in which aspiring entrepreneurs are able to acquire academic assistance, advice, contacts, information, and funding necessary to undertake a difficult path of entrepreneurship.

There are different definitions to describe the academic spin-off, in fact it"s referred to a phenomenon in a growing phase, but it is characterized by various interpretations: economic nature and legislative nature. We move from a restrictive definition in which reference is made to firms established on the basis of intellectual property generated within universities, in which the public body of research is directly present with share capital to a more general definition in which identify themselves as academic spin-offs firms set up on the basis of competence and results obtained in the course of research programs, but which are not necessarily the subject of intellectual property rights transferred by the public to search the nascent enterprise. The main targets of the spin-off is definitely to promote contact between the university research facilities, the world production and local institutions, to support research and disseminate new technologies with a positive impact on industrial production and social well-being of the territory. In an era of knowledge-based competition, technology transfer from university to firms is a key issue for the wealth of nations and regions. The creation of academic spin-off companies is one of the ways through which such a technology transfer

process (TTP) can be pursued. Although in Italy this form of TTP has become more and more popular in recent years (Netval 2008), the gap compared with other EU countries remains significant (Parente & Feola, 2013).

4. A COMPREHENSIVE PROCESS MODEL

In the first part of the paper we have analyzed some sources of regional development, linking these concepts in the second place to notions of entrepreneurship opportunities and external environment, this to identify in field of entrepreneurship, the conditions at the base of regional development that may lead to growth results. A tool perfectly compatible with the concepts of entrepreneurial opportunities and external environment is definitely one of the Academic spin-off that represents the value of the array of academic and scientific innovations in the real competitive environment, so the right balance between seizing the business opportunities provided by an external environment that stimulates, through incentives and by making its facilities available to develop entrepreneurship phenomena. A process model which highlights the interrelationship between logical and linear variables analyzed until now can be expressed as follow.

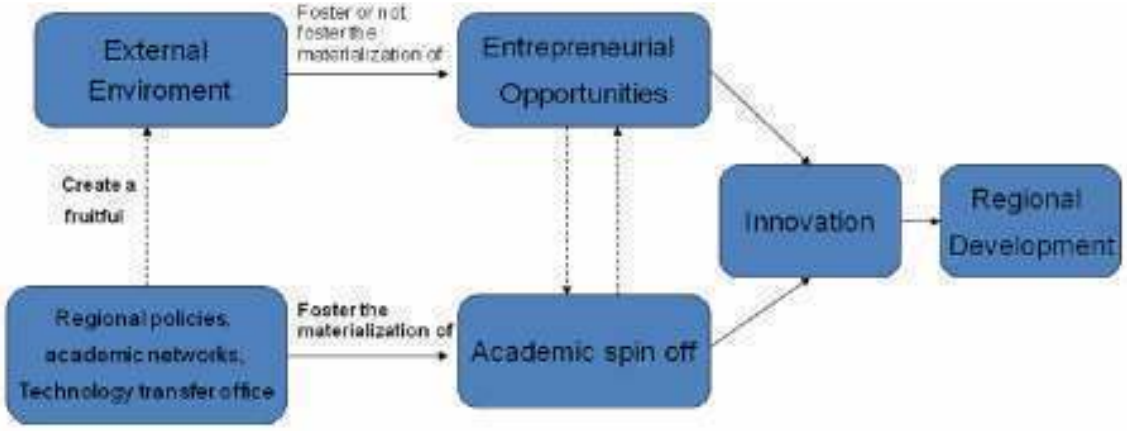


Figure 1. Process model

5. FOCUS ON THE EXTERNAL ENVIRONMENT, ESPECIALLY THE ROLE OF THE ORGANIZATIONAL CULTURE. (HOFSTEDE 5-D MODEL)

Several scholars have developed theories and conducted research that demonstrates the inseparability of the external environment from the entrepreneurial process. In this sense it is possible to understand how the different environmental conditions can encourage or hinder entrepreneurial activity (Bruno & Tyebjee, 1982). As say Covin and Slevin, the concept of external environment include those forces and elements external to the organization's boundaries that affect and are affected by an organization's actions as well as more general economic, sociocultural, political-legal, and technological forces. The aim of this work is to understand how organizational culture influences the external environment (key variable of the model of the paper). In reaching these conclusions, it is necessary to introduce the principles developed by Hofstede. Hofstede has been called "the one who more or less invented cultural diversity as a problem of management." In the mid-seventies Hofstede investigated the influence of national culture by developing questionnaires and interviews conducted within a magnificent "gym" which was IBM (some speak of 72 countries, speaking more than 100,000 contacts in 40 countries, in all cases, statistical mole of departure is indisputable). Every person carries within him or herself patterns of thinking; feeling; and potential acting which were learned throughout their lifetime. Much of it has been acquired in early childhood, because at that time a person is most susceptible to learning and assimilating.

As soon as certain patterns of thinking; feeling and acting have established themselves within a person"s mind; (s)he must unlearn these before being able to learn something different; and unlearning is more difficult than learning for the first time. Hofstede has classified so culture into five dimensions: power distance, individualism, masculinity, rejection of uncertainty, the long-term orientation. Each dimension has an associated numerical index that facilitates comparability between different national cultures and all can be represented within a pentagon, so you can see at a glance overlaps and differences. How to make more specific comments on the 5 dimensions of Hofstede is appropriate to focus on the evidence that emerged from the work of Hofstede same about the Italian culture, as the case study of a paper Italian region (Apulia). It would have been ideal to have even more specific analysis at the regional level, since different cultures even within the same country, but as a national overview I will refer to the national culture. Then, If we explore the Italian culture through the lens of the 5-D Model, we can get a good overview of the deep drivers of Italian culture relative to other world cultures. Starting from the dimension Power distance, it deals with the fact that all individuals in societies are not equal – it expresses the attitude of the culture towards these inequalities amongst us. Power distance is defined as the extent to which the less powerful members of institutions and organisations within a country expect and accept that power is distributed unequally. At 50 Italy sits in the medium rankings of PDI – i.e. a society that believes that hierarchy should be respected and inequalities amongst people are acceptable. The different distribution of power justifies the fact that power holders have more benefits than the less powerful in society. In Italian companies it is normal for a high level manager to have special benefits that his subordinates have not, i.e. a reserved parking place for his car or a larger office and a personal secretary or even a canteen only for the top managers and their guests.

In Italy age is an important factor for one"s career and is interesting to observe that the most powerful people, the prime minister and the president of the Italian Republic are aged 75 and 85, and they are not an exception in the Italian history. Status symbols of power are a very important communication tool: trough them one can easily understand how much power has an individual and subsequently show the due respect, addressing him with “lei” instead of “tu” (= you). In Southern Italy all the consequences of PDI are even more evident. Regarding the Individualism, the fundamental issue addressed by this dimension is the degree of interdependence a society maintains among its members. It has to do with whether people´s self-image is defined in terms of “I” or “We”.

In Individualist societies people are supposed to look after themselves and their direct family only.

In Collectivist societies people belong to „in groups" that take care of them in exchange for loyalty. At a score of 76 Italy is an Individualistic culture, “me” centered, especially in the big and rich cities of the North where people can feel alone even in the middle of a big and busy crowd. So family and friends becomes an important antidote to this feeling; but the word “friend” should not be misinterpreted because in business it has aslightly different meaning: someone that you know and can be useful for introducing you to the important or powerful people. For Italians having their own personal ideas and objectives in life is very motivating and the route to happiness is through personal fulfillment. This dimension does vary in Southern Italy where less individualistic behavior can be observed: the family network and the group one belongs to are important social aspects, and rituals such as weddings or Sunday lunches with the family are occasions that one can"t miss.

People going from Southern Italy to the North say that they feel cold not only for the different climate but for the less “warm” approach in relationships. Third dimension in the analysis are masculinity and femininity, a high score (masculine) on this dimension indicates that the society will be driven by competition, achievement and success, with success being defined by the winner / best in field – a value system that starts in school and continues throughout organisational behaviour. A low score (feminine) on the dimension means that the dominant values in society are caring for others and quality of life. A feminine society is one where quality of life is the sign of success and standing out from the crowd is not admirable. The fundamental issue here is what motivates people, wanting to be the best (masculine) or liking what you do (feminine). At 70 Italy is a masculine society – highly success oriented and driven.

Children are taught from an early age that competition is good and to be a winner is important in one"s life. Italians show their success by acquiring status symbols such as a beautiful car, a big house, a yacht and travels to exotic countries. As the working environment is the place where every Italian can reach his/her success, competition among colleagues for making a career can be very strong. The dimension Uncertainty Avoidance has to do with the way that a society deals with the fact that the future can never be known:

should we try to control the future or just let it happen? This ambiguity brings with it anxiety and different cultures have learnt to deal with this anxiety in different ways. The extent to which the members of a culture feel threatened by ambiguous or unknown situations and have created beliefs and institutions that try to avoid these is reflected in the UAI score.

At 75 Italy has a high score on uncertainty avoidance which means that as a nation Italians are not comfortable in ambiguous situations. Formality in Italian society is important and the Italian penal and civil code are complicated with clauses, codicils etc.

What is surprising for the foreigner is the apparent contradiction between all the existing norms and procedures and the fact that Italians don"t always comply with them. But in a bureaucratic country one learns very soon which the important ones are and which are not, in order to survive the red tape. In work terms high uncertainty avoidance results in large amounts of detailed planning. The low uncertainty avoidance approach (where the planning process can be flexible to changing environment) can be very stressful for Italians. In Italy the combination of high masculinity and high uncertainty avoidance makes life very difficult and stressful. To release some of the tension that is built up during the day Italians need to have good and relaxing moments in their everyday life, enjoying a long meal or frequent coffee breaks. Due to their high score in this dimension Italians are very passionate people: emotions are so powerfully that individuals cannot keep them inside and must express them to others, especially with the use of body language.

Finally, the long term orientation dimension is closely related to the teachings of Confucius and can be interpreted as dealing with society"s search for virtue, the extent to which a society shows a pragmatic future-oriented perspective rather than a conventional historical short-term point of view. The Italians score 34, making it a short term orientation culture which drives a great respect for history and tradition as well as a focus on quick results in the future. Western cultures are typically found at the short term side of this dimension.

6. EVIDENCE ABOUT CULTURE AND EXTERNAL ENVIRONMENT

Power distance: 50 (medium)
Uncertainty avoidance: 75 (strong uncertainty avoidance)
Individualism: 76 (Individualistic)
Masculinity: 70(masculine)
Long term orientation : 34 (short term orientation)

After this necessary premise we can discuss, using the Hofstede dimension table, such as inherent characteristics of the Italian culture, could improve or could worsen the external environment. Starting by power distance differences between small- and large-power Distance, Italy have a medium score and could be characterized by some of small and some of large power distance features. For example, if we consider small (SPD) and large power distance (LPD) distinctive features, to have a favorable environment for the proliferation of spin-off would be appropriate a student-centered education (SPD) (not a teacher-centered education – LPD) in this manner at any level of education would be awarded merit and ability to produce results from the study that could be embodied, ultimately, in academic spin-offs. If older people are both respected and feared (LPD) rather than not (SPD) cooperation at all levels would be unfair, because the fear would limit the freedom of initiative by younger people. Finally, in a context characterized by a reward system of merit of ideas and market potential that academic research can have, being at most times financed by public funds, corruption could play a key role in this development. If corruption is frequent and scandals are covered up (LPD) the consequences would be inefficiencies, countless failures and waste of public money, however if corruption events are rare and eventual scandals end political careers (SPD), the environment should result improved. In second place, Italy has a strong uncertainty avoidance (SUA) score, it could represent a threat to the or an opportunity. Strong avoidance societies need for clarity and structure that can be translated into systems and procedures transparent and well-defined structures, and it represent an opportunity, in the face of ambiguous situations and chaos that characterize weak uncertainty avoidance (WUA) societies. Vice versa, intolerance of deviant persons and ideas, and consider what is different as dangerous could be a threat, because it can be a hindrance to creativity and innovation, however, in the face of a characterization of the WUA societies that tolerate deviant persons and ideas and consider what is

different: curious. Italy is also an individualistic nation, and this involves that the personal opinion is expected (I) (opinions and votes predetermined by in-group – C). This is critical in the groups to the resolution of problems, individual opinions lead to the solution and the rewarding of merit of the individual. The purpose of education is learning how to learn, this requires the identification of a method and a less immediate approach but, from the perspectives, much wider. Furthermore, Italy is a masculine nation, the features of this dimension include statements like this: "fathers decide on family size" that represent a top down approach that not conducive to the creation of phenomenon of corporate entrepreneurship, then the absence of individual who exists within an organization to generate product and process ideas that will create value for the organization. This would adversely affect the environment. Another threat could be represented by the statement "Men should be and women may be assertive and ambitious" as this may limit the consideration of initiatives and ideas from studies and research related to women, the risk of losing potential good ideas and potential spin off of success. Finally, the last dimension underline that Italy is a nation short term oriented. One of this dimension statement is "In business, stress on short-term profits", and is inconsistent with the principles of academic research, technologic transfer and the creation of academic spin-offs which by definition represent a long-term investment that often does not lead to immediate results but over time. It"s represent another treat for the environment, same is true for the statement "Immediate need gratification expected" not always obtainable in research. Or still, for "Most important events in life occorred in the past or take place now" this confirms a future orientation almost absent.

7. THE APULIA RESULTS

Table 1 – The Apulian academic Spin Off

Years	Spin off no.		% Total Italian Spin off	% Variation
	Absolute Value	*% Variation*		
2005	7	-	1,6	-
2011	79	+ 1.029	8,0	+ 400
2012	85	+ 7,59	8,0	0

(***Source***: Annual Reports NETVAL and mapping ARTI)

The table 1 show the growth of this region in the last decade.These results are the fruit of a path focused on the enhancement of entrepreneurship within the ILO research and academic institutions active support mechanisms in favor of academic spin-offs, mechanisms focused on the establishment of links between the university system and the regional national networks of reference specifically refers to the association of university incubators and the association of UTT, also brought to the attention of investors and financial intermediaries experiences of high-tech start-ups from Apulia. So, In order to compare the graph of the regions of localization of academic spin-offs at 31 December 2012 (n = 1,082) with the graph about the 2005, it is clear that the development of the Apulia region has gone from being the third last with 1,6% of spin-off active at a 7.4% occupying the first position among the regions of Southern Italy and the sixth position at the national level, after Lazio at 7.7%, 9.4% in Piedmont, Emilia Romagna 10.8%, 10.9% Tuscany and Lombardy 11.4%. Furthermore, the Apulia innovation grade after the introduction of NILO has increased from medium-low in the period 2004-2006 to average in only two years the Apulian, as shown the Figure 3.

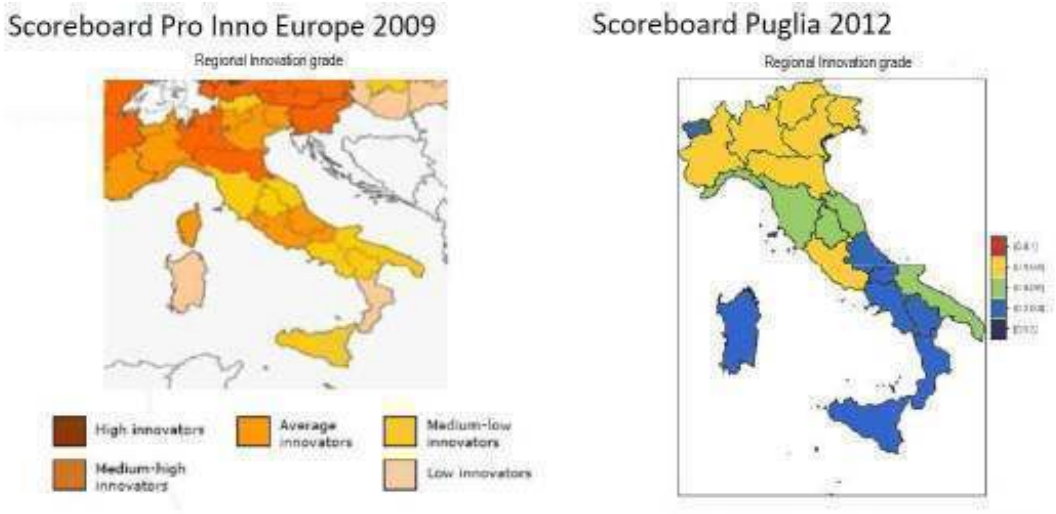


Figure 2. Comparative regional innovation grade 2004-2006 and 2006-2008

8. CONCLUSION AND LIMITATIONS

Innovation is one of the most important drivers of regional development (Florentina, 2013) and innovation speed - the time it takes to commercialize a technology – depend upon TTO resources, competency in identifying licensees, and the participation of faculty-inventors in the licensing process (Markman, Phan, Balkin, & Gianiodis, 2005).

In this paper has been highlighted the role of academic networks and academic spin-off as a drive for innovation and regional development, as endorsed by the results of the analysis of the case of the Apulia region (Italy). The institutional role of the Region in the2007-2012 planning has created an environment favourable to entrepreneurial opportunities, by fostering the creation of academic spin-offs and taking advantage of patents and research streams already developed at a university level but not really exploited as market opportunities. As a result, many innovative startups where founded starting from entrepreneurial ideas of researchers and students, boostering the number of startups and innovation in that period of observations.

The limits of these observations are related to the absence of a real quantitative measurement of data relating to individual spin-offs and the real growth of the region that can document the importance of individual relationships.

This position paper aim to substantiate the relationship among the variables analyzed with the final outcomes. After the explaination of each variable and after have shown the case evidence, we can say that the relation between variables and outcomes is clear, and for a significant demonstration we leave the field open to possible quantitative analysis on the data pertaining to academic spin-offs.

After the focus about the influence of the organizational culture, it"s possible to note that a country like Italy is affected by the strong impact of organizational culture that is not very fertile for the development of academic spin-offs. This phenomenon has become more and more popular in recent years and the gap compared with other EU countries remains significant, but this may also result from a national culture that is not very fruitful in this development.

Precisely for these reasons, to ensure that this imbalance in the external environment is reduced, actions are needed at regional, national and european level that can, while remaining unchanged the physical features of the nation, rebalance the conditions underlying the process of regional development through research and academic spin-off.

REFERENCES

Abernathy, W., & Clark, K. 1985. Innovation: mapping the winds of creative distruction. Research policy , 3-22.

Bruno, A., & Tyebjee, T. 1982. Developing the Marketing Concept in Public Accounting. Journal of the Academy of Marketing Science .

Covin, J., & Slevin, D. 1991. A conceptual model of entrepreneurship as firm behavior. Entrepreneurship Theory and Practice , 7-25.

Drucker, P. 1985. Innovation and entrepreneurship. New York: Harper & Row.

Fini, R., Grimaldi, R., Marzocchi, G. L., & Sobrero, M. 2012. The Determinants of Corporate Entrepreneurial Intention Within Small and Newly Established Firms. Entrepreneurship: Theory and Practice, 36 , 387-414.

Florentina, C. 2013. Regional Development And Innovation In Romania. Challenges And Perspectives. Annals of Faculty of Economics , 234-242.

Hofstede, G. 1983. The cultural relativity of organizational practices and theories." Journal of intemational business studies 14.2: 75-89.

Hofstede, G., et al. 1990. Measuring organizational cultures: A qualitative and quantitative study across twenty cases. Administrative science quarterly :286-316.

Hofstede, G., 2011. Dimensionalizing Cultures: The Hofstede Model in Context Universities of Maastricht and Tilburg, The Netherlands, hofstede@bart.nlOnline Readings in Psychology and Culture Article Copyright

Kent, C. 1984. The Environment for Entrepreneurship. Sloan Management Review .

Kirzner, I. 1973. Competition and entrepreneurship. The University Press Chicago .

Lane, J., & Johnstone, D. 2012. Universities and colleges as economic driver. Measuring higher education"s role in economic development,.

Lerner, J. 1999. The government as venture capitalist: The long-run impact of the SBIR program. Journal of Business , 285–318.

Markman, G., Phan, H., Balkin, D., & Gianiodis, P. 2005. Entrepreneurship and university-based technology transfer . Journal Of Business Venturing, Vol.20, No. 2 , 241-263.

Netval. 2008. Annual Report.

Parente, R., & Feola, R. 2013. Entrepreneurial intent and entrepreneurial commitment of young researchers. International Journal of Technology Management & Sustainable Development Volume 12 Number 2 .

Shane, S. 2012. Reflections on the 2010 AMR Decade Award: Delivering on the promise of entrepreneurship as a field of research. Academy of Management Review, 37: 10-20

4th International Symposium on Natural Resources Management
"Sustainable Development and Green Economy in Transition Countries"
31st May -1st June, 2014, Faculty of Management Zajecar, Republic of Serbia
www.fmz.edu.rs

CONCEPT OF BLUE ECONOMY - CHALLENGES FOR THE FUTURE

Ivan Ivanović[1],
Slavica Ostojić[2]
Ana-Marija Đurić[3]

[1]*Faculty of Management, Zaječar, Park Forest Kraljevica bb, ivan.ivanovic@fmz.edu.rs*
[2] *College for Business Studies and Industrial management, Kruševac, Topličina 12, ostojicslavica@yahoo.com*
[3]*Technical Faculty, Bor, VJ 12, annamariha@yahoo.com*

ABSTRACT

Today is a big hit in the world to talk about green development, green economy, as synonymous transition towards sustainability. Green economy is conceived as a solution to all the problems that have caused over the centuries and created a dependence on fossil fuels, but it sometimes does not fulfill its ultimate purpose, it uses economic models to promote running for profit at any cost, and the rule of money of peoples and goods. The new term blue economy began as a project to find the 100 best nature-inspired technologies that could affect the world economy, and to meet basic human needs in a sustainable manner-to provide potable water, food, work, energy and home. Blue economy is a challenge we need to face as soon as possible, so that mankind remained united with the planet on which we live.

KEYWORDS

Green economy, blue economy, innovation, technology, sustainability

1. INTRODUCTION

Environmental deterioration and the imbalance between man and nature increasingly preoccupy scholars, philosophers, businessmen and policy makers alike. The disparity between rich and poor and the continuous incapacity to respond to the basic needs of all (not only humans) preoccupies many. It seems that the only sustainable phenomena of our modern time is the loss of biodiversity and our incapacity to eliminate poverty. Even though we all look reality in the eye, we seem to lack the vision and the tools to make a difference and steer our excessive consumption society in general and our competitive business world towards sustainability. Our media continue to report on the loss of forest cover, biodiversity, and human dignity. Our concern should be: ***in spite of the statistics showing the downward trends, what can we do to make a material difference on the ground?***

Who would doubt that the world needs a new economic model? We need to find a way of meeting the basic needs of the planet and all its inhabitants with what the Earth produces. Many grand steps have been taken in the sustainability and green movement, yet we have to search for solutions that will allow us to make a quantum leap forward. The economic models of the past have collapsed and the Green Economy has been the only serious response. Yet - while it has had an impact on specific products in niche markets, as through fair trade on coffee and tea - it has yet to shape our entire system. The main challenge is that it requires companies to invest, and consumers to pay, more. This is valid and justified when the world economy is expanding and unemployment is decreasing, or when the main actors on the market are flush with financial resources. But it is tough when demand drops and consumer confidence dwindles and even tougher when people realize that their jobs are at risk. The time has come to embrace a broad portfolio of innovations that

build on what we have achieved and benchmarked around the world. For decades we have been copying the genius in nature's design - like the Velcro that imitates the adhesion technique of cocklebur seeds, or the self-cleansing of the lotus flower. Societies must now move from a romance with species to pragmatic inspiration from ecosystems.

Ecosystems provide pragmatic design principles for the new economy. The first of these is based on the observation that all matter and energy cascades from one species to another. Such cascading of nutrients involves partaking of locally available resources, employing all contributors, and using the waste for one as the resource for another.

2. THE RED ECONOMY AND THE GREEN ECONOMY

There are two avenues to economic growth – either the exploitation of more resources (increasing output by increasing input), or the more efficient exploitation of existing resources (increasing the output to input ratio). In general, any period of economic growth will involve both of these – during the industrial revolution for example, more inventive and efficient methods of exploiting the energy from fossil fuels led to increased demand for those fuels. But in return, the increased use of fossil fuels has led to the development of more efficient industrial processes, ultimately giving us technological wonders such as the computer I'm using to publish these words, a form of communication more efficient than anything dreamed of by the industrial pioneers of the 18th century. Unfortunately, there is a strain of public discourse that fails to distinguish between the two. Ronald Reagan once famously said: ***There are no great limits to growth because there are no limits of human intelligence, imagination, and wonder.***

While on the other side, the environmentalist movement points to dwindling resources and the limited capacity of the ecosystem to absorb pollution and other forms of biological disruption. Who is right? As in most such cases, there is truth in both arguments - and to reconcile them we need to distinguish between the two avenues to growth identified above. Reagan was talking about the second, "green" growth process, the one in which human ingenuity dreams up more efficient processes and new business models, opening the door to improved technologies and ever-decreasing waste, an **exponential** curve that continues indefinitely without ever touching a hard limit. The environmentalists meanwhile are warning that there are limits to the complementary "red" economy, the one which relies on ever-increasing rates of exploitation, a **ballistic** curve that must hit zero at some finite (if yet unpredictable) future date. The wrinkle comes when we remember that the two processes have always gone hand in hand – new technology requires new resources, and vice versa. But governments can rebalance the economy to place more weight on "green" efficiency than "red" extraction, by changing the burden of taxation. We have already made a start through carbon taxes, but pollution is not the only limit we face.

Land is the most visible finite resource we have. The exploitation of land for economic activity was mankind's first foray into resource extraction, and it continues apace. Northern Ireland in particular has almost no unspoiled land left, a testimony to its long history. But not all land is equally exploited – a farm is not in the same class as a factory, or a suburban estate. Site value taxes recognize this by indirectly using the planning system as a measure of resource extraction. Land zoned as commercial is more valuable than that zoned as farmland, as it can be exploited more heavily – and therefore it is taxed more highly. Land zoned as forest or wilderness would be essentially tax-free. By doing so, the incentive for land owners to have their land rezoned for further urban sprawl (or in the case of the Amazon, farmland sprawl) can be reduced or removed entirely.

One might think that human resources are another scarce commodity, but from an economic point of view they are quite the opposite. Every person unemployed – or employed in a Mc Job – is a potential efficiency squandered. Man-hours cannot be saved in land banks or left untapped in the ground for later generations – they get spent at a rate of one hour per hour no matter what, so letting them trickle away makes no sense from either an economic or a compassionate viewpoint. Unlike oil drilling or green field construction, pillars of the red economy, employment is inherently green. And yet we tax it, even knowing that taxes inhibit economic activity. If we want to increase employment and rebalance the economy from red to green, revenue-neutral taxation incentives are therefore available: reduce corporate and base payroll taxes, while increasing pollution, extraction and site value taxes to compensate (the upper income tax band can stay, for

the purposes of redistribution). The major benefits would be increased employment and investment, with reduced urban sprawl and fewer emissions.

3. FROM GREEN TO BLUE ECONOMY

Color-coding in the environment field can be quite confusing, partly because it is applied on ecosystems, infrastructure, services, economies, and other subjects. For ecosystems, "green" refers to the terrestrial ecosystem and "blue" refers to the marine ecosystem. But when the United Nations made "Green Economy" a major theme of the Rio+20 world summit in June 2012, it referred to concerns beyond terrestrial. At the summit, Green Economy is viewed, in the context of sustainable development, as the type of economy that "should contribute to eradicating poverty, as well as sustained economic growth, enhancing social inclusion, improving human welfare and creating new opportunities for employment and decent work for all, while maintaining the healthy functioning of the earth's ecosystems." Many other definitions of green economy have emerged before, during, and after Rio+20. It is easier to see how it can be applied than to find a definition that is acceptable to all.

A green building, through adoption of energy efficiency measures, is an example of a green economy initiative. In addition to green buildings, the other main sectors in a green economy are renewable energy, clean transportation, water management, waste management, and natural resource management. On the way to Rio+20, the Pacific Small Island Developing States (Pacific SIDS) started promoting "Blue Economy," which is focused on the marine environment. For the Pacific SIDS, "green economy" is a "blue economy" that prominently features oceans, which account for almost 71 percent of the earth's surface. Some concerns of the Pacific SIDS are increasing their share of benefits from the use of their marine living resources and building the resilience of marine ecosystems to the impact of climate change and ocean acidification. Although various countries have different priorities - blue, brown, gray, and, of course, green, etc. that represent varied types of concerns - there is general acceptance that nature must be at the center of a green economy. Thus, building the resilience of nature, improving governance of natural resources, and mainstreaming ecosystem values (such as, building ecologically sound enterprises) must be prominent in a green economy plan.

Then came Gunter Pauli, a Belgian entrepreneur, who started a project to find the best nature-inspired technologies that could affect the economies of the world. The result is his Report to the Club of Rome, ***"Blue Economy: 100 Innovations-10 years-100 million jobs."*** That project started the transformation of the "green economy" to a new concept of "blue economy," which is now attracting the interest of creative entrepreneurs in various countries.

Like "green economy," which is not limited to the green ecosystem, this "blue economy" is not limited to the marine ecosystem. It is the economy that responds" to the basic needs of all with what we have. As such, it stands for a new way of designing business: using the resources available in cascading systems, where the waste of one product becomes the input to create a new cash flow." (Jan Steffen, International Union for Conservation of Nature). Dr. Catia Bastioli, Chief Executive Officer at Novamont Spa, European Inventor of the Year 2007, sums it up this way: ***"The blue economy fosters our transition from a product-based economy to a system-based economy."*** Some of the basic principles of this "blue economy" are: *"Substitute something with nothing-question any resource regarding its necessity for production. Natural systems cascade nutrients, matter and energy-waste does not exist. Any by-product is the source for a new product. Sustainable business evolves with respect, not only for local resources, but also for culture and tradition."*

4. THE BLUE ECONOMY A FRAMEWORK FOR SUSTAINABLE DEVELOPMENT

The Blue Economy is a developing world initiative pioneered by SIDS but relevant to all coastal states and countries with an interest in waters beyond national jurisdiction. SIDS have always been highly dependent upon the seas for their well-being but the Blue Economy, whilst encompassing the concept of ocean-based economies, goes far beyond that. The Blue Economy conceptualizes oceans as "Development Spaces" here

spatial planning integrates conservation, sustainable use, oil and mineral wealth extraction, bio-prospecting, sustainable energy production and marine transport. The Blue Economy breaks the mould of the business as usual "brown" development model here the oceans have been perceived as a means of free resource extraction and waste dumping; with costs externalized from economic calculations. The Blue Economy will incorporate ocean values and services into economic modelling and decision-making processes. The Blue Economy paradigm constitutes a sustainable development framework for developing countries addressing equity in access to, development of and the sharing of benefits from marine resources; offering scope for re-investment in human development and the alleviation of crippling national debt burdens.

The Blue Economy espouses the same desired outcome as the Rio +20 Green Economy initiative namely: ***improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities*** (UNEP 2013) and it endorses the same principles of ***low carbon, resource efficiency and social inclusion***, but it is grounded in a developing world context and fashioned to reflect the circumstances and needs of countries whose future resource base is marine. Fundamental to this approach is the principle of equity ensuring that developing countries:

- *Optimize the benefits received from the development of their marine environments e.g. fishery agreements, bio prospecting, oil and mineral extraction.*
- *Promote national equity, including gender equality, and in particular the generation of inclusive growth and decent jobs for all.*
- *Have their concerns and interests properly reflected in the development of seas beyond national jurisdiction; including the refinement of international governance mechanisms and their concerns as States proximate to seabed development.*

The mainstreaming of equity at international and national levels offers scope for developing countries to realize greater revenue from their resources and reinvest in their populace, environmental management, reduce national debt levels and contribute to the eradication of poverty and hunger. At the core of the Blue Economy concept is the de-coupling of socioeconomic development from environmental degradation. To achieve this, the Blue Economy approach is founded upon the assessment and incorporation of the real value of the natural (blue) capital into all aspects of economic activity (conceptualization, planning, infrastructure development, trade, travel, renewable resource exploitation, energy production/consumption). Efficiency and optimization of resource use are paramount whilst respecting environmental and ecological parameters. This includes where sustainable the sourcing and usage of local raw materials and utilising where feasible "blue" low energy options to realize efficiencies and benefits as opposed to the business as usual "brown" scenario of high energy, low employment, and industrialised development models.

The Blue Economy approach recognizes and places renewed emphasis on the critical need for the international community to address effectively the sound management of resources in and beneath international waters by the further development and refinement of international law and ocean governance mechanisms. Every country must take its share of the responsibility to protect the high seas, which cover 64 % of the surface of our oceans and constitute more than 90% of their volume.

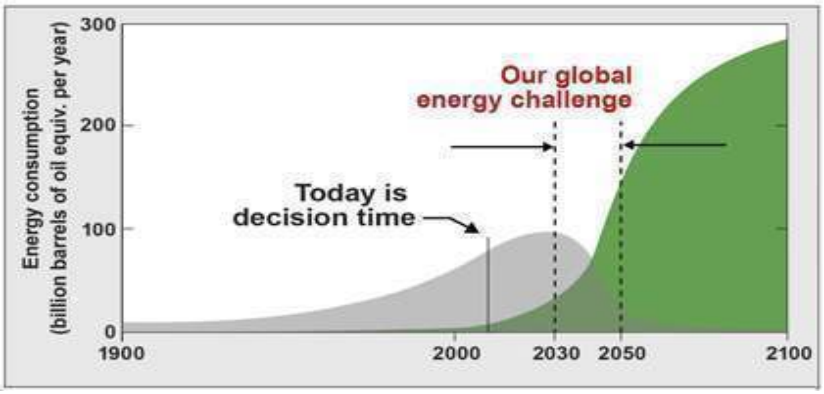


Figure 1. Graph of energy consumption
Source: www.google.com

4.1. Our blue planet

Oceans cover 72% of the surface of our blue planet and constitute more than 95% of the biosphere. Life originated in the oceans and they continue to support all life today by generating oxygen, absorbing carbon dioxide, recycling nutrients and regulating global climate and temperature. Oceans provide a substantial portion of the global population with food and livelihoods and are the means of transport for 80% of global trade. The marine and coastal environment also constitutes a key resource for the important global tourism industry; supporting all aspects of the tourism development cycle from infrastructure and the familiar ***sun, sand and sea formula*** to the diverse and expanding domain of nature-based tourism.

The seabed currently provides 32% of the global supply of hydrocarbons with exploration expanding. Advancing technologies are opening new frontiers of marine resource development from bio-prospecting to the mining of seabed mineral resources. The sea also offers vast potential for renewable blue energy production from wind, wave, tidal, thermal and biomass sources. Human development activities, however, have seriously taxed the resilience of the marine and coastal resource base. FAO data indicates that 87% of global fish stocks are fully or over exploited. Increasing pollution and unsustainable coastal development further contribute to the loss of biodiversity, ecological function and the decline in provision of environmental services. Climate change threatens to remove literally the very foundations of broad swathes of coastal development whilst rising atmospheric CO levels are undermining fundamental aspects of many marine ecosystems through ocean acidification; changing ocean chemistry at a speed faster than at any time in the last 300 million years.

The potential of the oceans to meet sustainable development needs is enormous; but only if they can be maintained in and/or restored to a healthy, and productive state. The importance of oceans for sustainable development has been recognized from the beginning of the UNCED process, in Agenda 21, the Johannesburg Plan of Implementation and reaffirmed in the outcome document of the Rio+20 Conference; but ongoing trends of exploitation and degradation of marine and coastal ecosystems show that endeavors to date have been insufficient and that more needs to be and **must be done**.

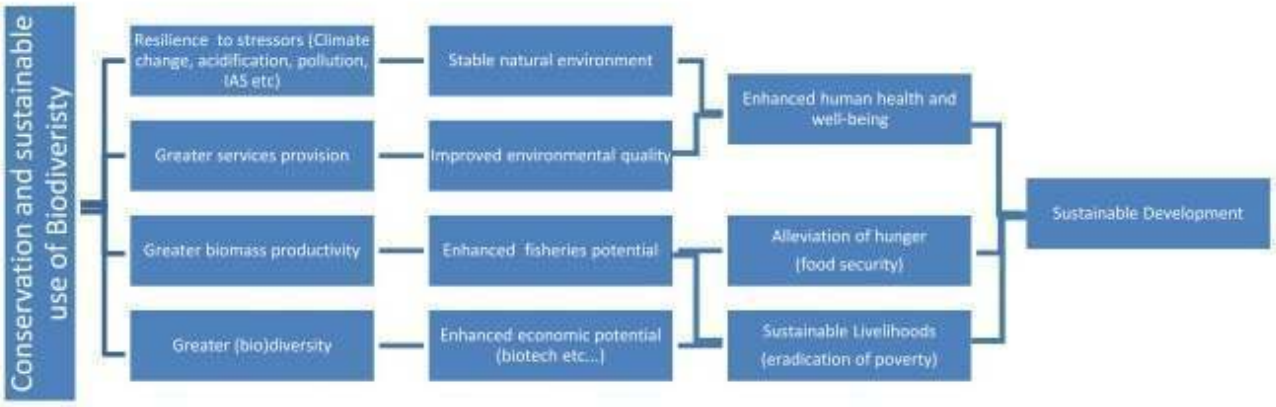


Figure 2. Conservation and sustainable use of Biodiversity
Source: *http://www.sids2014.org/content/documents/275BEconcept.pdf*

5. CONCLUSION

The natural world made up of the physical environment, its mineral components and biodiversity at all three levels (genetic, species, ecosystem) is intrinsically interconnected and the more diverse and productive the natural system, the greater the degree of interconnectivity. Hence the identification of particular issues is inherently an anthropogenic construct and depending on one's perspective may appear arbitrary. A case in point is the precursory role that the conservation and sustainable use of biodiversity has in enabling the establishment of a Blue Economy, broader sustainable development and poverty eradication (see fig below). This is particularly true in developing countries where economies are more directly related to environmental exploitation. The importance of marine and coastal resources to SIDS is evident, and has been elaborated in numerous international fora. The Blue Economy, however, offers the potential for SIDS to alleviate one of their defining obstacles to sustainable development; namely that of a narrow resource base. The remarkable per capita marine resource area enjoyed by many SIDS means that the Blue Economy approach offers the prospect of sustained, environmentally-sound, socially inclusive economic growth. SIDS must prepare now in order to position themselves properly to realise the optimal benefits for their sustainable development from the coming blue revolution. The benefits of the Blue Economy, however, are not exclusively tailored for SIDS, they are equally applicable to coastal countries and ultimately the Blue Economy approach offers the means for the sound utilisation of resources beyond national jurisdiction – the sustainable development of the common heritage of humanity; the resources of the High Seas.

REFERENCES

Pauli, G., 2010. *The Blue Economy*. Paradigm Publishers

Kanninen ,T., 2012. Crisis of Global Sustainability (Global Institutions), Routledge

http://www.unep.org/pdf/OP_Feb/EN/OP-2010-02-EN-ARTICLE7.pdf

http://www.worldacademy.org/files/Blue%20Economy%202009.pdf

http://www.theblueeconomy.org/blue/Home.html

http://www.zeri.org/ZERI/Home_files/From%20Deep%20Ecology%20to%20the%20Blue%20Economy%22011

4th International Symposium on Natural Resources Management
"Sustainable Development and Green Economy in Transition Countries"
31st May -1st June, 2014, Faculty of Management Zajecar, Republic of Serbia
www.fmz.edu.rs

CORPORATE INCOME TAX INCENTIVES

Leposava Jovanović[1],
Marina Malenović[2],
Ivana Avramović[3],

[1]*Faculty of management Zajecar,19000,leposava..jovanovic@edu.fmz.rs*
[2]*Faculty of Economics Niš ,18000,ivanajovanovic@rocketmail.com*
[3]*Faculty of Economics Niš ,18000,marinavujicic@rocketmail.com*

ABSTRACT

In the modern states very important function of fiscal policy is development function, which is carried out through its expenditure mechanism, and through revenue mechanism. The most appropriate tax for the achieving the development goals is the corporate income tax. Here are introduced many tax incentives in order to stimulate enterprises to invest.

KEYWORDS

Tax, enterprise, tax rate, accelerated depreciation, tax credit.

1. INTRODUCTION

The attractiveness of the tax system is one of the key components of the quality of the business and investment environment. Fiscal policy makers seek to build such a fiscal system that will work on stimulating investment activity of companies. The tax form that most often used for this purpose is a tax on income of legal persons or corporate income tax. Corporate income tax is of great importance for the realization of the development goals of fiscal policy. In order to be as efficient means realizing these objectives, under the corporate income tax introduced various tax incentives. With their help stimulate economic growth, employment, influence on reducing differences in the development of certain regions or they provide support to certain industries. Tax incentives can be targeted to reduce the tax liability or reduction in the tax base. Tax incentives in the corporate income tax can be divided into: preferential tax rates, accelerated depreciation, tax credits and tax exemptions.

1.1 Tax rates

Serbia has a nominal rate of tax on corporate profit that is uniform and proportional amounts to 15%. It is estimated that it will increase the tax base of corporate profit tax from 10% to 15% in 2013th lead to an increase in revenue from this tax, but that this growth will be proportional to the increase in the tax rate, the expected worsening business performance of the economy in 2012th due to the economic crisis. Income tax rate in Serbia is among the lowest in Europe, and after its increase, it is still much lower than the average corporate tax rates in the EU (25%), as well as the rates that apply to most of the central.

and Eastern Europe (18%). The lowest tax rate is Montenegro and it is 9%, while Africa has the highest rate, 20% .(http://glassrbije.org/privreda/finansijski-podsticaji-0)

Preferential or reduced tax rates are the simplest instrument for the implementation of tax incentives. However, at low marginal tax rates, this instrument has no great significance. Preferential tax rates are commonly used in newly-founded companies that are just starting to work. Also, there are usually differences in tax rates, depending on whether it is a new company founded in underdeveloped areas or not, and whether it belongs to the sectors identified as priority. In some tax systems, these companies are exempt from paying taxes for a number of years. Tax incentives in the corporate income tax are in other countries. Thus, in the Czech Republic there is a tax exemption for certain categories of companies, in over 10 years. In Croatia, there is a reduced income tax rate for companies in certain industries. (Raicevic & Nenadic, 2005.)

1.2. Accelerated depreciation

Accelerated depreciation is effectively increased the initial rate of depreciation. It is a method in which the depreciation is calculated by higher depreciation rates than regular amortization method demands. Companies that have acquired new fixed assets have the ability to use larger deductions for depreciation in the first or in the first years of use with the main purpose to defer the payment of taxes. There are several methods for calculation of accelerated depreciation. These are:

1. method for faster write-offs with respect to straight-line depreciation, which consists in increasing the rate of write-off of fixed assets. Thus, the useful life of capital to calculate depreciation for tax purposes is less than the actual economic life of assets;
2. Accelerated depreciation with a declining balance, where as the basis of depreciation is not taken cost than the current value. Depreciation calculation is performed on a straight line basis in economic useful life osnovnnih funds, with the difference, that in the initial period of the fixed assets written off larger amounts, and then lower;
3. Accelerated depreciation of the double declining balance, in which the depreciation rate doubled compared to the rate that is applied to straight-line method of depreciation;
4. the sum of the years digits method, where the digits are added every year life of the asset (eg lifetime of 5 years, the sum is 5 +4 +3 +2 +1 = 15), and then to determine the percentage by which the asset will be depreciated in each year number of each year divided with the determined sum, wherein the largest number of starts for the first year (5/15, or 33.3%)
5. one-time write-off method, which allows the write-off of total investment in the year of its implementation.(http://en.wikipedia.org/wiki/Depreciation)

Serbia offers accelerated depreciation for a wide range of fixed assets. In Serbia, accelerated depreciation is carried out at rates that can be up to 25% are available. Right to accelerated depreciation, the taxpayer has the fixed assets used for environmental protection, scientific research, education and training of personnel, as well as computer equipment.

1.3. The tax credit

Under the tax credit to include certain tax reductions defined by law. Companies are able to reduce their liability for income tax on the basis that they made certain investments in its activity. In particular, this means that companies in certain areas (which are established as a national and regional priorities), in proportion to their cost, are legally entitled to additional tax credits, which have a net effect of reducing tax liabilities of companies.

In Serbia, the tax credit amount is different for small companies compared to medium and large businesses. Small companies are entitled to a tax credit equal to 40% of the investment, while medium and large entities are entitled to a tax credit of 20% of the investment. For a taxpayer who invests in property, plant, equipment and biological assets (fixed capital) in their own property for the performance of core activities and activities listed in the Articles of Association of the taxpayer, or referred to in the second act of the taxpayer, which determines the activities performed by the taxpayer, is recognized entitled to a tax credit of 20% of the investment, but it can not be greater than 33% of the calculated tax for the year in which the investment was made. In a number of sectors (agriculture, fisheries, manufacturing of yarn and fabric, garments, leather products, basic metals ...) the reduction can be as high as 80%.

Ministry of Finance and Economy has issued a public call for participation of commercial banks in the implementation of the program of support to small businesses for the purchase of equipment in 2013$^{th=}$.

(http://glassrbije.org/privreda/finansijski-podsticaji-0) The program envisages that the total funds for these purposes amounted to 100 million, and the company will receive them in the form of grants of up to 25 percent of the value of the investment. Amount awarded a grant by the company shall not be less than 250 thousand, or more than 2.5 million.

The minimum repayment period for this loan is 18 months. It is anticipated that the programs are covered by small businesses, entrepreneurs and cooperatives, and the funds are earmarked for the purchase of manufacturing equipment and machinery in order to facilitate their financial situation and strengthen their competitiveness. The Serbian government has adopted a program of subsidized interest loans for liquidity, intended for entrepreneurs, small and medium enterprises. It is anticipated that in 2013. Subsidizing the interest rate of the budget set aside 600 million, which will allow commercial banks to the economy of placing loans in the amount of 100 million euros. Entrepreneurs and small businesses will be able to use credits of up to 30 million , while loans to medium-sized businesses will amount to 200 million.

Tax credit for job creation exists in most countries in the region. In Bulgaria there are special programs for employment, while Africa gives grants financial aid for a period of one year, to cover the cost of a new job. In Serbia, the income tax is reduced by 100% of the gross wages of new employees for a period of 2 years from the date of employment, provided, however, that during this period the number of employees is reduced .(Momirovic, Zdravkovic, 2009.)

1.4. Tax exemptions

Tax exemptions are one of the most common incentives used in developing countries. Tax exemptions are used in different forms in different countries. The analyzes indicate the existence of different criteria in their application.

The taxpayer, who in accordance with the regulations on tax incentives when investing in the Serbian economy, investing in net assets, or the one in which the basic means someone else is investing over 600 million, provided that the funds are used for the performance registered business entities, provided that the taxpayer employs at least 100 people, will be exempt from paying income tax for a period of 10 years, in proportion to the amount of investment. Exemption applies when the above conditions are met and the first year when the Company's taxable income.

The taxpayer, who in accordance with the regulations on incentives when investing in the economy of the Republic of Serbia, to an area of special interest for the Republic of Serbia, is exempt from income tax for 5 years (Zhang & Zhang, 2011.) under the following conditions:

1. If the taxpayer, or anyone else, invest in assets taxpayers more than 6 million,
2. If a taxpayer uses 80% of its fixed assets in the territory of special interest to Republic of Serbia
3. If, during the period of the investment, the taxpayer receives a permanent basis at least 5 new people,
4. If at least 80% of full-time resident in the territory of special interest for the Republic of Serbia.

The taxpayer is exempt from tax in proportion to their investments. Tax exemption is applicable if you meet the above conditions, starting from the first year when they realize taxable income. According to law, shall be exempt from profit tax and enterprise training, professional rehabilitation and employment of disabled persons, in proportion to the share of such persons in the total number of employees.

2. CONCLUSION

Tax incentives occupy a central place in the design development of fiscal policy. Fiscal management is particularly focused on stimulating taxation. When taxing companies are able to reduce their tax base and, in turn, receive tax relief in the form of reduced tax liability. Tax incentives are primarily intended for start-ups, as well as those companies that operate in underdeveloped areas and businesses in priority sectors of the economy. Corporate income tax is not the only form of taxation that encourages companies, but for this function has to be of use and value-added tax or a tax on profits.

The greatest effect is achieved if the tax incentives are defined in accordance with the industrial policy, which can most effectively influence the development of the economic structure. From this perspective, the most used tax incentives under the income tax. It is necessary to define the tax incentives of profit and

eliminate ad hoc decision-makers and to strive for a built-in incentive, which is activated automatically in case of fulfillment of the criteria for their use. In addition, tax incentives would in most cases you should be general, except that it must not neglect the crucial role of selective incentives in regional development. Serbia, in line with best international practice and our own experience, using the most tax incentives from income tax.

Among other tax incentives, it is important to mention the possibility of using accelerated depreciation, especially when combined with the transfer of the tax loss, which creates conditions for reduction and efficient management of future tax liabilities. Corporate income tax rate of 15% in Serbia will continue to be 10 percentage points lower than the average corporate tax rates in the EU-27, and lower in comparison to the rates that apply in most countries of the region. With the system retained the investment tax credit, which tax liability is reduced to 1/3, the effective tax rate in Serbia will amount to about 10% and will remain among the lowest in Europe. Therefore, it is estimated that an increase in income tax rates in Serbia would undermine the tax competitiveness of the country, of its attractiveness as an investment destination. Moreover, the moderate statutory tax rates, repeal of the investment tax credit, and reducing the difference between the effective and statutory tax rates would significantly undermine the requirements of business and investments in Serbia, since it is estimated that a significant reduction in corporate tax rates below 15% in average no significant positive impact on FDI inflows.

From the above it can be concluded that the size and structure of tax incentives in Serbia, in terms of investment, atypical compared to other transition countries aspiring to join the EU. A wide variety of favorable tax incentives, with the lowest rate of income tax, ranked Serbia among the most interesting and the most attractive emerging market countries to invest in Europe.

ACKNOWLEDGEMENT

Prof. dr. Bojan Krstic of mentoring in the development of scientific research

REFERENCES

Momirovic D., Zdravkovic D., 2009., Effect of tax incentives to build competition with a special focus on Serbia, vol 11, no. 23-24, pp 42-57

Raicevic B., Nenadic J., 2005., tax incentives in the tax system tax-comparative legal analysis of the decision in Serbia and Montenegro, Vol.50, No. .166,pp 81-107

Zhang Z., Zhang, W., 2011., The Road to Recovery: Fiscal Stimulus, Financial Sector Rehabilitation and potenacial risks ahead, *Journal of Asian Economics*, No 22, pp 311-321

http://glassrbije.org/privreda/finansijski-podsticaji-0

http://en.wikipedia.org/wiki/Depreciation

4th International Symposium on Natural Resources Management
"Sustainable Development and Green Economy in Transition Countries"
31st May -1st June, 2014, Faculty of Management Zajecar, Republic of Serbia
www.fmz.edu.rs

THE ROLE OF CORPORATE SOCIAL RESPONSIBILITY AND GREEN MARKETING IN CONTEMPORARY ECONOMY

Leposava Jovanovic[1],
Biljana Ilic[2]
Mladen Jovanović[3]

[1]*Teacher, Faculty of Management Zajecar, leposava.jovanovic@fmz.edu.rs*
[2]*Master assistant, Faculty of Management Zajecar, biljana.ilic@fmz.edu.rs*
[3]*Masterstudent, Faculty of Management Zajecar, leposava.jovanovic@fmz.edu.rs*

ABSTRACT

Each company in different ways manifest its social responsibility making a lot of effort to satisfy different needs of consumers. Marketing helps a company to meet its social responsibilities, encouraging proactive, but on the other side discouraging and limiting reactive reaction to social responsibility. Little by little, for better tomorrow it's good to awaken consciousness about the problem of sustainable development although some companies and individuals don't go into the matter of these issues. The constant question is if green marketing and the story of sustainable development are good tools that attract customers, which is essentially the purpose of marketing.

KEYWORDS

Social responsibility, sustainable development, green marketing

1. INTRODUCTION

Each company, no matter which branch of economy it comes from, has its primary assignment, to improve the quality of life, economic development, individual feeling of well-being, especially by a reduced use of non-renewable resources and the pressure on the environment and on the man. In its business each company also has to contribute to the improvement of natural, man-made and cultural values on the permanent basis.

Therefore sustainable development doesn't aim, nor has to aim to stop, but to improve development. And at the same time society, culture, environment where people live and work are not endangered by their undertaking and activities. Sustainability would mean a more dynamic process which enables people to recognize their potentials and improve life quality in a way that they, at the same time, keep and enlarge the basis for sustaining life on earth. The central question is how to turn sustainable development into practice?

1.1 Social responsibility of companies in business

Social and economic transformation of each economy brings new challenges for management, so the need to make profit can be in conflict with the wish of society for responsible behavior. That's why state, working for

the benefit of society as a whole passes and carries out laws that regulate a company behavior, protect consumers, competitors, the environment.

All the interested in the destiny of the company have some expectations from the changes it experiences. For numerous actions it is good for the company to get favor at least if not a support of important elements of the environment.

"After many, the greatest achievements and rises of mankind lie in technological progress and appearance of constant technologically superior and new products. Man has achieved once unimagined rises in conquering earth and universe" (Trandafilovic, 2013). However, that rise has its darker side as well, the more cars means the greater degree of air pollution, mankind goes in opposite direction, and such rapid development and progress become their own antipodes. But in recent years the concept of sustainable development, including green marketing gives hope because it evolved from the movement for environmental protection.

Appliance of social responsible marketing started in the 80s of the 20th century when American Express decided to donate 1 cent from each transaction made by American Express card to renewability of the Statue of Liberty. And for many companies it was a difficult period. "Productivity drastically dropped and executives of companies instead of looking for better ways of managing people, solve the problems of productivity by their elimination" (Jovanović, 2004).

Today that's the main way of charity giving of companies in developed countries. The accent is on profitable and non-profitable sectors so that a company's donations for charity and social purpose are directly related to selling a particular product. Socially responsible behavior of a company improves its image in society and it can also take a shape of not doing undesirable activities and/or doing positive actions.

The decisions about social responsibility are necessary to be seen and made as all other investment decisions. And all the activities on improving social responsibility should be observed from the point of benefits and expenses. It is possible to determine the level of social responsibility which maximizes benefit while the requests of many stakeholders are fulfilled. Hence social responsibility is seen as improvement of some social benefits above the company interest from what law asks.

The decisions made by managers can reflect one of four attitudes towards social responsibility of a company: 1. reactive, a company reacts to the strategic question only when it is opposed to the company's targets, that is to say it solves the problem when public finds out about it; 2. defensive, reacts to respond to a request. 3. attentive – a strategy of adjustment, it takes the same attitude as public opinion, a company takes over responsibilities for its own activities. 4. proactive attitude as a proactive strategy represents the most developed form when it foresees the requests that are not made yet, ready to bear responsibility regardless of any possible pressures coming from the surroundings, or regulations that government can pass. Activities of the company that applies socially responsible marketing mustn't be considered as a means of promotion, nor as exclusively various forms of donations or help. They, themselves are recognized by the surroundings as useful and they in a certain way influences a development of a community.

1.2 Social responsibility and the concept of sustainable economic development

There are many reasons for which a company must be responsible, some of them are – morality, to do a right thing- responsibility to stakeholders; 2. to explain its own interest and to be responsible to stakeholders, *to give as much as you get* quid pro quo 3. Reasonable investment policy –this leads to a bigger profit and higher stock prices – by this it is again responsible to stakeholders; 4. to keep autonomy- if a company in the long run doesn't use its power so as not being socially responsible, it can lose its autonomy. Hence the emphasis is on the concept of sustainable economic development, which enables the fulfillment of today's generation needs without questioning capabilities of future generations to satisfy their own needs. Of course it is macroeconomic level and it is not easy to operationally it on a company level, since it depends on stakeholders a lot. In any case activities of a company must be observed from the point of effect and benefit, not only for it but the whole society, taking into account that there are many differences among branches by potential damage for the society and environment.

"In recent years there are talks about ecological marketing, id ect about the need that marketing should take care of environmental protection" (Milisavljević, 1993). The task of marketing is to influence a product and a package to adjust so as to pollute environment as less as possible. Likewise, to contribute to use natural

resources (primarily energy power)as rationally as possible, ie. “to consider their exploitation in the long run” (Milisavljević, 1993).

1.3 Social responsibility and a company competitiveness

The task of a company is, after Kotler to define needs, requests and interests of target markets and to deliver a desired satisfaction, much better than a competition. In that way a company will not only keep but also enlarge benefit of both consumers and society. All this points out that criteria must be balanced; a company profit, consumers’ satisfaction, and a public interest. But a company must take care of its employees, only then workers are not workers, but partners – they breathe as a company. “Wise companies adopt a perspective of interior marketing since they realize that employees differ according to their needs, and by knowing their individual needs a company can serve them and satisfy them better” (Kotler, 2004).

Companies in competition are difficult to control, since market by means of profit mechanisms and by consumers’ free decisions, confirms social responsibility related to economic, social, cultural and natural environment. They are faced with a task of sustainable and responsible development in order to keep all the important environmental values, primarily the balance in which satisfaction of today’s consumer needs won’t endanger satisfaction of future generations’ needs. In that competitive, unfair, very seldom fair play match of companies, there is a question if they can do business philanthropically, without profit as a single target. If a company has started with the mission about profit, then there is no responsibility either to the society, nor consumers, not even to itself.

The purpose of a company business is, in creating activities and in competing, to make profit, cover expenses, invest in new investment projects, but at the same time to help create new jobs and provide protection of local eco systems. In fact, that’s a responsible dealing of a company which is friendly towards natural and cultural heritage.

“It is impossible to do business in the long run successfully if consumers are unsatisfied, if suppliers don’t deliver materials, if banks don’t give credits and so on. Understanding and mutual communication, ethical behavior of all sides are necessary” (Trandafilović, 2013).

It is necessary to do transformation of activities in the chain of values, to be useful for the society, strengthening at the same time a strategy of a company. Therefore philanthropy is of use to strengthen capability of a company to improve competition conditions in the surroundings, so integration of social needs and business dealings requires more than good intentions and strong leadership.

2. SOCIAL RESPONSIBILITY AND GREEN MARKETING

Green marketing is a form of social, ecological marketing in which all the products, services and all marketing activities are formed and done in harmony with what they can do and how they can influence the environment and society as a whole.

Today to apply green marketing, that is ecological, means to satisfy consumers’ needs in the way of behaving responsibly towards environment, even the very word green is included in the process of product development as well as communication towards market, together with the motivation an efforts of individuals and groups of people for ecological management.

“The initiators of the study and application of green marketing are producers of the most modern technology but at the same time the biggest environment pollutants. As such it is coupled with ecology. The principles of green marketing become a constituent part of marketing strategy of a company, with multiplied effects on the company success, consumers’ satisfaction and a general benefit to the community and the environment.

The principles of green marketing become a part of green marketing policy. And as a concept, green marketing besides policy definition and aims definition requires the area of activities, as well as the strategy of their implementation. Policy, aims, an area of activities and strategies of green marketing are a part of planning phase within green marketing management” (Milanović-Golubović, 2004)

With the growth rate of economic development the question of man’s working and life environment gains in importance. And the growth demands mass production, distribution and consumption, together with the

latest technical and technological processes, which necessarily brings negative implications on consumers as human beings.

Protection and preservation mean taking care of a man as a biological being, and then protection and taking care of values for his survival, existence and development.

"**The need of environmental protection intensifies the need of reviewing technology and resources which are applied in production and selling" (**Milanović-Golubović, 2004)

The experience in business of the biggest and the most famous companies from different fields and of different national origin in the global market indicates the activities of green marketing according to the fields: rational use of all sources of energy, use of natural sources, waste reduction, introduction of eco-packaging, protection of water, earth, air and animals.

Green marketing brings a lot of problems; how to adapt products, services, processes and other things with legal and other law regulations, different standards and norms in order to declare something eco or a green product or service. The conclusion follows that green marketing is more expensive than traditional, with which is more difficult to make profit even with a low price.

Adopting the concept of green marketing is declared as a strategy for achieving a competitive advantage and is based on four prerequisites and conditions: 1. firms mustn't count that consumers are ready to pay more for those products; 2. marketing statements (ads, labels…) concerning aspects of environmental protection should be completely clear and understandable; 3. the approach to the products of ecological marketing must respect the duration of production and usage cycle; 4. green marketing strategy should be proactive.

3. SOCIAL RESPONSIBILITY, GREEN MARKETING AND ECOLOGICAL AWARENESS OF CONSUMERS

Consumers are becoming more aware of global warming and constant violation of the environment. All over the world people are concerned about the environment and its protection so they change their behavior. As a result there is green marketing which requires sustainable and socially responsible products and services, and all those products and services must meet ecological requests.

Most people, consumers believe that green or eco marketing is connected to promoting or advertising products with ecological characteristics (contains no phosphates, can be recycled, preserves the ozone or protects the environment) and they associate consumers with eco marketing.

However green marketing is much greater concept because it can be applied to consumer goods, industrial goods, even services, it can be defined as product marketing for which it is presumed that they are safe and as such it includes a wide range of activities: a product modification, changes in the process of production, changes in packaging, as well as advertising a product. So all those activities give double results, provide participation in promotion process and education about the environment protection and what is more important by all these activities it is easier to get ecologically aware consumers.

Companies all over the world invest a lot of money in recycling, energy saving, however if consumers don't have information about that companies are not able to enjoy the benefit of eco marketing. Parallel with the appearance of eco marketing, the term "**GREEN WASHING**" showed up marking a form of propaganda in which green marketing is used in a tricky way promoting the policy and aims of a company as ecological. Most frequently in order to make bigger profit and sometimes in order to get political support green washing can lead to consumers' deception and get their support for suspicious purposes.

So ultimately everybody loses, both a company, such profit is short-termed and consumers who lose confidence and run to other companies – manufacturers. Let's remember the fact that they vote with their legs, as soon as they are not satisfied off they go, which is more dangerous. In public there is prejudice about a particular company as a concept of company STIGMA which is used in Anglo-Saxon literature and has a negative con notation. The society marks the company negatively.

The mission of a company is to prevent the appearance of such a view, to make a plan to neutralize that situation and to watch the company positively. Of course those are the processes which take place in a particular context, with a long-lasting effort and work of responsible and above all capable management.

4. CONCLUSION

A responsibility of a company for its activities must exist, even Smith in Wealth of Nations indicated its importance and need. Companies that survive in the market are socially responsible since market oriented to a mechanism of profit and a free decision of a consumer rewarded and punished companies. Well-functioning market, on one side, and profit as a motive on the other side, make sure that a company's behavior is socially acceptable. A classical aspect points out all the activities which are done regarding social responsibility for a final maximum profit. However a social economic aspect is wider, together with making profit it asks for protection and improvement of social community.

In 2010 European commission defined social responsibility as a concept by which companies integrate concern for the society and environment in all business activities and interaction with their stakeholders on a voluntary basis. However it's the best for both a company and a society if a company tends to be of some use to a society on a voluntary basis. Hence it is not denied that a company makes – maximize profit, and all its activities influence the environment and a well-being of a society, this is expected by all in the chain of business, employees, consumers, investors, creditors, state organs and other stakeholders.

Socially responsible and ecological orientation of marketing is the only one correct since it will eventually direct consumers to companies which won't deceive them.

REFERENCES

Jovanović M., 2004. *Interkulturni menadžment* , Megatrend Univerzitet, Beograd, p229.

Kotler F., 2004. *Ten Deadly Sins in Marketing*, Asee, p56.

Milisavljević M., 1993. *Marketing* Contemporary Administration, p19.

Trandafilović I., 2013. *Principi marketinga,* Megatrend Univerzitet Beograd, Fakultet za menadžment Zaječar.

Milanović-Golubović V., 2004. *Marketing Management* (fifth edition), Megatrend University, Belgrade, p56.

4th International Symposium on Natural Resources Management
"Sustainable Development and Green Economy in Transition Countries"
31st May -1st June, 2014, Faculty of Management Zajecar, Republic of Serbia
www.fmz.edu.rs

COPPER AND ITS IMPACT ON HEALTH AND SAFETY OF WORKERS IN METAL INDUSTRY

Ljiljana Trumbulović[1]
Zagorka Aćimović[2]
Ljubiša Andrić[3]
Nada Jovičić[4]

[1] *Higher Technical School of Uzice, Užice*
[2] *Univesity of Belgrade, Faculty of Technology and Metallurgy, Karnegijeva 4, Belgrade*
[3] *Institute for Technology of Nuclear and Other Mineral Raw Materials, 86 Franchet d'Esperey street, Belgrade*
Email addresses: lj.andric@itnms.ac.rs
[4] *Technical School of Uzice, Užice*

ABSTRACT

The aim of this paper is to draw attention to certain hazards of working with copper-base materials and copper alloys, as well as to the chemical properties and toxicity of copper compounds and their impact on occupational health and safety in metal industry. Different safety measures, means of protection and treatment methods for those exposed to occupational hazards are also discussed.

KEY WORDS

copper, safety measures, health

1. INTRODUCTION

Copper is an important technical material widely used both in the unalloyed condition and in combination with other metals with which it forms alloys (its best known alloys are brass and bronze). Due to its high melting point (1083 ^{o}C), copper can be easily combined with other metals to make alloys. Those metals include: nickel, zinc, tin, aluminum, manganese, beryllium, silver and gold.

Copper has a remarkable combination of properties due to which it is widely used in industry. Some of these properties are: high electrical and thermal conductivity (because of which it is widely used in electrical industry for the production of conductors); good resistance to corrosion (which makes it good for plating); it is easy to process by a deformation method and can be easily joined by soft soldering. Copper is very difficult to cast because it absorbs gases easily and causes porosity in castings. Its high toughness makes its processing by cutting difficult. Copper is hard to weld using the electric resistance welding methods.

Other copper applications include water pipes, cooking vessels, chemical and pharmaceutical equipment and the production of copper alloys. Copper is a metal which can also be used as a pigment.

Copper-sulphate is used as an algaecide and molluscicide in water, as a plant fungicide, as an abrasive, in electroplating, as froth (a corrosive substance) of the floatation agent in the separation process (for separating zinc sulphate from ore), as a tanning agent in leather production and protection. The mixture of

copper sulphate with slaked lime, known as *Bordeaux mixture*, is used as a fungicide in vineyards. Copper oxide has been used as a component of paint applied to ship bottoms, as a pigment in glass, ceramics, enamels, porcelain, as well as for grinding and glazing artificial gems. It is also used in the production of rayon and other copper compounds, such as optical glass, (including its polishing), as well as a solvent for chromic and iron ores.

Copper oxide is a component of the melting flux in copper metalurgy and pyrotechnic compositions, of the flux for bronze welding, and it is used as an insecticide and fungicide in agricultural production. Black copper oxide is used as a supplement to prevent copper deficiency in soil and as a soil amendment.

Copper chromates are pigments, catalysts for liquid phase hydrogenation and potato fungicides. Copper hydroxide is used in the production of battery electrodes and in the production of tin foil. It is also a pigment, food additive, dye mordant and an ingredient of fungicides and insecticides.

2. HAZARDS OF WORKING WITH COPPER

Amine complexes of copper chlorate, copper dithionate and copper acetylide are explosive, but are not dangerous for people or industry. Copper acetylide has caused explosions in acetylene plants, and it has been replaced with other compounds. If copper and copper alloy fragments remain in the eye for some time (a condition known as chalcosis), they can cause the inflammation of the uvea (uveitis), an abscess (a corneal ulcer) or even the loss of vision.

The workers who spray the vineyards with Bordeaux mixture may suffer from pulmonary lesions (sometimes called as “vineyard sprayer’s lung”) and copper-laden hepatic granulomas.

The negative consequences of the accidental ingestion of copper salts can be mitigated since by vomiting, the patients almost completely expel copper from their organism.

Copper-induced toxicity may occur in the following situations:

Oral administration of copper salts for therapeutic purposes;

- A considerable amount of copper dissolved from the tubing commonly used in hemodialysis equipment may be retained in a patient’s body, significantly increasing the hepatic copper concentrations;
- When added to the food for livestock and poultry, copper accumulates in their liver, and its concentration consequently increases in the liver of the people who eat these animal livers. The manure from the animals which eat the copper-supplemented food can cause the extraordinary high concentrations of copper in edible seeds and vegetables grown on the soil manured with it.

2.1 Acute poisoning

According to the information in scientific literature, soluble copper salts are toxic if consumed in large quantitites (by mistake or in a suicide attempt, etc). If ingested in gram quantities, copper sulphate, also known as “blue stone“ or “blue vitriol“, causes nausea, vomitting, diarrhoea, sweating, intravascular haemolysis and kidney failure, and it may rarely result in convulsions, coma and death. The consumption of carbonated water, lemon juice and other fruit juice which were in contact with copper containers, pipes and taps, can cause gastrointestinal irritation, which is rarely dangerous. Such drinks are acidic enough to dissolve copper in the amounts that can irritate. There are certain reports about ulcers and skin irritation induced by copper, but the information about its other toxic effects is sparse (for example, the information about mine workers in plants with electrolyte baths, where the cause of harmful effects is the acid, not copper). In some cases, the use of copper salts for the treatment of skin burns causes high concentratons of copper in serum, which results in toxic manifestations.

The inhalation of dust, fumes and mists of copper salts may cause the congestion in nasal mucous membranes, nasal ulcerations and nasal septum perforations. Employees who work in copper and copper alloy foundries are constantly exposed to the harmful effects of copper fumes, which can significantly damage their health. Smoke and fume emission from the surface area of heated and molten copper can cause fever, nausea, abdominal pain and diarrhea.

2.2 Chronic poisoning

Chronic toxic effects of copper on human beings have only been recorded in the individuals with the autosomal recessive genetic disorders, the consequence of which is the development of a disease known as Wilson's disease, though this rarely happens. The amount of the daily dietary intake of copper by humans is usually 2-5 mg, and almost nothing of it is retained in human body. The adult human body contains about 100-150 mg of copper most of the time. In healthy individuals (who don't have Wilson's disease) almost all of the copper is present as an integral and functional part of one or several proteins and enzymes.

The daily copper intake is ten or more times higher in individuals who eat large quantities of oysters and other shellfish, mushrooms, nuts and chocolate, all rich in copper, as well as in those workers who work in the atmosphere laden with 1-2% of copper ore dust.

However, no evidence of primary chronic copper toxicity has ever been found in any individual, except in those with Wilson's disease (based on the observation of patients with inherited chronic copper toxicosis – Wilson's disease, which causes the disfunction of and structural damages to the liver, central nervous system, kidneys, bones and eyes). However, excessive amounts of copper that have been found in the liver of the patients with cirrhosis, cholestasis and Indian childhood cirrhosis additionally contribute to the severity of the hepatic disease which is characteristic in such cases.

3. SAFETY AND HEALTH MEASURES

The workers who are exposed to copper dusts and mists should be provided with the appropriate protective clothing in order to prevent the repeated or prolonged contact with the skin, Figure 1.

The individual protective equipment is necessary in the situations when hazards cannot be eliminated or sufficiently controlled by technical means of collective protection or organization procedures. In the situations when dust conditions cannot be satisfactorily controlled, the appropriate respirators and eye protection gear are necessary. It is essential to ensure the appropriate hygienic-sanitary conditions, while food consumption at workplace should be prohibited.

Helmet: Protection of person; Eye

Overalls

Earmuffs: caps, wool

Gloves: Leather, set

Footwear: Ribbed sole

Fig.1. Some parts of the protective clothes

The individual protective equipment is necessary in the situations when hazards cannot be eliminated or sufficiently controlled by technical means of collective protection or organization procedures. In the situations when dust conditions cannot be satisfactorily controlled, the appropriate respirators and eye protection gear are necessary. It is essential to ensure the appropriate hygienic-sanitary conditions, while food consumption at workplace should be prohibited.

Workplace moulders with an increased risk, because the worker is exposed to the harmful effects of copper and zinc vapor, radiant heat and large microclimate (high temperature) overdrafts in the summer. Measures need to be implemented to reduce risk include: increased vigilance when using the work equipment, use of protective masks the occurrence of vapor, dust and smoke, exercise and periodic medical

examinations for 12 months, use the antiphons for hearing protection, face shields used to protect Radiation and provide enough water (mineral water) in a given extreme summer temperatures.

In mines with water-soluble ores, workers must be especially careful when washing their hands with water before eating. The metal fume fever preventive measures imply keeping the exposure below the concentration level which is accepted as satisfactory for workers in copper industry. Using the local exhale ventilation is inevitable in order to capture copper mists and fumes at their sources. People with Wilson's disease should not be employed in copper industry.

The serum concentration of ceruloplasmin is an important indicator, since the level of the copper protein in unaffected individuals ranges from 20 to 50 mg/100 cm3, whereas 97% of patients with Wilson's disease have less than 20 mg/100 cm3. However, this is a relatively expensive procedure for broad-based screening programmes.

4. CONCLUSION

Copper, in the form of different compounds and alloys, is widely used in industry. It also plays an important role in human metabolism. Its numerous applications increase the possibility of human exposure to its harmful effects, both in industrial processes and when using certain products with copper as their principal element.

In addition to various business activities, managers at all levels of an organization, have a very important task to do – to manage the risks that may arise when using copper, its compounds and alloys, because it is the only way to ensure safety and health at work.

The consistent implementation of regulations and safety measures in production processes would significantly improve and simplify the process of designing, manufacturing and testing copper-base products, as well as their use and applications. This would reduce the negative effects of these products, improve the comfort in the workplace and protect the workers, regardless of the risk levels. Great efforts should be made to provide all copper processing plants with proper ventilation. The workers who are exposed to copper dusts and mists should be provided with the appropriate protective clothing in order to prevent the repeated or prolonged contact with the skin. In the situations when dust conditions cannot be satisfactorily controlled, the appropriate respirators and eye protection gear are necessary. When planning work and employment, organizations should try to reduce the number of workers who would have to be exposed to copper dust as much as possible.

ACKNOWLEDGEMENT

This investigation was supported by Serbian Ministry of Education, Science and Technological Development and it was conducted under following project 33007.

REFERENCES

Law on Safety and Health at Work, 2005., "Offic. Gaz. of RS", no. 101 / 05.

Regulations on the procedure for the assessment of risks in the workplace and in the workplace, 2006., "Offic. Gaz. of the RS ", no. 72 / 06.

Arsenijević, S. et al.,1990. *Chemistry and Chemical Technology*. Encyclopedias, Prosveta, Beograd.

Law on Chemicals, 2000.

htp ://www. environmental sredine.com-heavy metals.

htp://www.farmamrazovac.com.

4th International Symposium on Natural Resources Management
"Sustainable Development and Green Economy in Transition Countries"
31st May -1st June, 2014, Faculty of Management Zajecar, Republic of Serbia
www.fmz.edu.rs

BENEFITIAL MODEL FOR TECHNOLOGICAL DEVELOPMENT OF BUSINESS SYSTEM IN METAL PROCESSING INDUSTRY OF SERBIA

Milan Đuričić[1],
Ahmed Mumdžić[2]
Ljubiša Andrić[3]
Marko Pavlović[4]

[1]*Faculty for Industrial Management, Majke Jugovića 4, 37000 Kruševac*
[2]*State University in Novi Pazar, Vuka Karadžića bb, 36300 Novi Pazar*
[3] *Institute for Technology of Nuclear and Other Mineral Raw Materials, Franše d'Epere 86, 11000 Beograd*
E-mail: lj.andric@itnms.ac.rs
[4]*University in Belgrade, Faculty of Technology and Metallurgy, Karnegijeva 4, 11000 Beograd*

ABSTRACT

This paper presents research results of a benefitial model for technological development of business systems in metal processing industry of The Republic Of Serbia. On one hand, an analysis was carried out from the aspect of globalisation conditions; on the other, an intention for an economic regionalization of Serbia was taken into account. KOPPSIO system was fully obeyed as a model benefitial for sustainable industrial development.

KEYWORDS

Business systems, technological development, metal processing industry, KOPPSIO system, sustainable industrial development

1. INTRODUCTION

Serbia is a small and poor country. It relies on foreign loans and revenues gained mostly due to a sale of national wealth and to insufficiently utilized resources. Serbia has not accepted business standards governing the internal EU market, although it tends to be its part. Transition caused more economic, social and demographic problems than benefitial opportunities. All former advantages are lost. Therefore, metal processing industry and the economy as a whole are in a structural disbalance, looking for the ways to recover devlopment trends. With the usage of both bench-marking and re-engineering methods, Serbian development must be re-oriented in order to be brough into accordance with development of technological leaders, especially with EU countries, as it tends to be an equal part of it. Future development must be based on a benefitial model for technological development of business systems. At the same time, all relevant business factors are to be identified and analysed in order to suggest a model respecting the interests of each individual economic system. [1-5] As huge Serbian business systems vanished, medium and small business systems emerged. As research results have proven, these systems mostly cannot apply the technological development model suggested but they must adjust their own technological development to their own demands and capabilities. They must be aware that they cannot be self-sufficient and independent. That is, they must connect to large business systems and, further, to participate in innovative actions of similar systems, with an aid of the existing scientific research organizations, research & development centers, innovative centers, high schools and faculties, being the subject of research in this paper. [6-10]

2. RELEVANT FACTORS FOR TECHNOLOGICAL DEVELOPMENT OF BUSINESS SYSTEMS

Technological developemnt of business systems is a complex notion including three basic fields: technology, development and business system. It encompasses aspects referring to growth of producution values, improvement of production technology and organization, development of individual functions, i.e. departments, as well as forming new ones, expansion of production range, improvement of working conditions and improvement of a complete business system organization.

An analysis established relevant factors for technological development of business systems in metal processing industry, first of all: technological & economic frame of modern business; technology management with an insight into Technology management in a business system; analysis of a business system ambient, where development of business systems with superior competitive performances was examined, as well as the research & development data required for superior components.

A technological-economic frame of modern business was discussed in such a way that a system was observed in reference to two inter-connected and conditioned sub-systems: the first sub-system refers to material and energy conversion from one form into another, while the second one deals with information conversion from one form into another. In the first years of the 21st century, most business activities don't result in an input transformation into a material product. According to data, economic sectors had the added value share of just a bit more than one quarter (27%, where agricultural sector had a 7% share and processing industry a 20% share) , while service sector had a 61% share. [10]

A business system taking care of its own future must be: innovative and open for changes and innovations, in order to succesfully acquire, create and manage the same; it must both achieve competitive and secure strategic positions; it must improve innovative capabilities and competitive development; further, it must include a technological aspect in formulating the business strategy.

In each business system, there are three basic tasks for technology management: to manage a business system; to manage the managing-professional structure making the business system productive on the basis of human and material resources, and to manage the employees and the labor.

Technology management (MT) is a design for the total business system, as well as for a wider economic-ecological system where a human being exists (ECO SYSTEM). Technology management is based on both scientific and technological knowledge referring to various areas of human needs and activities. It has two strategic paradygms:a product of generating technologies and the technology of generated products.

In MT, managers, professionals and laborers build a model of technological management (PTM) depending on: arena-AR (natural, artificial); aspect-AS (theory, practice); phase-FAZ (analysis, synthesis) and factor-FAK (goal, space, structure, time, process, efficiency).

Modern approaches referring to technological management in a business system are based on a design concept based on „product life cycle"(life cycle product design), where product & process design is based on the design ensuring environment protection and development of recycling technologies. It includes introduction of „clean" technologies securing environment protection regardless of a huge turnover of goods in the condition of market economy and globalisation. Improvement and development of production-business system depend on the ambient of technological development. Each production-business system carries out its activities within its own environment building, at the same time, various environments, Fig.1. Ubiquitous globalisation is a paradygm of the New Age. Globalisation determines and imposes very strict rules to all participants in social life. It is an imperative for all of them to fit in with these rules: global politics; global finance; global knowledge; global industry; global military alliances; global corporations; global technology; global marketing. Fig. 2. shows the model development of production technologies.

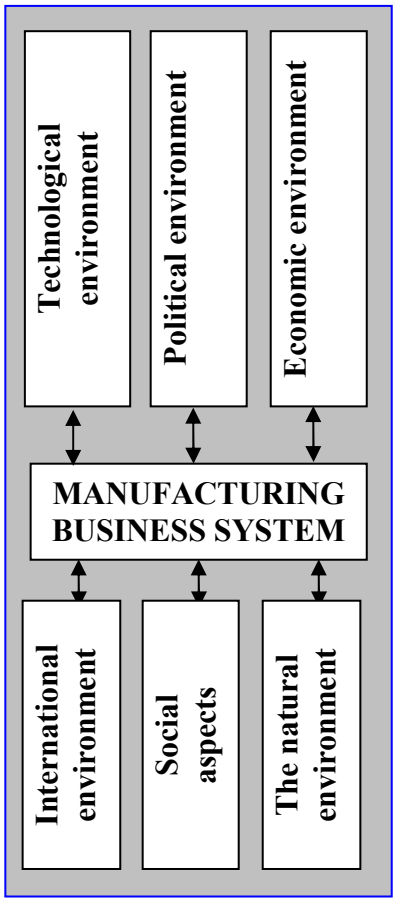


Fig.1 Manufact. business systems and environment

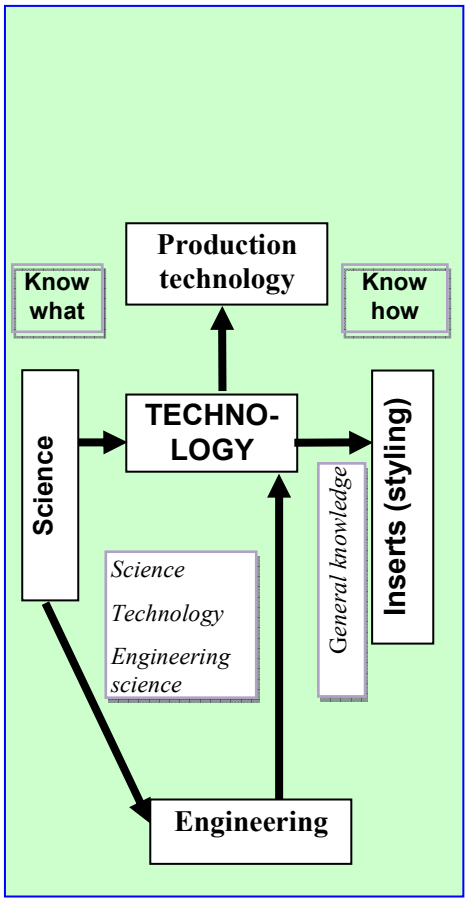


Fig.2 Model development of production technologies

Technological development of production-business systems must be based on adequate and timely made development decisions featured by the following: decisions must be exclusively based on relevant facts; decisions must be prepared by using adequate scientific methods; decision must be made timely according to the plan and when carrying out individual decisions, the methods of a scientific occupational organization should be used.

According to when observed from a national stand point, it is impossible to get out of the existing crisis without carrying out the following: educating the population and forming a society possesing certain knowledge; developing new generation of industry as a base for economic development of the country; domestic concept of banking-financial system; managing the state and its systems by using some ideas for a future reference, and ecological intelligence.

3. FINAL DISCUSSION

Technological development management related to business systems in metal processing industry of Serbia in each stage of its formation, development and application is particularly important at social level in general. Through this, it is possible to ensure an even regional development. In future, only business systems able to manage knowledge, perceiving that investment in training and development of human resources is the most important task, will survive. They will survive if they knew that intelectual capital has become an important tool of business systems. Improving innovative capabilites influences formulation and economic power of business systems, local community and the economy in general. Management of a successful business system formulates and develops a technological strategy adjusting the same to the strategies of other business systems . This primary refers to financial and marketing startegies, as well as to human resource strategy. Technology management represents a design of both a total business system and a wider economic-ecological system where humans exist (EKO=KOPPSIO SYSTEM). To a large extent, technology management depends on the ambient where a technological development is carried out. There is no business system which could not be improved or developed through activities in its own environment, and not in globalisation conditions.

The leading position and profit for a business system may be reached through pro-active procedures, predicting and welcoming the new events, making changes and leaving others to adjust to such changes. A successful business system does business in the conditions which may be described with new terms: intelectual capital, capital of knowledge, organization of knowledge, organizational learning, information century, the time of knowledge, information advantages, intangible values, intangible management, hidden values, human resources. They describe new notions – forms of economic values. Superior competitive performances may be secured for a business system through certain research & development tasks using a logical sequence of establishing connection between analysis of business systems and functional decomposition of business systems.

According to economic competitiveness, Serbia is much behind EU countries due to a low level of knowledge applied to product and service structure. It was suggested to apply a proven receipt to improve competitiveness as follows: systematic approach for application of research and innovation results in practice; financial support of government to research & development; investments into industrial research and development; promoting importance of research and development and innovation for the society; development of enterpreneur's mind, especially in applying innovations; co-operation with regional and EU partners and market economy, improvement of small and medium enterprises sector, orientation towards exports; innovation has become a very actual topic over the recent years leading to an intense global competition. PS must constantly develop themselves in order to be competitive; proposed model TRPS in MPI should not create innovations itself, isolated from the rest of the world; norwegian experience in forming an innovation system may be useful for Serbia.

4. CONCLUSION

In order to develop metal processing industry in The Republic Of Serbia faster and more, a 4-level concept for securing competitiveness for production-business systems was designed. It was suggested to form a technological research center as a new organizational form aimed to incite regional development of scientific research activities as a support to innovative development of business systems aimed to gather together all actors interested in development of innovative activities and overal development.

ACKNOWLEDGEMENT

This investigation was supported by Serbian Ministry of Education, Science and Technological Development and it was conducted under following project 33007.

REFERENCES

Sterlakini ,A., 2007. *Economics of Innovation.* Ancona Polytechnic University,.

Andreosso, B. and Jacobson, D., 2005. *Industrial Economics and Organization: A European Perspective.* Second edition, The McGraw-Hill Education.

Boskovic, D., 1979. *Organization of research and development in a joint operation*. Modern administration, Belgrade.

Innovation audit, 2005. *Survey of innovation performance in Serbia.* ECORYS Research and consulting, EAR.

Radovic, M. M., 1999. *Production Systems-Design*. Analysis and Management, Culture, Belgrade.

Djuricic, M. R., 2007. *Management of technological innovation-an important prerequisite for successful industrial development of business systems*-opening lecture at Conferences "Industrial Management and Development", Krusevac, December.

Djuricic, M. R., Bjelic, S., Djuricic, R.M., Misailović, V., Djuricic, M. M., 2008. *Technological innovation and competence metal-processing activities.* RCC, Uzice.

Krstic, M., Besic, M., Bojković, R., 2007. *Standardized innovative methodology to increase operational competitiveness.* May Conference on Strategic Management (MKSM07), Jagodina.

Djuricic, M. M., Krstic, M., Djordjevic, Lj., 2009. *Relevant aspects of technological development and the organization of production and business systems.* Journal IMK Research and Development 14, No. (20-31) 1-2 pp.115-121.

Djuricic, M. M., Krstić, M., Djordjević, LJ., Aćimović-Pavlović, Z., 2010. *The Technology-Research Center Concept for Promotion of Regional Technological Development.* Proceedings of the International Conference "Management 2010", Krusevac.

4th International Symposium on Natural Resources Management
"Sustainable Development and Green Economy in Transition Countries"
31st May -1st June, 2014, Faculty of Management Zajecar, Republic of Serbia
www.fmz.edu.rs

DECISION MAKING IN AGRICULTURE USING LINEAR PROGRAMMING SIMPLEX METHOD

Milan Grujović[1]

[1]*Kragujevac, Dragojla Dudića13, milangrujovic1979@gmail.com*

ABSTRACT

In recent years we often hear that the Republic of Serbia has very favorable conditions for the development of agriculture. Everybody keeps talking about reviving of the Serbian villages. However, Serbia has a large number of villages which are in very bad condition and the question is how they will survive and how to improve the conditions of life in them. Their further evolving and existence depends on the creation of adequate life conditions in the villages themselves. Serbian farmer is often struggling with the dilemma which crops to sow on his property, taking into account both the investment and the profit on one hand, and on the other, he must not disrupt the environment. Due to the economic crisis and in order to achieve the maximum benefit, one should properly decide which crop is more profitable. Arable land is the basis of agricultural production. At a time when, on the one hand, there is a large resource potential and, on the other hand, insufficient use of these natural advantages, planned and sustainable use of resources with appropriate incentives and agricultural policy, is the basis for the achievement of the strategic objectives in the field of agriculture. Mathematical method, called linear programming, can be applied in order to systematically develop and grow the most profitable farming culture.

KEYWORDS

Agriculture, decision-making, sustainable development, linear programming.

1. INTRODUCTION

Decision-making involves the development of global thinking and an integrated approach to problem solving. Within the various resulting problem situations, there may be one or more problems to be solved. Decision makers are often faced with lots of challenges in such situations. When making decisions, it is necessary to take into account some parameters such as the time dimension, responsibility, authority, implementing decisions as well as the consequences and the implementation of those decisions. It is believed that the decision making is as old as mankind, because it is part of man's everyday life.

Decision-making can be regarded as the selection of an option between two or more possibilities of action that are available to the decision maker when achieving a goal (Wolf & Runzheimer, 2009).

In the past few years, a new science has developed - decision theory dealing with decision-making. From a scientific point of view, there are a number of methods that serve as a way of solving problems in decision making. It is a process that requires a variety of activities, interconnected and conditioned with the ultimate goal of making a decision. Decision-making is most often caused by problems that need to be addressed. It also involves exploration of a large number of solutions and selection of the most appropriate ones for almost every problem. These decisions are based on scientific grounds, not on the intuition of the person who makes the decision.

2. DECISION MAKING IN AGRICULTURE USING LINEAR PROGRAMMING SIMPLEX METHOD

2.1 Sustainable Agricultural Development

Agriculture has played an important role in the history of mankind. It is assumed that the start of agriculture dates back ten thousand years ago. The man started to breed animals and cultivate crops in order to survive. In time, this activity created the favorable conditions to leave the nomadic lifestyle and enabled men to settle permanently in one place. The beginning and development of agriculture led to the development of the oldest civilizations in the world in countries such as China, India, Mesopotamia and Egypt.

The most common factors that influence the development of agriculture are natural, demographically and economically. In conditions of limited and valuable natural resources, the need for their rational use, which would support the achievement of sustainable development, is evident. Lately the scientists often talk about sustainable development which means the development that ensures meeting the needs of present generations without compromising the ability of meeting the needs of future generations. It is based on a reciprocal relationship between economic, social and environmental factors. This kind of development occupies an increasingly central role in the consideration of the survival and prosperity of mankind. Sustainable development should be a harmonious relationship between environmental protection and economic development. One of the biggest challenges facing the Republic of Serbia is solving problems in the field of environmental protection and sustainable management of natural resources.

Land in agricultural production is one of the most important factors. It is formed very slowly, but destroyed and degraded rapidly. Anything that threatens the land, threatens the health and survival of man, too. Sustainable development of agriculture means optimal utilization and conservation of available capacity in the agricultural production, where human needs for food and achieved economic viability are met entirely. This ensures a successful process of economic development and significantly contributes to the alleviation of existing differences in rural areas.

Compared to all other economic activities, agriculture shows the highest dependence on natural conditions (climate, terrain, and the presence of water for irrigation). The modern term for farming is agriculture. (Dragan Mihajlović, p.189 "Strategic Management of Natural Resources").

2.2 Decision-making in agriculture

Decision-making in agriculture is important for many reasons, but the two most important factors faced by farmers are price and yield volatility. One of the main causes is climate change that will lead to extreme weather events which will have a negative effect on yields in the future. In addition to these, there are environmental factors-polluted water, earth, air, declining fertility and soil erosion. The disruption in the supply and demand of agricultural products is expected due to the increasing world population and limited natural resources.

Economic fertility represents a yield of crops, which is the result not only of natural conditions, but another man's activities: neutralizing harmful chemical elements, establishing water and air regime, the use of fertilizers, appropriate treatment, the use of protective chemicals and others. Thus, fertility is determined by the composition and structure of the soil, but it may be significantly increased by the use of modern agricultural measures and it can also be reduced in the absence of such measures (Magdalinović).

The main aim of leading the agricultural household is to achieve takings or profit that can show efficient use of resources. Everything that the human does has a certain risk which is the part of his life. In general, risk can be defined as “factor, thing, element, or course which includes suspense or danger.” In order to reduce the risk the right decision should be taken. The choice of solutions in the process of making decisions is an answer to existing problem which is identified.

2.3 Simplex methods of linear programming

Linear programming is a special method of mathematical programming. By use of linear programming, many practical economy problems can be solved. Linear programming development started during the Second World War, and it was used for the needs of minimal military expenses. This model was formulated by a Soviet mathematician Leonid Cantorovic in 1939. The method fully developed not before 1947. when an American mathematician George Dantzig found a very efficient method for numerically solving problems of linear programming. That's the Simplex method, which is nowadays a basic method of linear programming, too.

The first step in the Simplex method is to determine the initial solution. The way of formulating the initial solution depends on the fact if the problem is to determine the maximum or minimum. If the problem is to determine the maximum, one should start from the solution in which the lowest available value of structural variables is zero. The value becomes higher with every further step. If the problem is to determine the minimum, one should start from the highest possible solution which gradually becomes lower. After the initial solution is being formed, its improvement should be reached. The improved initial solution is then being investigated if it's optimal or not. If it's not, the solution becomes improved, and each of the steps is called iteration. If an optimal solution is got in the end, or if an optimal solution does not exist at all, the method application ends. If the solution which is reached in the end is optimal, then the optimal values are being read.

The way by which a new solution is reached through investigating if it's optional or not, is called simplex algorithm. A detailed description of the use of this method can be given in the table or without a table at all.

2.4 The use of Simplex method in agriculture

Simplex method is used in a rural household in the territory of municipality Knić. This municipality is situated in the valley of the river Gruža. It extends in the direction from north-west to south-east and it is opened towards the valley of the river Zapadna Morava. Most of the municipality is the pit of Gruža, which is situated between the mountains of Rudnik (1132m), Kotlenik (749m) and Gledić mountains (922m). The borders of this municipality are: on the north the municipality of Kragujevac (which is 20 km far away), on the north-west the municipality of Gornji Milanovac (which is 40 km far away), on the west the municipality of Čačak (which is 38km far), and on the south the municipality of Kraljevo (about 40km far)[1].

The most important nature resources of the municipality of Knić is the agricultural land which is 66,06% of its total area. Agriculture is the most common sector of industry. Fertile land in the valley of the river Gruža is suitable for the growth of crop plants. On the territory of this municipality (413 km2), 49,66% of the land is cultivated. Fertile pieces of land in the valley of the river Gruža and around the Lake of Gruža offer the possibility for organic agriculture development that is the production of healthy food, without any pesticides and other chemical things. It is prohibited because of the closeness of the lake of Gruža, and its water is used for drinking. The advantage of the organic agriculture is conservation and environmental protection, by which clean water, air and soil is guaranteed.

This household is an agricultural one that produces cabbage and carrot. They have two farms, of 10 and 15 ha, where these crops are raised. Based on their record, it has been found that the profit of the cabbage on the first farm is 400 metric cents, and the profit of the carrot is 300 metric cents. The profit of the cabbage on the second farm is 450 metric cents per ha, and the profit of the carrot is 350 metric cents per ha.

It is necessary to provide at least 3000 metric cents (mc) of cabbage and 2000 mc of carrot. The value of one metric cent of cabbage is 1500 n.j., and of one metric cent of carrot is 2000 n.j[2].

According to the available records, it is necessary to help this household, to determine an optimal production (where and in which quantity the cabbage and the carrot should be raised) and to form a linear model of cabbage and carrot production which will provide the maximum profit for this household.

The fields in which cabbage is raised are marked with x1 (ha) on the first farm and x2 on the second farm, and the fields in which carrot is raised are marked with x3 (ha) on the first farm and x4 on the second farm.

This means that the following limitations have been set up (assuming that all the fields have been used):

---

[1] *Google Maps*

[2] *Legend: 1mc = 100kg, 1 n.j. = 1 RSD (Serbian dinar) = 1/116 EUR*

X1 + x3=10 (farm 1), x2+x4=15 (farm 2).

The fields cultivated with cabbage should give profit more than 3000 mc, that is 400•x1 + 450•x2 ≥ 3000

The fields cultivated with carrot should give profit more than 2000 mc, that is 300•x3 + 350•x4 ≥ 2000.

The profit from the cabbage will be: 1500•(400•x1 + 450•x2), and the profit from the carrot will be 2000•(300•x3 + 350•x4).

An overall profit (the function of the goal which should be maximized) is:

F=1500•(400•x1 + 450•x2)+ 2000•(300•x3 + 350•x4) = 600000•x1+ 675000•x2+ 600000•x3+700000•x4.

Based on the above mentioned, a mathematical model of this problem is:

(Max) F= 600000•x1+ 675000•x2+ 600000•x3+700000•x4.

To make an estimate easier, an equation is divided by 105.

With these limitations:

x1 + x3 = 10

x2 + x4 = 15

400•x1 + 450•x2 ≥ 3000

300•x3 + 350•x4 ≥ 2000

x1≥0, x2≥0, x3≥0, x4≥0.

An optimal solution: : x1 = 15/2, x2 = 0, x3 = 5/2, x4 = 15, or x1 = 7.5, x2 = 0, x3 = 2.5, x4 = 15

Maximum profit is[3]: F = 165•105 = 16.500.000 n.j (RSD) ≈ 142.214 EUR[4].

3. CONCLUSION

Agriculture is one of the oldest human activities which are the basement for the solutions of many problems characteristic for rural areas. Agricultural production and conservation of agrar resources should be one of the most important goal for improving development of the villages. The only way for keeping the residents of the village is giving the conditions for work on their own family`s business. Development of rural areas will give better conditions for balanced regional development.

The chance for faster economic development is turned to agricultural production. People have to take care of sustainable use of natural resources and conservation of environment for the sake of the future generation. The quality of the human activities will mostly depend on achievement and keeping such balance. It means that young will inherit not only the goods made by a man but natural goods like arable lands.

The aim of development and improvement of agriculture, making the better conditions for life and work in rural areas and eradication of poverty can be achieved through right decision.

Agriculture production is seasonal, so there are uneven costs during the year and different crop and the risks of dealing with it. The question of running in agriculture is becoming popular because of natural and social facts. Investment into development of agriculture demands scientific research which can be showed through mathematics methods of linear programming or Simplex method. The maximum limit of profitability of production on the certain size of the land should be taken care of by the Simplex method. In such way, the economic result of agriculture production is improved and competitive advantages on the market can be reached, so both of them are the source of profit for the farmers.

[3] *See following attachment on page 6 and 7*

[4] *Note: In this task resource expenses haven't been taken under consideration, so maximum profit is not a real profit, but all the expenses should be substracted (the price of seeds, mechanization, human resources, fertilizer, agents against pets, etc.)*

REFERENCES

Jovicic, Z., 1994. Sumadija-the central part of Serbia, Serbian association of geographer, Belgrade

Linear programming – simplex method, University in Novi Sad, Technical faculty,2005 http://ccd.uns.ac.rs/aus/mopt/mopt_doc/simplex_linearno_programiranje_2005.pdf(20.03.2014)

Magdalinovic, N., 2007. Running the natural resources, Inogor, Zajecar

Magdalinovic, N., Jovanovic, R., Stanujkic, D. 2009. Linear programming in the function of managing projects and production in mineral industry. *Economics*, 55(1-2), pp177-184.

Mihajlovic, D., 2013. *Strategy of managing natural resources.* Megatrend University Belgrade, Faculty of Management, Zajecar.

Wolf, K., Runzheimer, B. 2009. *Risikomanagement und KonTraG:Konzeption und Implementierung*. Wiesbaden: Gabler.

Stanujkic, D., 2012. *Information technologies.* Faculty of Management, Zajecar.

4th International Symposium on Natural Resources Management
"Sustainable Development and Green Economy in Transition Countries"
31st May -1st June, 2014, Faculty of Management Zajecar, Republic of Serbia
www.fmz.edu.rs

THE RE-CULTIVATION OF LAND DAMAGED BY UNDERGROUND COAL MINING IN SERBIA

Prof.dr. Mirko Ivković [1]
Doc.dr. Jovo Miljanović [2]

[1] *Mining Institute-Banja Luka,email:mirko.ivkovic@jppeu.rs*
[2] *Mining faculty-Prijedor,email:miljanovic.jovo@gmail.com*

ABSTRACT

This paper presents the problems of recultivation of land damaged by the works of underground coal mining inside mines of PLC UCM - Resavica.
Treated issue is of great importance to environmental protection, because intensive mining operations rapidly degrade environmental protection, and taking appropriate measures is mandatory for all mines.

KEYWORDS

re-cultivation, underground coal mining (exploitation), coal mine, environment protection

1. INTRODUCTION

In carrying out mining operations, rather surface or underground coal mining, large and small areas of land are destroyed. Experience shows that land degradation is significantly higher in open cast mining systems where the content area degrades not only in the contours of the mine but also in the surrounding area and changes are also edit in the natural course of events and conditions. In underground mining are present appearance of the takeover of land by objects and landfill and deformation of the ground surface above mine space.

Landfill of tailings in underground coal mining are areas used to dispose tailings generated in the pits works of construction of underground facilities and tailings facilities in the preparation and processing of coal.

Tailings material in its properties is biologically sterile, and by moving and mixing the layers of the overburden layer is obtained by a heterogeneous composition and is usually called techno-genic land (deposol, rekultisol, flotisol). To give this land economic and biotic potential, it must be re-cultivated.

By excavation of a part of the deposit of mineral raw materials, in the affected underground massif is formed (uncovered) space which causes a certain settling and stratification of the rock mass, is also expressed in multi lying rock layers and "definitely" over the excavated area of the central zone in the reservoir.

Basic forms of disturbance undercuts rock layers with excavated underground works include the resulting cracks and crevices in the rock massif deposits. In addition, cracks are smaller, and crevices are greater degree of disturbance of rock strata. In situations where the appearance of cracks and fissures created such a disruption of the rock layers to lose Self-load time, then there is a complete violation of undermine rock layers. Practically distortions of undermine rock layers reach the surface and manifest themselves on the ground undermine terrain, vertical and horizontal scrolling. Through vertical displacement are formed so-called recess of undermine field, and on the ground there is a change in the slope and curvature of field. The immediate consequence of horizontal ground movements are cracks and crevices, and the appearance of

wrinkles on the ground. Horizontal deformation of the soil and ground movements are a consequence of stretching or compressing massive rock deposits, and it has a special significance in terms of distortion of individual objects on the surface and by this indicator, determine the appropriate category of protection of surface facilities.

As the joint effects of vertical and horizontal displacements, on undermined ground there are landslides, which, like the corresponding distortion field can occur outside the direct influence of underground excavation works on the surface of the field.

Restoration of this field deformation is usually carried out by works of technical re-cultivation.

In earlier active mines that have been closed, mainly due to the exhaustion of coal reserves, has been implemented only partial technical re-cultivation, and biological re-cultivation has not been performed systematically and it is expected a self-re-cultivation of damaged areas.

2. RE-CULTIVATION OF DAMAGED LAND IN UNDERGROUND COAL MINES

The term damaged land means those areas that are affected, directly or indirectly, by particular activity, in this case the underground mining of coal, which are changing the basic properties of such land. In addition to this, commonly used term is and devastated areas, which means the lifeless surface after use, without the layer of fertile soil suitable for further processing (use).

Each tailing material is biologically sterile, and by moving and mixing of this overburden the surface soil becomes usually very heterogeneous composition. When this happens, a number of problems occur: deterioration of drainage by increasing its transcendence, lack of nutrients, weak fauna activities, compacting and depending on it destruction of soil structure. Damaged land is coming to a new purpose by the works of technical and biological re-cultivation, where land re-cultivation is a collection of works for rehabilitation (reconstruction) productivity and economic value of the damaged area, as well as to improve the conditions of the surrounding environment.

Technical re-cultivation precedes biological re-cultivation and includes the preparation of the land surface for its later dedicated commercial use, restoration of fertile topsoil, surface leveling and removal of harmful substances.

Biological re-cultivation of land includes measures of soil fertility after technical reclamation. It implements a set of agro-technical and fitomeliorativ measures aimed at restoring the flora and fauna. Biological re-cultivation is essentially an upgrade in terms of training land for crop production.

In the company PLC UCM coal mining by underground mining is carried out in eight mines with eleven mining pits, while surface mining is performed in one locality (PK "Progorelica" - Ibar Mines coal) with a relatively small surface mine mountain character. In all mines are present appearance of land damage done by mining operations and tailings, and that is why is required taking measures of technical and biological re-cultivation, which was ordered by approved work studies of exploitation on the environment and by decision of the competent line ministry for environmental protection.

Practically, with the execution of works, geodetic deformations of the ground surface are monitored and if depressions occure, technical re-cultivation is performing. For disposal of tailings, disposal is planned, taking into account the slope angles and slipping prevention, and on the parts where disposal is completed planting of acacia is carried out. Experience has shown that acacia is rapidly evolving and its underground part “impregnate” the surface of the soil.

3. LEGISLATION RELATED TO LAND RE-CULTIVATION

Policy of the state and of the local authorities toward protection of the land from pollution and damage, as well as mandatory undertaking re-cultivation works, is regulated by a number of legal and bylaw acts, which everyone from his point of view, regulates this problem.

In the mining sector, the basic law is Law of mining and geological investigations which orders that mining companies which acquired exploitation rights are required, during and after the operation, to bring land for a particular purpose, or to perform tasks re-cultivation of land, according to project re-cultivation.

How mining operations are caused by the existence of a developed and approved investment and technical and project documentation and with this documentation is determined and the extent of re-cultivation and remediation work. Approval for the required documentation provides relevant Ministry of Mines and supervision of the implementation of measures is prescribed by the authority of the Republic mining and geological inspection.

Set of statutory of environmental includes protection of land, both from physical degradation and from pollution and harmful substances. This lists only the current basic legal acts, namely:

- The Law on Environmental Protection;
- The Law on Agricultural Land;
- Water Act;
- Forests Act;
- The Law on the Management of Waste;
- The Law of assessment of influence on Environmental;
- The Law of strategic assessment of influence on Environmental;
- The Law on integrated prevention and control of Environmental Pollution.

In modern terms, the Law of the environment as a separate branch of law is defined as a set of legal norms regulating and directing man's impact on his natural environment in order to protect the environment and maintain ecological balance.

The general legal framework for environmental protection in Serbia is established by the Law on Environmental Protection, the first is specifying the object of the law, basic concepts, system protection, protection of subjects and the basic principles underlying the system of environmental protection. Legal and physical entities are obliged, in performing their activities, to provide: rational use of natural resources; accounting of environmental costs within the investment and production costs, implementation of regulations, and taking measures to protect the environment in accordance with the law.

Legal or physical entities that use the natural resources or the goods, shall, during the construction and performance of activities, as well as its termination, plan and implement measures to prevent environmental degradation. Who degrade the environment, shall perform re-cultivation or otherwise rehabilitate degraded environment. Minister for the Environment shall prescribe the methodology for determining priorities for the rehabilitation of the environment.

Strategic assessment of the impact on the environment is regulated by the Law of strategic assessment of influence on Environmental, which terms, conditions and procedures for assessing the effects of certain plans and programs on the environment (strategic assessment) to ensure the protection of the environment and promoting sustainable development by integrating basic principles of environmental in the process of preparation and adoption of plans and programs.

Strategic assessment is carried out for plans, programs and principles in the field of spatial and urban planning or land use, agriculture, forestry, fishery, energy, industry, transport, waste management, water management, telecommunications, tourism, conservation of natural habitats of flora and fauna, which establishes a framework for the approval of future development projects of certain regulations governing the assessment of environmental impacts.

In addition to the strategic assessment of the environmental impact, there is assessment of environmental impacts. It is also regulated by special Law (The Law of assessment of influence on Environmental).

Assessing the impact of the project on the environment shall be for projects that are being implemented in the area, including changes in technology, reconstruction, capacity expansion or termination of which may lead to significant pollution of the environment or pose a risk to human health. This estimate includes projects in the fields of industry, mining, energy, transport, tourism, agriculture, forestry, water and utilities, as well as all the projects that are planned in a protected natural area.

Assessing the impact of the project on the environment is an integral part of the documents without which you cannot access the performance of the project, and is based on a study of the assessment of environmental impacts, whose scope and content are determined by special regulations issued pursuant to the aforementioned law.

Consent to this study is given by a competent organ of the Ministry of Environment under the prescribed procedure, which is implemented through more phases.

Protection of agricultural land is regulated by the Law on agricultural land and this law itself regulates: planning, protection, development and use of agricultural land, monitoring the implementation of this law and other issues relevant to the protection, development and use of agricultural land as a resource of general interest.

The law, among other things, stipulates that agricultural land can be used for non-agricultural purposes, as in the case of extraction of minerals, or the work of the tailings, fly ash, slag and other hazardous and noxious substances at a certain time by the previously obtained consent of the ministry responsible for agriculture. One of the conditions for the conversion of agricultural land is re-cultivation project, which contains in particular:

- general characteristics of the area for exploitation of mineral resources (climate, the soil, hydrographic) and condition of agricultural production;
- documentation of the owners, as same as of the users of agricultural land;
- design solution of technical re-cultivation (removal procedure, preserving and restoring topsoil, technical landscaping, hydro-technical works that established the original water regime in the soil, etc.);
- design solution of biological re-cultivation (land preparation for agricultural production, the use of agricultural land, procedure and deadline of dangerous substances in the reclaimed land);
- deadlines for the presentation of certain phases of re-cultivation;
- measurement and calculation of works;
- graphical and numerical contributions.

Re-cultivation project is prepared by a legal company or a company that has the authority of the ministry responsible for agriculture.

Also, a special law (Law on Water, Forests Act) provides that the protection of the land must be done, as same as water and forests protection inside the mining area if mining activities affect the water regime and perform re-appropriation of forest land. It is inevitable that the performance of underground mining works and related activities affect the water regime, how by lowering of groundwater levels, the same as water use and by engaging into the waterways of mine and industrial water. In addition, forest land is almost invariably present on the surface within the mining fields, so it comes under attack of forest Law and under attack of demands that he prescribes.

4. CONCLUSION

In underground coal mines in Serbia a number of measures to reduce the harmful effects of exploitation on the surface are undertaken, and at the occurrence of damage technical re-cultivation and partly biological re-cultivation is carried out. Specifically, to the biological re-cultivation has not been given adequate importance, and now this topic is more and more necessary.

Also, the legislation in the area of re-cultivation is sketchy.

From the above, it is evident that the legislation field of land re-cultivation damaged by underground mining is widely covered and that it is under charge of several ministries and their relevant authorities. In practice, this creates a large number of problems, particularly in the process of drafting and approving of technical documentation because it requires more time and higher costs, and it would be appropriate that the whole area of re-cultivation get under the Law of mining and geological research. This would avoid unnecessary paperwork and would not affect the quality of technical solutions and their implementation.

REFERENCES

Ivković M., Miljanović J., Kokerić S., 2013., ***„Legislation for the re-cultivation of land damaged by underground coal mining”***, Journal of Mining works N^{o} 4/2013, pages 36-40Author's Name[1],

4th International Symposium on Natural Resources Management
"Sustainable Development and Green Economy in Transition Countries"
31st May -1st June, 2014, Faculty of Management Zajecar, Republic of Serbia
www.fmz.edu.rs

A STEP AHEAD OF THE COMPETITION BY CREATING A UNIQUE SALES OFFER

Mladen Jovanović [1]
Ivana Avramović[2]
Leposava Jovanović[3]

[1] *Master student, Faculty of Management Zajecar, Jovana Popovic 61 , leposava.jovanovic@fmz.edu.rs*
[2]*PHD student, Faculty of Economics Nis, University of Nis, Serbia,, ivanajovanovic@rocketmail.com*
[3]*Faculty of Management Zajecar, Jovana Popovic 61, mladennb@yahoo.com*

ABSTRACT

Without creating a unique sales offer as a unique advantage a company will still be in grey average of business and ramble, just one of bidders, participants in a tough competitive battle. With its creating and building the most important values for consumers it gets dominance in winning market positions, in the eyes and mind of a consumer. And a company doesn't need to have the best product, but it has to say to a potential customer how the product can improve his life, in that way it sells benefits for consumers. A company mustn't forget a cruel truth that customers-consumers vote by their legs, if they are not satisfied with a product or a service, off they go to other producers.

KEYWORDS

concurention, a unique sales offer, satisfaction

INTRODUCTION

Identifying the existing and anticipating the expecting competition is necessary in creating a successful strategy of a company business. Especially for the reason that in the global market there are so many companies, competitors, which acted disguised, and as a consequence of the market development, a new product and technology by means of alliances- joint arrangements witch are created by companies of different strength and competitive power.

Being different from the competition and at the same time capable to cash in its competitive advantage is the best way by creating a unique offer. Many companies in the same field are the same and each of them makes efforts to give its potential customer more value, benefit or additional services. Since many companies offer their products without shaping particular reasons which could at the same time influence the decision of purchase, the result is a small sale, fleeing customers and a great number of firms on the edge of survival. On the other hand, a central question is how to increase a number of customers, their satisfaction and thus a company profit as well. It's very important that a company differs from others by something and becomes in the eyes of a customer very important, that there's no dilemma when a customer comes and asks why he would buy a product of one not the same of the competitive company. First a competitive advantage of a company should be defined and then discover how to use that advantage to make higher earnings.

But when a particular company with the same or similar group of products is concerned, space is being narrowed and research goes to a final consumer. A following definition of competition is relevant for marketing. Firms that try to satisfy the same needs of consumers and serve the same group of customers / product – market – area. (Milisavljević, 1996.) From there a company may take one of the possible positions, domineering, strong, adequate, sustainable, weak, unsustainable. In order to choose a particular, competition strategy (with real estimation of chances for success) a company's answers to the questions, where to apply,

when and why must have its tactics which should enable adaption of marketing mix when a firm faces the competition in the market.

If a company in USO offers the features of its products, then they will hard find the way through subconscious filters of customers since they are asked if there's anything useful for them in the message, it's almost sure that there won't be any positive answer. In spite of this a large number of companies do so. It is a better marketing when a company compares its offer with the competition, to emphasize the areas in which it is better than the competition, this is a method a smaller number of companies use. Another possibility for daring companies is a more successful marketing which will bring a company a true advantage over the competition, to emphasize in marketing messages the final result of product usage. In that way, instead of features a company will sell benefits which customers will have by consuming them. There are a few companies which practice this method of management and that's why they are very successful. And there's no need for the company to have the best product, but it's important to know how to show a potential customer that a particular product or a service will make his life better. And now there's a question why the statements on features don't pass through subconscious filters. The messages about the features of a product will pass only through those people who already know that they want the offered product or they have already tried it so a positive experience doesn't allow any change.

1. Competition, competitive advantage of a company and a company offer

When creating a unique sales offer a company must take care that a company itself is not interesting to a consumer, not even its product, there are many of those in the offer, but a consumer has a problem and he needs help to solve it. A consumer in the process of satisfaction and solving a problem, goes through several phases. „ AIDA in English means A stands for attention, I for interest, D for desire and A for action. That is the order of psychological reactions of a reader who reads an ad, a letter or he decides what to buy. The phases of this process flow in an unwritten order which the best advertisers know how to use" .(Lisac, 2008.)

„For marketing it is relevant which attitude on consumer's behavior in shopping is acceptable. Making a decision, an experiment and a behavior. The attitude on making a decision is that the consumer's behavior is the result of his engaging in the task of solving a problem in which he goes through various phases. The attitude on an experiment starts from an assumption that in particular cases consumers buy in order to create feelings, experience, emotions, more than solving problems. The attitude on a behavior suggests that consumers react in particular cases to pressures that come from the surroundings ". (Milosavljevic,1996.)A company at the very beginning of creating an offer must tell the essence, emphasizing a basic purpose of a product, and in that way makes a potential buyer act immediately. So a company has attracted his attention but it has to gain his interest. It's necessary to grab his interest, by emphasizing his needs and problems in the first place and then to show how it will satisfy those needs better than the competition. The best way to keep a consumer's attention is to offer him a solution of his problems since he is not interested in you but in his problem. In the given order of phases a company has come to desires. And here it should be careful as well, keep up to the target group: if they are high educated or not, older or young (by all means true facts should be given, as well as a certain statement of a satisfied customer, they have lost weight, the pain has gone). Therefore a customer wants a product, an action is needed as a final level of what a company wishes to gain and to offer a customer more possibilities to make contact with it, a direct meeting or a direct order. A company must know that people don't buy the features of a product but the benefits he expects from them.

However, it's a fact that we are all exposed to the influence of millions of different ads or other commercial messages, they are everywhere, on TV, on the radio, the internet, in the shop windows, sales letters, magazines, packages, and since we, the customers, are used to a bombardment, even if it is very intense, all those facts hardly reach our consciousness. The question is what is really happening in reality and how we react as customers. People have developed special subconscious mechanisms or filters so they filter all the messages they see, which helps them to stay stable or spiritually balanced. In those millions of messages we ask ourselves subconsciously if there's something useful for us in this message. If our subconscious answers this question positively, an alarm switches on in our brain. Therefore, subconscious by this alarm recommends the consciousness to analyze the message, so in that way a certain ad attracts our attention. But a purchase process doesn't always flow completely consciously.

2. Competition and perception of a company offer seen by a customer

The most frequently a failure of a product, that is, its non-acceptance by a consumer is ascribed to wrong marketing models and their uses. So, a company must change something if it wants to get better results, to act fast. Time is a key element how to solve the problem. The most frequent case is that a marketing message is sent to those who are not interested in the product or a service of the company or they cannot afford them. So marketing management should think if the statements-USO are really positioned in the right places. It might be that the company has chosen a wrong way of communicating with potential buyers. There are numerous ways how a company can attract and keep consumers, for instance ads in magazines, periodicals and reviews, exhibitions at fairs, a free sample packet, electronic reports, fax reports, phone conversation, TV show, recommendation of an acquaintance, satisfied customers, friends, dinner with a business partner, marriage with a business partner's daughter. All the mentioned and listed, as well as many other not listed methods are effective, of course in certain circumstances, marriage once, and some other models more times.

A company might have chosen a right target group, therefore it communicates with people who want a product and have enough money but the result is still missing, so the causes should be discovered and eliminated. Positive experiences of some companies say that a company must have a business mission, since if you think that you are in business to earn money, we truly doubt that you will be successful in the long run and the mission of marketing is creating values better than the competition in the long run, for all the participants, stockholders, with a consumer as a key participant. Let a basic purpose of marketing in a company be finding people who look for exactly what the company sells, find those consumers who really want that very product or service. Not an easy task at all, marketing exists on the principle, customers are " beings of needs and desires" but they are changeable, so a company must clearly define what it sells and who its customers are, what he looks like, what his age is, what he wants, how he dresses, where he lives, to define his target market.

A unique sales offer of every company must be clearly positioned by the target market of the very company, so only then it will take a clear position in the eyes of a customer. The idea which is reflected by USO must be shown clearly and simply, be understandable to the target market of the company, there is no, and mustn't be any ambiguity, mystification, indecision, so potential buyers won't know what exactly a company wanted to say.

Finally a company must calculate value of its customer and when it finds out how much money in average an individual customer brings, only then it will be indestructible .It will again draw a conclusion out of it how much money it can spend on attracting a customer. A company must know that every attracted customer brings certain profit, it's more valuable and cheaper to keep him in the long run than to invest in a new potential one.

Potential customers have a defined idea about a company product and it can match to the idea the company emphasizes or not. It's rare that ideas match completely, and that would be ideal, so in that case marketing would lose its sphere of action and its importance as well. Just as the thesis of a famous and world well-known expert in the field of management Peter Drucker says: "The purpose of marketing is to get to know a consumer so well and to realize which product or service suits him, so that they sell themselves. The situation is ideal when marketing results with the customer ready to buy, and everything that should be done after that is that a product or service is available." (Milanovic-Golubovic,2004.) However the assignment is not easy at all, to get this parallel of perception vision of a potential customer of company offer closer, even better to meet, so mutual satisfaction is guaranteed.

3. Competition –why do customers not understand the company's offer, so they leave the company

The company which gets a better insight into need, the way of perception, preferences and behavior of customers will get a competitive advantage.(Kotler,2004.)

Why does a customer in all possible ways make excuses and leave the company, not realizing how useful its product is, "because the customer's behavior is conditioned by personality, a product and a specific situation".(Milosavljevic,1996.) A company must ask itself what it can, actually what it must do if its potential customers of the products and services are not mature enough to see, to realize or feel the benefit of the product. Well it simply must get down to their level. With right questions to find out their opinion or their problem, maybe in their incorrect use of the product. The basic assignment is to teach those potential customers about the usefulness of the product. It's very important that the company offers the customers as many free information as possible, regularly informs them about all the changes and stays in constant touch

with them. And then there is a question when a purchase will happen, only then, when a customer is on the same level of understanding the problem as the salesman, that is, when he sees the same as the salesman himself who creates sales offer. Earlier there were thousands of reasons for the customer not to buy a product, and after gathered information a buyer begins to look for the reasons for yes, therefore his brain is being slowly reprogrammed.

4. Competition – statements of satisfied customers in victory over the competition

There are many reasons of using the statements of satisfied as well as not satisfied customers, since they enable both sides to reduce the risk. Customers will remove disbelief and much more easily order the product, if they reach the statement that others tried the product and that they are satisfied. However, when other customers' experiences are concerned, in some cases opposite effect can be expected, so manufacturers must have that in mind because consumers differ and they don't expect the same satisfaction. That's why there's an eternal problem for marketing what, when, where, who... Regardless of this diversity of customers there are some rules. Always and always true statements of customers should be used, may those statements be longer if possible, they are better than shorter, more precise with lots of details. Of course every manufacturer which wants to use any statement of its customers in any aspect of commercials must have their consent, even customers themselves want to be actors in marketing commercials, how much they are satisfied, that is, to pass their positive impressions to all around them.

A good solution in the battle with competition is that a company producer sets itself as the customer himself, which means to go to the other side and ask itself for the price of that product (what he can buy an apartment or a car* therefore it's not easy or simple to conquer the competition. Competition is a manufacturer to itself, it must perceive all the dangers, chances, advantages and possibilities. It's a duty of a manager to perceive in details SWOT analysis in applying and finding marketing strategies. *SWOT analysis represents a marketing-strategic instrument by which strengths and weaknesses are tested in relation to chances and dangers from the surroundings. On the basis of SWOT analysis a company makes a starting step for defining an existing and desired position in the market and defines the strategy which it will use for reaching planned aims. (Mihajilovic, Sovtic & Plavsic,2011.) Combining various marketing methods, the integration of different approaches in the end brings the best results, as a final effort in marketing intentions. A company producer must not forget a crude truth that buyers-consumers vote by their legs, if they are not satisfied with products or services they are off to other producers, so something must change.

5. Competition, effects and results, possibilities and ways of cooperation competitive companies

The central question on this way of "cooperation" of competitions is how to find companies which are ready to cooperate, how to find real partners. By all means a basic and starting point is that our customers are interesting, attentive to numerous companies because they don't buy only our products, and those products of other companies can supplement what we sell, and they can also be completely different but necessary to the other company.

Sometimes a company should present its offer in a different way so the result can be completely different. Can a cooperation be of any use: Of course it can, there are strong pressures in the direction of cooperation and joining. Big companies, owners of big concerns pursue bigger profit and cooperation is an excellent way to this goal, even banks, insurances, big trade companies. However small entrepreneurs don't think about cooperation so often and so loudly as big companies, which usually don't lack money in business projects. The reasons are numerous: misuse can happen, it's hard to believe somebody, that it might take too much time, that nobody understands the idea of cooperation.

Innovation, creation and making of a new product take lots of money, but in cooperation with other companies a new product can be made faster and cheaper.

If your products are recommended to other company's customers and in agreement with you it gives a discount, a response to the offer will be 10 times bigger than normal and that is the case since existing customers believe their company, and this trust pass to other companies it recommends. So cooperation is possible without money investments, and by winning new customers profits may be very big. Even with competitive companies cooperation is possible, buying and purchasing of a larger quantity of raw materials

from the same supplier give possibility for more convenient terms and price or transport and storage expenses can be lowered, so every saved euro increases the profit.

Who else will have benefit is another question, if it goes well to us, good. It will be good news for many companies and individuals. So if it goes well to our company, the employees will be satisfied, as well as suppliers, the state for taxes, owners-big profit from capital, banks- bigger credit, and all other firms in the surroundings.

6. Competition – steps which help a company to be a step ahead

It's a rule, follow each step of competitors, to get the picture of them, that will help you to build a better strategy, tactics and plans in that battle.

Analyze competitors, then anticipate them, then compare your offer to the offer of the competitors, find their advantages and disadvantages and then use them yourself.

Good recognition of customers' needs as well as their expectations make a strong basis for successful marketing. In the situations when you know the most important values for a customer, as his life values, you can all marketing activities and communication focus on their needs.

Find out who your customers really are, a profile of a customer, which are his characteristics, a customer's motivating process and actions, it's almost impossible to conceptualize appropriate marketing strategies and plans and actions.

Be different from competitors, single out some of your aspects of management, which set you out from your competition and use them everywhere as your marketing weapon. Let your customers tell you how you can improve your product, ask them what they think, want, a company is there for customers, to please them. Try to be always where your competition is, together with the consumers of your competitors.

Personalize your marketing message with your consumers, taking into consideration various segments of existing and potential consumers, so for all different types of consumers sell different messages.

Be prepared for a dirty game, since that could be a part of competitors' strategy.

Be creative, be always the first and always give a new idea first, that's what potential customers expect from you.

Don't take mere facts out, tell them a story, potential buyers actually buy your story, it should be very good so that potential customers could believe it. The story, told by a consumer to himself about a new product or service is mostly under the influence of the opinion which a consumer had before he has found out for a new offer at all.(Godin,2007.) Be unique. At the end a piece of advice to all companies, be consistent, be trustworthy. Marketing is powerful, as each weapon use it wisely. Marketing is successful when it conveys the story, the plot of which is harmonized with our attitudes, the story which we will embrace instinctively and then share with our friends.

CONCLUSION

There are many pieces of advice of the management in creating a unique sales message. Watch how customers use your product and what they mind when using it, then try to determine what you could do for your customers so as to ease them the usage of the product, services. Only when all the employees know and recognize the value of sales offer, the company can include it in marketing of its products, and it's also very important that the statement seems and it is trustworthy, that the company stays faithful to its statement and it mustn't run away from its promises it must fulfill. The company will change the idea of the statement only when it is convinced that the statement is not good. Of course, good business results won't be evident one week after the first announcement after creating the offer, but in six months or a year, or even later. So the management of the company must endure and give customers the chance to see and hear the statement more times over a longer period, to become sure of the company's offer. Only then they will decide to make a purchase.

Without USO as a unique advantage, a company will still be in grey average, just one of many bidders, therefore defining USO is one of the most important business decisions. And with u unique advantage a company stands out from average and in the eyes of the customers it becomes the company that works the best in its business. In order to be recognized by its USO which it sets as a goal a lot of work, especially a lot

of time is needed. That's why many give up, they want quick results, profit in the short term, so those very expectations, sometimes betrayed, kick them out from the business scene. Competition means to be better, not only today, but in the long run of business and getting profit. Sometimes the solution is here, nearby the company, to find a company with which it is possible to cooperate, join, do a good action useful in the range of business for all the participants.

If managers and employees are not sure that they offer something better than the competition, how can they convince potential customers to trust them. We conclude that this is a very long and difficult assignment which by all means brings satisfaction, for both, a company and customers. It's for sure that a big share of credit belongs to sales force, to salesmen who are in constant contact with customers, to listen to their comments, praises, wishes, suggestions and compliments and that's a big step-a starting point in creating USO. It's good news for the company to be a little better from the competition, but that's not enough for the company to be ahead of the competition, it needs competent, aggressive people, those who want to learn and are not afraid to take a risk, who are self-confident, devoted and above all responsible.

REFERENCES

Milisavljević, M., 1996. *Marketing*, Contemporary Administration, Publishing and Printing Company Belgrade

Lisac, A., 2008. *A step ahead competition*, Belgrade

Milanovic-Golubovic, V., 2004. *Marketing Management,* Megatrend University of Applied sciences Belgrade

Kotler, F., 2004. *Ten Deadly Sins In Marketing* The Library of Matica srpska, Novi Sad

Mihajlovic, D., Sovtic, K., Plavsic, A., 2011., *Economy of Business,* Zajecar

Godin, S., 2007., *All the Marketing experts are Liars,* Logos Art Belgrade

4th International Symposium on Natural Resources Management
"Sustainable Development and Green Economy in Transition Countries"
31st May – 1st June, 2014, Faculty of Management Zajecar, Republic of Serbia
www.fmz.edu.rs

SUSTAINABILITY OF ENERGY EFFICIENCY OF RAILWAY STATION BUILDING BOR USING LED LIGHTING

Mlađan Maksimović,

Faculty of Management Zajecar, mladjan21@ahoo.com

ABSTRACT

Using less energy for doing the same work, or function, such as lighting is called energy efficiency. Energy efficiency should not be seen as energy saving because saving always involves some kind of sacrifice whereas the efficient use of energy never violates the conditions of work and life. In this context, the authors of this paper paid attention to energy saving by using LED lighting on a specific object. The central theme of this work is the energy efficiency and energy saving in the railway station Bor building

KEYWORDS

Energy efficiency, LED lighting, Railway Station Bor

1. INTRODUCTION

Since the invention of the first incandescent carbon pile until now, little has changed in our attempts to dispel the darkness, and win the night. Only in recent years semiconductor technologies have been offering a revolutionary new way of converting electrical energy into light. It seems that the light emitting diode (or LED, Light Emitting Diode) will become light source of the future.

The advantages of LED lighting are numerous. First of all, high efficiency in converting electrical energy into light (which leads to less heating of the light source, since the excess is converted into heat), small size, adjusting the brightness easily, significantly longer life in which there is no sudden burning of the light sources and the unpleasant flickering at the end of its working life as it happens with fluorescent tubes, the absence of the infrared and ultraviolet ranges, resistance to shock and vibration, achieving full strength instantly and resistance to frequent switching on and off.

On the other hand, LED lighting has some of its disadvantages, notably the high cost and the need for installing an AC adapter to power low voltage with stabilized (or at least limited) voltage. Furthermore, the cooling is necessary because the LEDs are smaller than other lighting, and they are very sensitive to overheating.

Having in mind that the ecology has become a very important topic, in order to save energy (therefore preservation of the environment), the EU announced that, starting from 2015 (Živković, 2011) it would prohibit the use of incandescent bulbs with heating lamps. Instead of them,so-called energy saving light bulbs will be used and they are actually fluorescent lamps with integrated electronic starting mechanism. At the beginning a very important fact has been neglected- that all electroluminescent lamps (including energy saving light bulbs) contain mercury, which is highly toxic, and there has subsequently been issued a regulation to separate disposing of used energy saving light bulbs as hazardous waste.

Therein lies one of the great advantages of LED lighting, because it combines all the advantages related to ecology: (Agencija za energetsku efikasnost Republike Srbije, 2012). lowest power consumption, the longest life expectancy and the complete absence of toxic substances.

In this context, the central theme of this work is the energy efficiency and energy saving by using LED lighting on a specific object. The facility is the building of the railway station in Bor, which is illuminated with 900 fluorescent sticks of 20W of power and 600 fluorescent sticks of 40W of power. Instead of them there should be placed sticks with LED lighting. The railway station is also illuminated with 50 sodium lights of the power of 150W that also need to be replaced with the LED floodlights of 50W, (Železnice Srbije, (2014).

2. LIGHTING OF THE RAILWAY STATION BOR OBJECT

The object of the railway station in Bor is characterized by being illuminated with 1500 fluorescent sticks, 900 of which are long sticks, 60cm each, and with power of 20W and with 600 fluorescent sticks of the length of 120cm and the power of 40W each,(Železnice Srbije, 2014).

Also,the building of the railway station in Bor is illuminated (as a form of external lighting) with a reflector with 50 sodium (Na) bulbs.

Fluorescent lighting as a backing material for normal use in fluorescent lighting in addition to the fluorescent sticks must have muffler as well as a starter, which further increases material costs of fluorescent lighting.

Figure 1 Material for Fluorescent Lighting

The same is the case with sodium lighting. In addition to the bulb, the reflector has to use sodium choke and the starter, as shown bellow in Figure 2.

Figure 2. Material (Na) lighting

3. THE SUSTAINABILITY OF ENERGY EFFICIENCY OF THE RAILWAY STATION BOR BUILDING

If we replace the entire ligthing with adequate LED lighting on the builging Train Station Bor, we will achieve significant savins in energy and materials cost. This can be explained as follows.

The period of the exploitation of a fluo-stick is 1000h. The same is the period of exploitation of a starter for fluorescent sticks while the period of exploitation of a choke is 2000h.

Considering that the average exploitation of lighting in summer is 8h, and in winter it is 15h, the average usage of lightingis 11.5 h per day during a year.

If such specified period of exploitation of a fluo stick and starter is up to 1000h, in our case, it is three months or one quarter of a year, while the period of exploitation of chokes is six months or two quarters. As for the LED lighting, the period of exploitation of a stick with LED illumination is 50000h. On the concrete example, the exploitation period of the led stick would be 12 years, if compared with fluorescent sticks it is the period of 48 quarters.

In order to present an obvious difference in power consumption as well as material we have taken a period of 12 years or 48 quarters.

Table 1 E lectricity consumption in fluorescent and LED sticks

Year	Fluo (kWh)	LED (kWh)
1	176.295,00	83.110,50
2	352.590,00	166.221,00
3	528.885,00	249.331,50
4	705.180,00	332.442,00
5	881.475,00	415.552,50
6	1.057.770,00	498.663,00
7	1.234.065,00	581.773,50
8	1.410.360,00	664.884,00
9	1.586.655,00	747.994,50
10	1.762.950,00	831.105,00
11	1.939.245,00	914.215,50
12	2.115.540,00	997.326,00

The table presents the total electricity consumption with fluorescent lighting in the first year of operation which is 176,296.00 kWh and with the LED lighting it is 83110.50 kWh, where it is evident that the difference in energy consumption is 93184.50 kWh annually .

For chosen period of exploitation of 12 years, fluorescent lighting consumes 2,115,540.00 kWh and LED lighting 997,326.00 kWh. The difference in power consumption for a period of 12 years is 1,118,214.00 kWh.

Table 2 as well as on the graph 2 show that (Na) spotlights illuminating the existing facility spend 31,481.25 kWh in a year, while the LED lighting spends 10439.75 kWh in the same period. During the chosen period of exploitation of 12 years (Na) Lighting consumes 377.775kWh, while LED lighting consumes 125.925kWh. The difference in power consumption for a period of 12 years is 211,850 kWh. The graph clearly shows the movement of the regression curve slope.

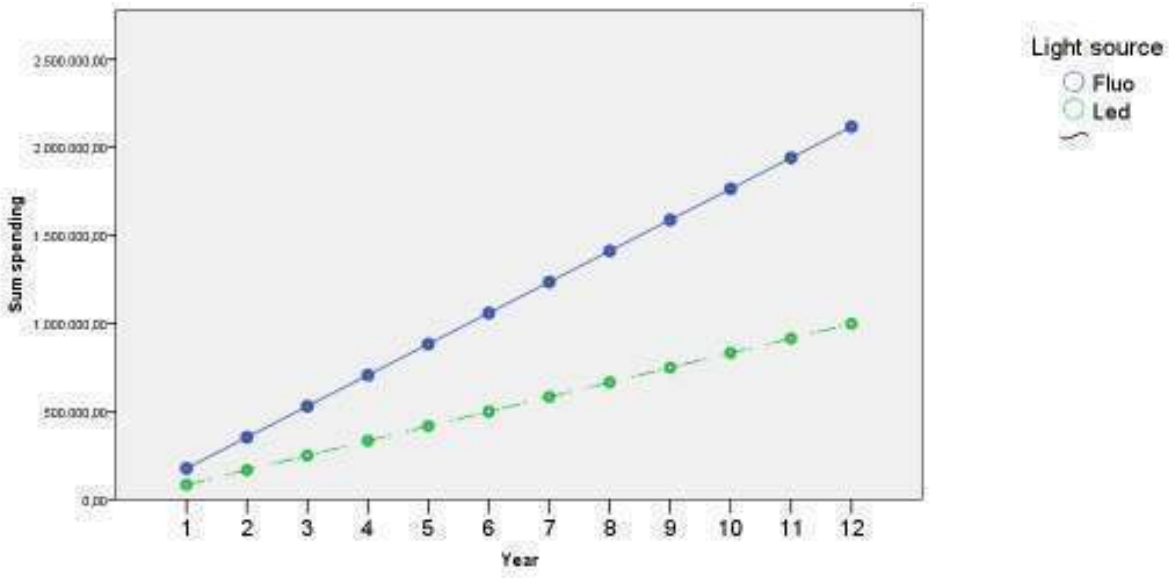


Figure 3. Navigating of regression curve slopes in fluorescent and LED in (kwh)

If we take into consideration cost of materials, in the initial period the material for LED lighting would be more expensive but at some time it will come to break-even point and profitability to buy LED lighting for the exploitation period of 12 years will increase.

Table 2. Consumption (Na) and LED lights in (kwh)

Years	Na (kWh)	LED (kwh)
1	31,481.25	10,493.75
2	62,962.50	20,987.50
3	94,443.75	31,481.25
4	125,925.00	41,975.00
5	157,406.25	52,468.75
6	188,887.50	62,962.50
7	220,368.75	73,456.25
8	251,850.00	83,950.00
9	283,331.25	94,443.75
10	314,812.50	104,937.50
11	346,293.75	115,431.25
12	377,775.00	125,925.00

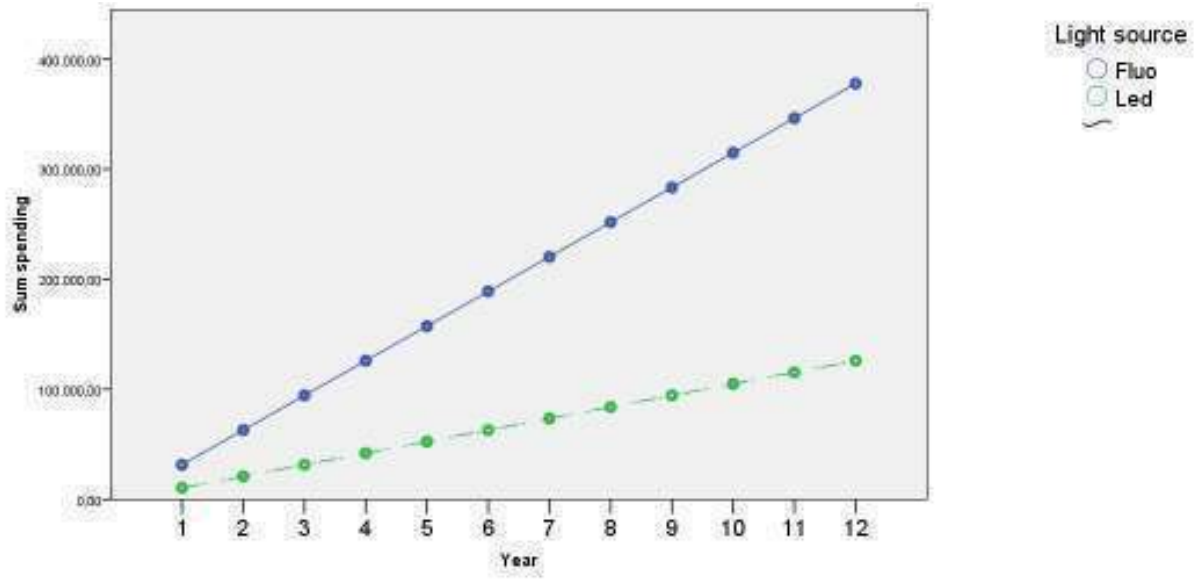


Figure 4. Consumption (Na) and LED lights in (kwh)

The price of a fluo stick of 20W is 120 RSD , the price of a fluo stick of 40W is 150 RSD.

The price of chokes for both of the fluo sticks is 360 RSD.

A starter costs 30 RSD.

The price of an adequate LED stick of 10W is 1500 RSD and price of a LED stick of 18 W is 2200 dinars. If we take into consideration the prices of the materials and the price of electricity consumption, which is between 0,08 € per kWh, and if we convert the cost of materials for lighting into euros at the middle exchange rate of 115 dinars, the total cost of materials and electricity in the first quarter of Fluorescent lighting will be € 10,285.60, while the LED lights, together with electricity consumed and materials would cost € 24,856.83. For the period of one year, total operating costs of fluorescent lighting would be € 31,753.83 and for LED lighting it would be € 29,775.15.

The graph 3 shows the break-even point , which is reached in the fourth year of operation , so in the period to come, LED lighting is obviously more effective .

At the end of the exploitation period of 12 years, the overall price of use of fluorescent lighting would be € 381,046.54, while the total price of using LED lighting would be € 101,910.51. In this case, the saving of € 279,136.03 is evident , as it can be seen in the following FIG.

The research is based on calculations of consumption of material in terms of consumption in kWh of electricity. The results are converted into monetary units (€). After recalculating spending of the material in kilowatts, it was decided that it must be based on quarterly basis. After calculation the exploitation period of 12 years was divided into quarters. The consumption for fluorescent and LED lighting was observed in a time unit. By analyzing data we came to the conclusion that there is a positive trend, ie. line upward progression of a positive character.

Regarding fluo lighting ie . placing the same in the time unit obtained through regression line which is significant in terms of the crop in terms of slope . The correlation coefficient with respect to time is absolutely high and approximately 1

The coefficient of determination explains the percentage of the dependent variable fluo spending which is time shown with a variation of 99.9% compared to the time, as it is shown. The same is with LED lighting. By connecting the diagram of fluorescent and LED lighting, it can be noted that the LED lighting is more expensive initially , but in the fourth year of operation there is a breaking point where LED lighting per unit time becomes cheaper.

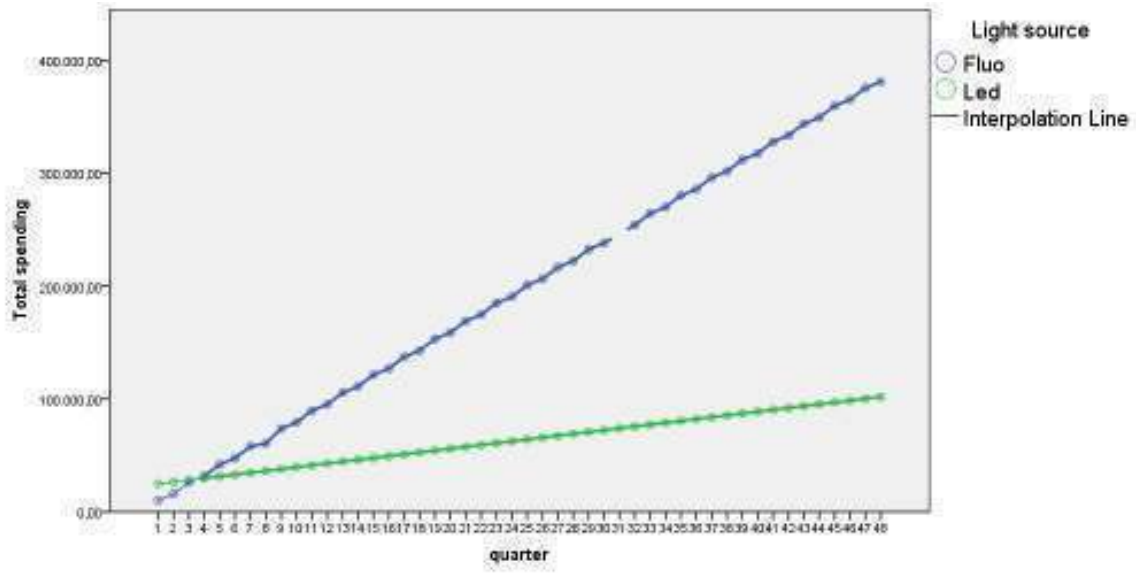


Figure 5. Breakpoint (cost effectiveness of LED lighting)

.

Simple Regression - FLUO vs. Quarters

dependent variable: FLUO

Independent: Quarters

Linear model: Y = a + b*X

Coefficients

Table 3. Simple Regression - FLUO vs. Quarters

		Standard	T	
Parameter	Estimate	Error	Statistic	P
Segment a	1067,36	390,605	2,73257	0,0089
Slope b	7940,43	13,8781	572,157	0,0000

Intercept and the slope are statistically significant in the time unit.

Correlation Coefficient = 0.99993

The coefficient of determination = 99.986%

Simple Regression - LED vs. Quarters

Dependent: LED

Independent: Quarters

Linear model: Y = a + b*X

Coefficients

Table 4. Simple Regression - LED vs. Quarters

		Standard	T	
Parameter	Estimate	Error	Statistic	P-Value
Segment a	23217,2	0,0435929	532592,	0,0000
Slope b	1639,44	0,00154884	1,0585E6	0,0000

Intercept and the slope are statistically significant in the time unit.

Correlation Coefficient = 0.99998

The coefficient of determination = 99.991%

3 Test comparisons of average cost

Table 5 Total cost of usage

		Lighting	
		Fluo	Led
Total	The Average cost of exploitation	194,483.81	63,383.67
	Standard deviation	112,099.69	22,952.16
	Median	190523,27	63383,67
	Mode	10285,60	24856,83
	Range	370760,94	77053,68
	Minimum	10285,60	24856,83
	Maximum	381046,54	101910,51

We have concluded (on the basis of prices of consumption and electricity prices) that the average cost of operation for a period of 12 years is 194,483.81 for fluorescent lighting and 63 383.67 for LED lighting.

Table 6 t-test average values

t-test of average values					
t	df	probability errors	The average difference	95% Confidence interval of average difference	
				Lower	Upper
7,858	49,772	0,000	131100,14489	97586,25470	164614,03509

Noticing the average consumption for a period of 12 years, we tested it with the statistical t test and we found out that the value of the test is highly statistically significant, the average difference is high, as well as the average confidence interval of the difference of the lower and upper bound (Na) lighting compared to the LED spotlights.

The exploitation period of a (Na) bulb and of a Starter of (Na) lighting is 4500h which is, in our case, a year. The exploitation period of an inductor is 9000h which includes a period of two years.

If we take into consideration the price of materials, the cost of electricity consumption to an average of 0,08 € per kWh and the cost of materials for lighting converted into euros at the average exchange rate of 115 RSD, the total cost of materials and electricity in the first year of (Na) lighting is € 3,909.80, for LED lighting during the same period the cost of electricity and materials would be € 3,448.50.

As shown in Figure 4, the turning point comes at the end of the first year of operation, so that in the period to come LED lighting is more effective.

At the end of the exploitation period of 12 years, the overall price of use (Na) lighting would be € 43,004.61, while the total cost of using LED lights would be € 12,683. In this case, the saving of € 30,321.61 is evident, which can be seen in the following figure.

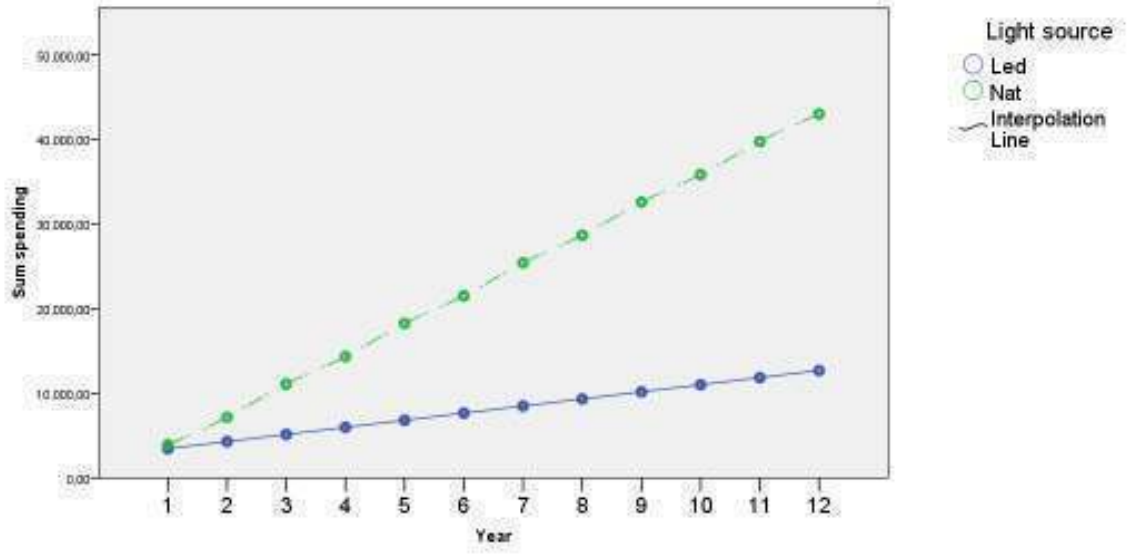


Figure 6. Saving by using LED lights for a period of 12 years

CONCLUSION

Due to changes in the economic relations of production and consumption, today more attention is paid to the rational use of energy.

Energy efficiency is the future of the XXI century, and the Republic of Serbia is lagging behind in the global competition. In order to keep pace with the times, Serbia must adopt and enforce adequate laws and standards for energy efficiency.

The current energy efficiency of the Railway Station Building in Bor is not satisfactory, with the poor lighting and the irrational energy use.

On the basis of whole analysis, we concluded that the replacement of the current fluorescent lighting with adequate LD lighting at the Railway Station Bor, would make savings in power consumption, as well as significant savings in raw material costs in the total amount of € 30,321.61 during the exploitation period of 12 years.

REFERENCES

Agencija za energetsku efikasnost Republike Srbije, 2012. *Racionalno korišćenje energije u funkciji razvoja lokalnih zajednica*, Beograd: Palgo centar.

http://www.efikasnost.com/2012/08/23/mali-recnik-pojmova-energetske-efikasnosti/ (17.03.2014.)

Železnice Srbije, 2014. *Interna dokumentacija*, Bor: Železnička stanica.

Živković, Z. 2011. Predlog mera za finansiranje energetske efikasnosti u Srbiji, Beograd: Građevinska knjiga.

4th International Symposium on Natural Resources Management
"Sustainable Development and Green Economy in Transition Countries"
31st May -1st June, 2014, Faculty of Management Zajecar, Republic of Serbia
www.fmz.edu.rs

SOLAR ENERGY- SERBIAN MARKET FOR SOLAR PANELS

Marija Nikolić[1]
Irena Ristić[2]
Mlađan Maksimović[3]

[1]*LUM Jean Monett Bari, mmarija.nnikolic@gmail.com*
[2]*The mechanical engineering faculty Nis, irenaristic84@gmail.com*
[3]*Faculty of management Zajecar, mladjan21@ yahoo.com*

ABSTRACT

The solar energy is the largest and totally clean energy source that has always been available. The danger of climate change and the reduction of fossil fuel reserves largely influenced that in the last twenty years the solar energy is set as the only guarantee for the possibilities of meeting future energy needs in longer period of time.

In this paper, is clarified why Serbia does not use enough thermal conversion of solar radiation, despite a much larger potential compared to Western European countries that are leaders in the application of solar energy.

KEYWORDS

Sustainable energy recources, solar energy, solar panels, electricity

1. INTRODUCTION

In order to protect the natural life-support systems and to eradicate energy poverty the present energy systems need fundamental transformation onto a more sustainable basis. A major contribution to this transformation can be expected to come from solar radiation enabled by the tremendous scientific and technological advances during the last century and the ongoing research and development.

Serbia, as a huge electricity consumer, has a chance to come to the extra amount of electricity without building new power capacity, just with saving, rational consumption and increasing overall energy efficiency. Base on this attitude, it can be concluded that by the construction of new power plants the new amount of energy will be available for export.

In following is presented a statistical overview of current energy sources in the world and Serbia, anticipated and planned trends and a more detailed discussion on the utilization and potential of solar energy in Serbia.

2. ENERGY CONSUMPTION AND SOURCES

Regardless of reducing energy intensity, primary energy consumption continues to grow faster than the population and in 2025. is predicted increase of primary energy consumption by 40%. (Nacrt Strategije razvoja energetike Republike Srbije do 2025) Much of the growth in energy consumption occurs in countries outside the Organization for Economic Cooperation and Development (OECD), where demand is driven by

strong, long- term economic growth. Energy use in non - OECD countries increases by 90%; in OECD countries, the increase is 17%, (http://www.eia.gov/forecasts/ieo/more_highlights.cfm).

In 2012, oil, coal, and natural gas comprised 87 % of global energy consumption. Oil, with 33.1 percent of energy consumption, remains the world's leading energy source. (http://www.instituteforenergyresearch.org) Moreover, US Energy Information Administartion (EIA) predicts that through 2040 fossil fuels continue to supply almost 80% of world energy use,(http://www.eia.gov/forecasts/ieo/more_highlights.cfm).

Hydroelectric and nuclear power are the main sources of industrial power that is not derived from fossil fuels. Although alternative energy sources currently meet only a small fraction of the total energy needs, due to environmental and economic justification, inclusion of renewable energy in the global energy development strategy is increasing.

EIA estimates that currently about 10% of world marketed energy consumption is from renewable energy sources, with a projection of 14% by 2035. (http://www.eia.gov/tools/faqs/faq.cfm?id=527&t=1) EIA Energy Outlook 2011 (IEO2011) projects that China and India will lead the way in adding hydroelectric and renewable electric generating capacity. Among renewables, installed hydroelectric power capacity is expected to increase more than other renewable sources between 2008 and 2035. However, installed solar power capacity sees the largest growth rate over the projection period, expanding 8.3% per year, followed by 5.7% for wind, 3.7% for geothermal, 2.0% for hydropower, and 1.4% for other renewables such as wood waste, landfill gas, and agricultural byproducts. Further, the report estimates installed capacity of power plants running on petroleum products will fall by 1.0% a year, as higher oil costs and climate change concerns encourage a switch to cheaper and cleaner generating fuels. In addition to having the highest annual growth rate, renewable energy sources are expected to account for the biggest share of total installed electric generating capacity by 2035, nearly a third at 2,372 gigawatts. (http://www.eia.gov/todayinenergy/detail.cfm)

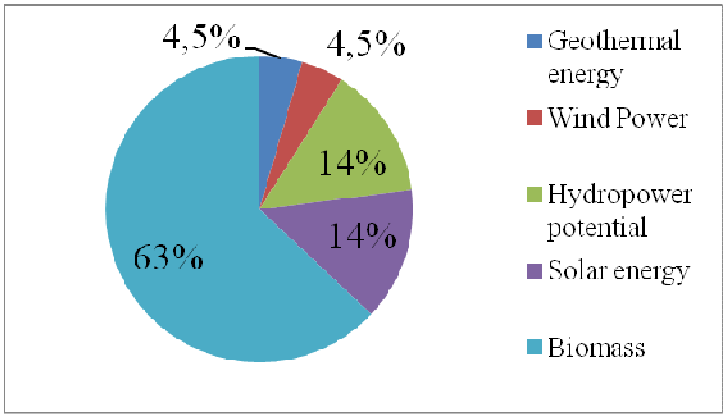


Figure1. The potential of renewable energy sources in Serbia

The energy potential of renewable energy sources in Serbia is significant and estimated on over 4 million tonnes of oil equivalent (toe) per year, which corresponds nearly to the half of the annual energy needs of the country. Biomass is considered to be the greatest potential in Serbia. The biomass potential is estimated at about 2.7 million toes, or 63 % of the total potential. Also, 0.6 million toes in unused hydro (14%), 0.2 million toes of geothermal (4.5%), 0.2 million toes of wind power (4.5%) and 0.6 million toes of solar radiation (14%). The average solar radiation in Serbia is about 40% higher than the European average, but still use of the sun's energy to produce electricity in Serbia is far behind the countries of the European Union. (Lazic, 2013. Str. 22).

2.1. The potential and utilization of solar energy

Solar energy is the most abundant permanent energy resource on the earth and it is available for use in its direct (solar radiation) and indirect (wind, biomass, hydro, ocean etc.) forms. The total annual solar radiation falling on the earth is more than 7 500 times the world's total annual primary energy consumption of 450 EJ. In less than 9 minutes earth shone the amount of solar energy that is equal to the amount of energy necessary to the humanity in one year.

Serbia has the resources of solar radiation well above the European average with a very favorable seasonal schedule. The energy potential of the solar radiation is about 30% higher in Serbia than in Central Europe, and the intensity of solar radiation is among the highest in Europe. The average daily global radiation energy of a flat surface during winter ranges between 1.1 kWh/m^2 in the north and 1.7 kWh/m^2 in the south, and during the summer period between 5.4 kWh/m^2 in the north and 6.9 kWh/m^2 in south (Janković, 2010. str.23). For the purpose of comparison, the average values of global radiation on the territory of Germany is about 1000 kWh/m^2, while in Serbia the value of 1400 kWh/m^2. The most favorable areas in Serbia recorded a large number of hours, the annual ratio of actual irradiation and total possible irradiation is approximately 50%. (Janković, 2010. str 24)

For a discussion of the solar energy utilization important are data concerning the duration of sunshine and energy of direct and diffused solar radiation falling on a horizontal, vertical or inclined surfaces. Direct solar energy can be used in practice, its transformation into heat, electricity and chemical energy.

Generally, solar systems can be divided into active and passive. Passive solar systems don't use any additional device or element of the system which will spend an extra energy to operate. These are mostly different architectural and construction solutions which have role of better collection and acumultaion of the solar energy and then use for heating purposes. Active solar systems use solar panels and additional electricity to power the pumps and air conditioners which distribute solar energy.

Solar power plants generate electricity by transforming solar energy into heat. Due to the need for high temperatures, almost all forms of solar thermal power plants must use some form of concentrating the Sun's rays from large area to the small surface. Focusing can be accomplished by a variety of lenses or more often by mirrors. The intensity of the light has been concentrating to one point in order to obtain a temperature from several hundred to several thousand Celsius degrees. The resulting heat has leaded to the conventional generator where it convertes into electrical energy. Solar power plants, which are based on the concentration of solar energy, can achieve a power of 10 kW to 1000 MW, depending on the system performance.

Photovoltaic cells (PV) are the most desireble way solar energy utilization; they directly convert solar into electrical energy. The operation princip is that during the day photovoltaic composition converts light into electricity that can be used immediately or accumulate in the battery for later use when there is no Sun (during the night). Electrical voltage of one cell is small, so the individual cells connect together, pack in modules (or "panel"), and then make PV systems of any size. Efficiency transformation of solar energy into useful heat in these types of collectors is raised from 35 to 55%, and in this moment, it is the most economical way and can be used by individual users to large systems.

The base material of photovoltaic cell is silicon (one of the most abundant elements on the Earth). Monocrystalline silicon cells can convert 1000 W/m^2 of solar radiation to 140W of electricity, from the cell surface of 1m^2. Polycrystalline silicon cells can convert 1000 W/m^2 of solar radiation to 130W of electricity, from the cell surface of 1m^2. Production of these cells is more economically efficient in comparison to monocrystalline, but lower utilization. There are another type od cells, such as amorphous Si cells, Gallium arsenic GaAs, Cadmium Tellurium CdTe etc.

The basic unit of active solar system is the receiver of solar energy (PSE), or, as they are often referred to a solar collector. The reciver of solar collector, based on design, can be devided to: flat PSE, tubular, or parabolic.

Plate heat collectors use direct and diffuse solar radiation and do not require tracking the path of the Sun; the maintenance is minimal, they are relatively inexpensive and mechanically simple. Solar radiation enters into collector through a transparent glass and comes to the absorber, where the absorbed radiation converts into heat energy. Good thermal conductivity is required to transfer the collected heat from apsorbers plates to pipes where the heat is finally transferred to a liquid, usually water/glycol mixture with an anti-corrosion additive. It also protects the collector from freezing.

Vacuum collectors are composed of a series of tubes, where the each vacuum tube consists of two glass tubes made from very strong borosilicate glass. Outer tube is transparent and allows light rays to enter with minimal reflection. The inner tube is coated with a special selective coating (al-n/al), which characteristic is excellent absorption of solar radiation and minimal reflection. On the top, two tubes are connected, and while the pipes are exposed to high temperatures, the air contained in the space between the two layers of glass is pumped out. In general, improvement flat collectors have economic advantages over concentrating solar systems for all applications which require the temperature to 120 °C.

If only 300,000 households in Serbia would have at least 5 m² of solar collectors for heating water or air, it will save 1,500 GWh per year, which corresponds to an installed production capacity of approximately 400 MW. Such investment would be paid off in two years without any energent consumption.

3. SITUATION IN SERBIA

The percentage of solar energy in the total potential of renewable energy in Serbia is about 14% or 0.6 million toes. However, the low standard of living, low electricity prices, low level of energy efficiency in all areas of energy consumption and lack of knowledge and political decisions are the main causes of insufficient use of renewable energy sources in Serbia.

Current global trends are in favor of Serbia. Firstly, subsidies in developed countries, have decreased significantly, and at the moment are on the Serbian level, while Serbia has more hours of sunshine than, for the example, Denmark or the Czech Republic. Their governments closely monitor the price trend of solar equipment, especially, solar panels and the inverter therefore the decline in subsidies in the EU is dynamic. Prices of solar panels in the last two years decreased in average four times, thus it had to be consequences on the level of subsidies. Another effect which occurred in some countries of Western Europe is excessive debts to the investors and owners of solar power plants. If we compare the value of other feed-in tariffs for renewable energy, solar power is much higher, making it the largest burden of the state budget, and the end user. These large debts have started to significantly affect the price of electricity in these countries. If we go back to Serbia, where the price of electricity is still a social category, we answered to the question why the prescribed quota for solar systems is low until to the end of 2015.

Furthermore, in recent years, in the strategic plans significant progress has been noticed. As Serbia's international commitments on January 2014, the Assembly has passed the Draft Energy Development Strategy for the period up to 2025, with projections to the 2030 in which is planed the establishment of a sustainable energy system by more efficient energy production from renewable and available energy sources, with a planned and cost-effective placement. The National Action Plan for the utilization of renewable energy of the Republic of Serbia, which encourages investment in renewable energy sources, is adopted. The strategic goal of the Republic of Serbia is 27% of renewable energy sources in gross final consumption of energy in the 2020th year, and improving energy efficiency by 20%.

Serbia, as a huge electricity consumer, has a chance to come to the extra amount of electricity without building new power capacity, just with saving, rational consumption and increasing overall energy efficiency. Base on this attitude, it can be concluded that by the construction of new power plants the new amount of energy will be available for export. The use of solar energy is the only healthy way to make a reduction in energy consumption wherever possible. This means that no matter the fact that the cost of investing in solar energy is quite high, approximately 3000 euros for 1 kW of installed capacity, it pays to invest in such a stable market. If in that price is calculated all that follows well-designed and organized work such as research, development, production, marketing, creating professional scientific and production staff, the conquest of new technology, the export of majority of production, increase of employment in the primary and supporting activities then the price is much lower and full effect is acchived. Then the price of the installation of thermal collectors of 1kW power for the state can be neglected.

A lot of projects have been announced for realization in the near future. However, when we look at Serbia’s place in the world by capacity, we can say that it is at the very beginning and that things are going slow. Current projects are mostly confined to smaller systems, pioneering ventures on the roofs of schools, some institutions and private buildings.

The benefits of solar collectors for water heating are undoubtal. First, by virtue of using sunlight provide a unique sense of security because it is an inexhaustible energy source available to each user. Second, their

maintenance costs are insignificant compared to the explotation life and the paying for installation of the system is only once. Third, solar energy saving other energents that are paid and the investment returns of two to five years. Fourth, it is not necessary that the subject is pre-designed for the installation of such a heating system. The solar panels are easy to integrate into any existing heating system in any facility. The average household system reduces CO_2 emissions by around 350 kg per year.

3.1. Research of the market of solar collectors

Over 55% of the total energy consumed in households in Serbia is used in the form of electricity, of which a good part for water hiting. Although in winter the energy effect of solar radiation is lower than in summer, it is still very important for the solar heating of houses, as support to other energy of the central heating system. In this case solar energy can cover about 45% of free heat for heating homes and achieved reducing the cost of heating hot water for about 60 to 70% during the year, which leads to relaxation of the household budget. The best effect of solar energy utilization for heating of family houses and other residential and commercial properties can be achieved in transitional periods with energy-efficient heating systems, ie floor-wall heating systems, ie. low temperature heating systems.

However, due to the variability of the solar irradiance during the day, month and year, the installation of solar heating that would allow entire house heating throughout the winter can not be performed, and therefore solar systems are combined with the other sources of energy which consumes some of the other forms of energy: liquid fuel, gas fuel, electricity, solid fuels etc.

As an inevitable precondition for the utilization of solar energy in Serbia, it is necessary to direct and finance knowledge in the field of thermal conversion of solar radiation in order to achieve proper results:

- Reduction of energy dependence
- Increas of the employment rate
- Reduction of family energy expenses and therefore contribution to poverty reduction
- Reduction of environment pollution

3.2. Solar power plants in Serbia

When we talk about solar power plants in Serbia, we have implemented projects near to Kladovo, Merdar, Mionica, in Bajna Basta, on the roof of the Institute “Mihajlo Pupin”, on the roof of the factory “SNE Energy” in Cacak, on the roof of the factory “Gorenje” in Valjevo. In addition, we also have some smaller systems on the roofs of schools and other public and private buildings that have already begun to reap revenue from the state at a subsidized price.

The first solar power plant in Serbia was built in Vrbovac near to Blace. Plant has installed power of 10 kW and is designed for eight months. Value of the plant is 30,000 € and is owned by the TV mechanic Dragoljub Petrovic from Vrbovac, who has signed a contract with EPS of the sale of all produced electric energy. Monthly income is estimated from 400-500 €.

The panels are placed at suitable angles from 33 degrees to better absorbing solar energy and are connected sequential (serial).

Example of the calculation of small power plant "Zica": The total installed capacity of small power according to the applicant's request is 3.4 kVA, with one generator (fotogen with inverter). Selected peak power which power hands to the distribution network of electricity system: 3.31 kW, a selected peak power that power plant takes from the distribution network of electricity system: 0.05 kW. Annual production that power plant delivers to the distribution network of electricity system: 4 040 kWh / year.

Tabel 1: Planned peak power and energy per month wich power plant hands to the distribution network of electricity system

Month	Jan	Feb	Mar	Apri	May	Jun	Jul	Avg	Sep	Oct	Nov	Dec
Power (kW)	3,31	3,31	3,31	3,31	3,31	3,31	3,31	3,31	3,31	3,31	3,31	3,31
Energy (kWh)	197	240	329	378	429	423	476	462	402	327	208	167

Average size of a panel is about 1.6 m² and the price of panels is about 16000 dinars or approximately 150EUR. Strength of such panels is 160 W. The needs of an average household can be meet with the 10 panels with a total price of EUR 1.500. Considerable influence in the formation of prices has a DC-AC transmitor that cost about 800 euros. The total investment in this type of generating energy is around 3000 euros.

If we assume that the energy savings on a monthly basis is about 30 euros (reduce of the monthly electric bill) we can see that the investment is pay off for 8 years.

Concerning solar cells, the building blocks of elementary units of solar panels, the institute "Mihajlo Pupin" tried something in their labs, but the effect was not commercial. The reason is expencive production: from the processing of raw materials to the production of the final product. On the other hand, the University of Nis has already turned to the study of modern solar cells, contemporary biaxial solar system, and could make a major contribution to the field of research, and even, in some future, in production of solar panels.

In a word, at the moment, Serbia has no production capacity for solar panels and other key equipment: no production of solar cells, no plant for the conclusion of the module. There lies a great potential for the development because Serbia has enough of the human resources and natural resources.

4. CONCLUSION

Although in the winter energy effect of solar radiation is lower than in summer, it is still very important for the heating of homes, as support to the another energy on the central heating system. It can cover about 45% of free heat energy for heating homes and about 75% of domestic hot water. The best effect of solar energy utilization for the heating of family houses and other residential and commercial properties can be achieved in transitional periods by energy-efficient heating systems, ie. floor-wall heating systems, ie low temperature heating systems.

Solar energy for electricity production in Serbia is insufficient, primarily because of high investment costs of the photovoltaic plant. Although, in recent years, progress in the technology of production of solar cells is ovious, they are still expensive to use in generation of electricity and generally are applied in cases where other sources of energy can not be used. Popularization of manufacturing photovoltaic devices would lead to a reduction in prices and increased use of these devices by the population. The rapid growth of the photovoltaic industry in the world, promise good prospects of photovoltaic technologies in Serbia.

REFERENCES

Harris,J., 2009. *Ekonomija životne sredine i prirodnih resursa.* Data status, Beograd

Janković, V., 2010. *Toplotna konverzija sunčevog zračenja*. Jefferson institute

Lazić, M., 2013. *Коришћење соларне фотонапонске енергије у Србији.* Fakultet tehničkih nauka, Čačak

Zakona o energetici „Službeni glasnik RS" br. 57/11, 80/11 - ispravka, 93/12 i 124/12

Nacrt Strategije razvoja energetike Republike Srbije do 2025. Godine sa projekcijama do 2030. godine

http://www.eia.gov/forecasts/ieo/more_highlights.cfm

http://www.eia.gov/tools/faqs/faq.cfm?id=527&t=1

http://www.eia.gov/todayinenergy/detail.cfm?id=3270#

http://www.eia.gov/forecasts/ieo/more_highlights.cfm

http://www.instituteforenergyresearch.org/2013/06/27/statistical-review-of-world-energy-2013-viva-la-shale-revolucion/

http://www.obnovljiviizvorienergije.rs/solarna-energija.html

http://www.solarnipaneli.us/elektrana.php?gclid=CI3woPvK8b0CFUmWtAodtDUAJw

http://www.solarnipaneli.org/2011/03/roi-solarna-energija-i-povracaj-investicije-deo-iii/

4th International Symposium on Natural Resources Management
"Sustainable Development and Green Economy in Transition Countries"
31st May -1st June, 2014, Faculty of Management Zajecar, Republic of Serbia
www.fmz.edu.rs

'THE GLASS CEILING' – A PRECONDITION FOR TRANSITION ON THE WAY TO GREEN ECONOMY

Milica Paunović[1],
Anđelija Plavšić[2]
Ana Stanujkić[3]

[1]*mr, Park šuma Kraljevica bb, milica.paunovic@fmz.edu.rs*
[2]*MSc, Park šuma Kraljevica bb, andjelija.plavsic@fmz.edu.rs*
[3]*Independent researcher,ana.stanujkic@gmail.com*

ABSTRACT

The concept of green economy has received significant international attention over the past few years both as a tool to address the 2008 financial crisis as well as one of the two themes for the 2012 United Nations Conference on Sustainable Development (Rio+20). This has resulted in a rapidly expanding literature and emerging international practice as well as new partnerships, coalitions and platforms. One of the principles of green economy presented at the United Nations ConferenceRio+20 (Rio Earth Summit 2012) was integrating gender equality in all sustainable development frameworks and this issue is the starting point of this paper. The paper deals with the fact that women do not participateequally in ecological management, although they play an active role as agents of change. When it comes to women, their career advances are limited and they usually occupy less responsible, less prominent or less paid jobs and the term which describes this phenomenon more closely is known as 'the glass ceiling'.

KEYWORDS

Green economy, glass ceiling, sustainable development

1. INTRODUCTION

At its most basic level, the green economy is the clean energy economy, consisting primarily of four sectors: renewable energy (e.g. solar, wind, geothermal); green building and energy efficiency technology; energy-efficient infrastructure and transportation; and recycling and waste-to-energy (Gordon and Hays, 2008).

The green economy is not just about the ability to produce clean energy, but also technologies that allow cleaner production processes, as well as the growing market for products which consume less energy, from fluorescent lightbulbs to organic and locally produced food. Thus, it might include products, processes, and services that reduce environmental impact or improve natural resource use (Adapted from Buffa et al., 2008).

2. PRINCIPLES FOR A GREEN ECONOMY

1. Equitable distribution of wealth Promote the equitable distribution of wealth within nations and among nations, to reduce disparities between rich and poor, and achieve social and economic justice, within a sustainable and fair share of the world's resources and leaving sufficient space for wildlife and wilderness.

2. Economic equity and fairness Guided by the principle of common but differentiated responsibilities, create economic partnerships that would transfer substantial financial and technological assistance to less developed countries, to help minimize the gap between the developed and developing world and support the environmental sustainability of both.

3. **Intergenerational Equity** Environmental resources and ecosystems must be carefully managed and safeguarded so as to enhance the value of environmental assets for future generations, thereby equitably meeting their needs and allowing them to flourish.

4. Precautionary Approach Science should be utilized to enhance social and environmental outcomes, through the identification of environmental risk. Scientific uncertainty of environmental impacts shall not lead to avoidance of measures to prevent environmental degradation. The 'burden of proof' should lie with those claiming that there will not be significant environmental impacts.

5. The Right to Development Human development in harmony with the environment is fundamental to the achievement of sustainable development, so that individuals and societies are empowered to achieve positive social and environmental outcomes.

6. Internalization of Externalities Building true social and environmental value should be the central goal of policy. To this end, market prices must reflect real social and environmental costs and benefits, so that that the polluter bears the cost of pollution. Tax regimes and regulatory frameworks should be used to 'tilt the playing field', making 'good' things cheap and 'bad' things very expensive.

7. International Cooperation The application of environmental standards within nation States must be undertaken in a cooperative manner with the international community, based on an understanding of the possible impact on the development potential of other States. Environmental measuresrelating to trade should avoid unfair protectionism, but overall should ensure that trade supports sustainable resource use, environmental protection and progressive labor standards, promoting a 'race to the top' rather than the bottom.

8. International liability Acknowledging that actions within national boundaries can cause environmental impacts beyond national jurisdictions, requiring cooperation in the development of international law that allows for independent judicial remedies in such cases.

9. Information, participation and accountability All citizens should have access to information concerning the environment, as well as the opportunity to participate in decision-making processes. To ensure that environmental issues are handled with the participation of all concerned citizens, institutions at all levels (national and international) must be democratic and accountable, and make use of tools that enable civil society to hold them to account. In this regard, the access to justice by citizens for redress and remedy in environmental matters is a cornerstone of enhancing accountability.

10. Sustainable Consumption and Production Introduce sustainable production and consumption with sustainable and equitable resource use. Reduce and eliminate unsustainable patterns of production and consumption, i.e. reduce, reuse, and recycle the materials used, acknowledge the scarcity of the Earth resources and implement activities accordingly.

11. Strategic, co-ordinated and integrated planning to deliver sustainable development, the green economy and poverty alleviation An integrated approach must be adopted at all levels to expedite the achievement of socio-economic and environmental sustainability through strategic planning with civil society and stakeholders, and across all relevant government departments.

12. Just Transition – there will be costs in making the transition to a low carbon, green economy in the pursuit of sustainable development. Some States and actors are better able to bear those costs than others and are more resilient to transitional changes. In the process of change, the most vulnerable must be supported and protected – developing countries must have access to appropriate financial and technical assistance, citizens and communities must also have access to new skills and jobs.

13. Redefine Well-being – GDP is an inadequate tool for measuring social wellbeing and environmental integrity. Many socially and environmentally damaging activities enhance GDP – such as fossil fuel exploitation and financial speculation. Human wellbeing and quality of life, and environmental health should be the guiding objectives of economic development.

14. Gender Equality – gender equality and equity are prerequisites to the transition to a green economy and the achievement of sustainable development. Women have a vital role to play as agents of change for environmental management and development – their actions must be rewarded accordingly and their skills enhanced.

15. Safeguard biodiversity and prevent pollution of any part of the environment – protect and restore biodiversity and natural habitats as integral to development and human wellbeing, and develop a system of governance that protects the resilience of ecosystems to prevent irreversible damage (Stakeholder Forum Sue Riddlestone, Bioregional Mirian Vilela, Earthsummit 2012).

3. THE GLASS CEILING

The term 'glass ceiling' has been frequently used from 1987 (it was first used in the USA in 1970) and denotes the unseen yet unbreachable barrier that keeps women from rising to the uppermostmanagerial positions in the organizational hierarchy.

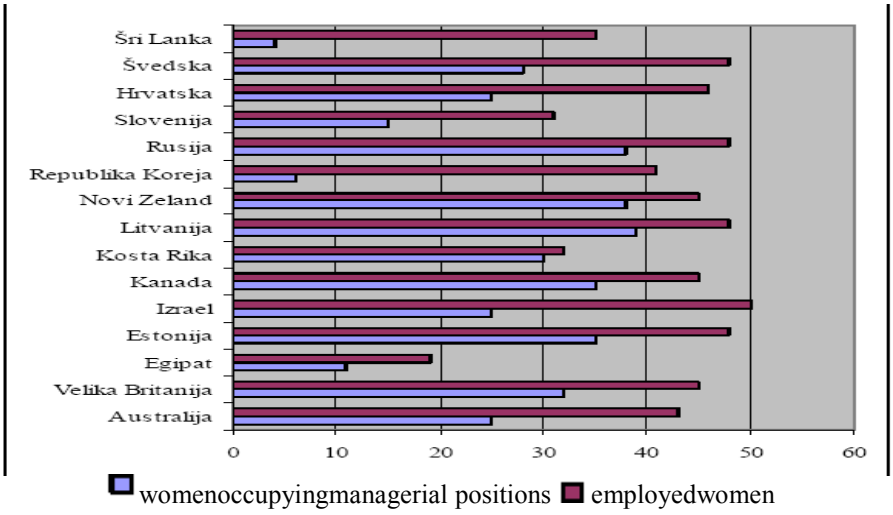
Their career advances are limited to less responsible, less prominent and less paid jobs without any obvious reasons and regardless of their qualifications or achievements. This invisible but unbreakable barrier was defined in 1998 by Morgan as 'all those cases when women start their careers in the same way as men do but as time goes by they either advance more slowly or are at some pointstopped in their attempts to advance.' The glass ceiling refers to all those cases when women are prevented from advancing to managerial positions, especially top-management positions, regardless of their efforts, qualifications, achievements or skills.

The glass ceiling is a final result of economic and social gender inequality. It is reflected in several sets of factors which in fact depend on each other or are mutually conditioned:

1. Deeply rooted attitudes regarding the male and female roles in a society which very often affect the level and choice of female education;
2. Job segregation according to the gender (what is traditionally vied as a female job is less paid, allegedly less complex and less demanding, and even in those fields where women make the majority – the managers are men);
3. Men and women who work at the same positions are not paid the same – men are always paid more regardless of the existing laws which state they ought to be paid the same;
4. Taking part in unpaid work activities (housework) – according to Wirth, 2001, 2/3 of women's overall work is unpaid in relation to 1/3 of men's time; and
5. Difficulties women have in balancing business and private duties.

Before indulging in deeper considerations, it may be useful to say why this issue is so relevant at this moment and why it is necessary to change certain matters that have been such for centuries. Besides the ethical (the women's rights to equality as the basic human right) and social-psychological reasons (more and more women take part in the labour market and are more career-oriented), there are legal-economic (fines and penalties for unlawful discrimination are extremely high) and practical reasons for accepting the difference principles at work (the more different workers are, the more different ideas they have, the more consumers are attracted).

Picture 1 shows the relation between the total number of women in the labour market and their number of women occupying managerial positions in several countries from different parts of the world (http://www.e-jednakost.org.rs/download/Stakleni_plafon.pdf.).



Picture 1. Relation between total number of women in the labour market and their number of women occupying managerial positions in several countries from different parts of the world

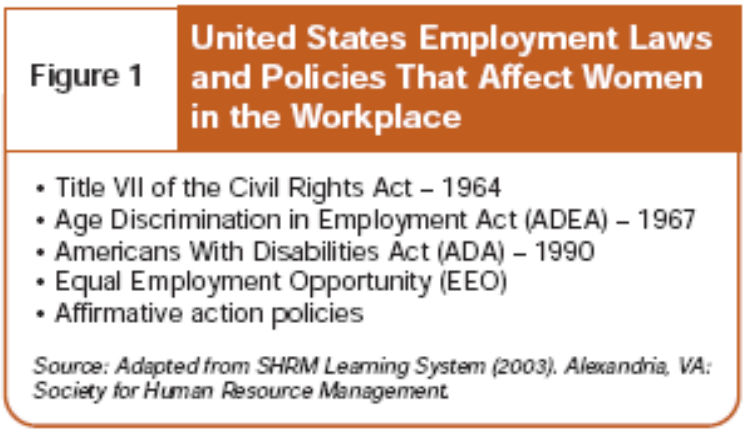
In average, women earn 1/3 less than their male colleagues for doing the same job. The United States of America may serve as an example here: women make 46.5% of the workforce but only 8% of them are found in the top managerial positions (for the sake of comparison, in 1995 this was 5%). This means that they earn only 72% of the total amount of earnings their male colleaguesmake. The situation is similar in Europe – there is not a single woman among the 25 most paid executives.

According to the Economistmagazine, there are three main reasons for the glass ceiling. The first is excluding women from informal networks that exist within the very companiesand which are very important for career advances. The second reason is found in the still existing prejudices against women and their skills regarding leadership, and therefore men who make the majority on all boards are reluctant when it comes to appointing women chief officers. The third reason is the lack of models – there are too fewwomen occupyingtop positions who could show other women that they are equally capable of doing the same jobs as their male colleagues.

Family is also one of the major reasons why women give up their career advances. Most women make career breaks because they are pregnant and have to take care of children, after which it is very hard to continue the career in the same place due to fierce competition. That is the reason why many women decide to start their own businesses after giving birth as they thus have more time for family duties (http://www.gov.me/files/1206526537.pdf.).

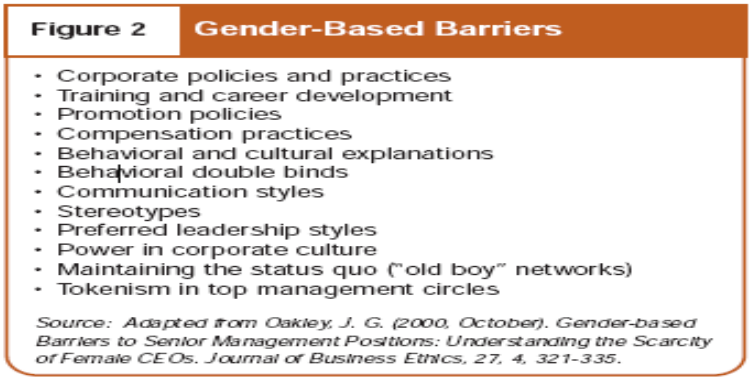
Women are still scarce in top leadership positions in wealthy industrialized societies in spite of substantial gender equity in education and the entrance of an increasing number of women into high prestige professions and managerial jobs long dominated by men (Acker, 2009).

In the United States, discrimination in the workplace is illegal (see Picture 2 - Figue 1). Yet discrimination exists in many forms. For women, for example, discrimination can result in lower pay and fewer advances in salary when compared with men. It may also manifest in hiring practices, training and development, and promotional opportunities that are disproportionately in favor of men.



Picture 2. Discrimination at work

Evidence of the glass ceiling has been described as invisible, covert and overt. At the root of the glass ceiling are gender-based barriers, commonly cited in the literature and noted anecdotally. These barriers run the gamut from gender stereotypes to preferred leadership styles to tokenism in the high managerial ranks (see Picture 3 - Figure 2).



Picture 3. Gender-Based Barriers

4. HOW TO BREAK THROUGH THE GLASS CEILING

The fact that the glass ceiling phenomenon is found in every country points out that today we can only talk about breaking it through instead of destroying it. Breaking through the glass ceiling is an action that takes time and involves the whole society. A great deal of attention has to be paid to liberating education from stereotypes, and encouraging girls and young women to choose schools that are not traditionally seen as female. Attitude changes within families, schools and the environment (men have to accept changes in gender roles, too) cannot be successful without a thorough social programme. Different institutions in the state have to take part in the process of course but this does not only mean adopting and applying the laws regulating women equality rights at work. What is more important is forming a special body that would deal with this issue and that would initiate, carry out and evaluate different actions and activities regarding this matter and its possible violation.

As far as companies are concerned, breaking through the glass ceiling means ensuring that all the employees in one organization are familiar with this problem, defining the ways of monitoring and evaluation,and defining the responsibilitymanagers have. When laws begin to be applied, the whole economic situation becomes better; this economic situation is not a threat to social justice nor is it unimaginable, especially when it comes to almost utopian measures for changing the opinions and traditions the women in Serbia talk about (I'm afraid that it won't happen in the near future. When the Balkan is in question, it will take 100 or 200 additional years' – one of the woman managers says). It is possible to use the methods that have already been usedin the world successfully; it is of course necessary for the management to be fully aware of the importance of this issue and to be willing to solve the problems.

Fighting against stereotypes and prejudices. Both men and women take part in workshops (the presence of both sexes is a precondition so that women are not isolated and seen as an enemy) with the aim of improving the corporate climate and culture through the following: improving relationships, increasing sensitivity to stereotypes and prejudices, team work in overcoming these problems.

*Professional training.*Constant motivation and encouragement of women to educate themselves by the company management. This is necessary if women are to be taken into account for top leadership positions. If there are not enough educated and experienced business women ('critical mass') men will continue to occupy top positions.

Assertion trainings for women. Their goal is to prepare women for top leadership positions 'psychologically' – they will increase their self-esteem and practice how to use efficient non-aggressive and non-defensive styles of communication.

Workplace adjustment. The point here is to increase flexibility of working hours (e.g. teleworking) and thus balance housework and business duties. This also includes finding help for housework duties, organizing child care at workplace.

Networking. The importance of informal networks and personal contacts is invaluable. It goes without saying that a top leadership position will rarely be given to a person nobody knows. As they do not have

much free time women rarely have time for any gatherings after working hours and thus become 'invisible' to the management. Companies can help forming such relationships and bonds among the women employees – and in this way women can hear important information regarding doing business and promotion. Networking can also be done outside the institution, at the country or international level through non-profit organisations, magazines etc.

Career tracking. This means taking care of the young and promising workers who are helped in gaining experience by being given challenging and responsible job tasks. It is also supported by additional education and advice offered by senior and older colleagues.

*Workplace Mentorship.*This technique means that a more experienced, senior person provides guidance to a young woman who is a potential future manager. This mentor does not necessarily have to be from the same company. He offers professional assistance, information, knowledge and contacts. This work method is employed successfully is some Serbian companies but not with the purpose of supporting gender equality (http://www.e-jednakost.org.rs/download/Stakleni_plafon.pdf).

5. CONCLUSION

It is a fact that there are great differences between men and women occupying top leadership positions. Al these differences are in part a consequence of prejudices and opinions that women cannot run a business as successfully as men. Although today there is a greater number of women managers than it used to be, it is a fact that there are still more men in these positions. What is stated as the most frequent reason for this is that women do not employ a stern and controlling management style which leads to a strong hierarchy and strict working principles. On the contrary, women managers mainly try to create a trustworthy and pleasant environment and only if the results have not been accomplished do they apply an 'autocratic' style.

Therefore, many people think that women have a milder way of running business than men and use this as a justification for the greater number of men in the top leadership positions. Such prejudices are precisely the reason and obstacle for appointing or promoting a woman even when she accomplishes the same results as her male colleague.

REFERENCES

Acker, J., 2009. From glass ceiling to inequality regimes, *Sociologie du travail,* Vol. 51 , pp 199–217.

Adapted from Buffa et al., 2008. *California's Global Warming Solutions Act of 2006 – A Background Paper for Labour Unions* (CA: Center for Labor Research and Education, UC-Berkeley.

Gordon, K. and Hays J., 2008. *Green-Collar Jobs in America's Cities: Building Pathways out of Poverty and Careers in the Clean Energy Economy* (Apollo Alliance and Green for All, 2008). http://www.apolloalliance.org/downloads/ greencollarjobs.pdf.

Stakeholder Forum Sue Riddlestone, Bioregional Mirian Vilela, Earthsummit 2012, *Principles for the Green Economy A collection of principles for the green economy in the context of sustainable development and poverty eradication By Hannah Stoddart*, Earth Charter Initiative

http://www.e-jednakost.org.rs/download/Stakleni_plafon.pdf

http://www.gov.me/files/1206526537.pdf

http://www.e-jednakost.org.rs/download/Stakleni_plafon.pdf

4th International Symposium on Natural Resources Management
"Sustainable Development and Green Economy in Transition Countries"
31st May -1st June, 2014, Faculty of Management Zajecar, Republic of Serbia
www.fmz.edu.rs

STEEL SCRAP AS AN IMPORTANT RESOURCE IN THE PRODUCTION OF IRON AND STEEL

Miroslav Sokić[1], Zvonko Gulišija[1], Branislav Marković[1], Nada Štrbac[2], Vaso Manojlović[1]

[1]*Institute for Technology of Nuclear and Other Mineral Raw Materials,*
86 Franchet d'Esperey Street, Belgrade 11000, Serbia, m.sokic@itnms.ac.rs
[2] *Technical Faculty, University of Belgrade, 12 VJ Street, Bor 19210, Serbia*

ABSTRACT

This paper presents importance of using the steel scrap in steel production, the quality and sources of creation the iron and steel scrap and balancing model for estimation of their creation in the future. Steel scrap is usually classified into classes according to the origin and quality. Considering the steel scrap formation, the three major groups are elaborated: own scrap or circulation scrap, processing scrap and amortization or collecting scrap. The content of trace elements to the scrap is very important and influencing to the quality of the obtained steel. The balancing model for estimation of the total generated steel scrap is a simple sum of partial balances of circulation scrap, processing scrap and amortization scrap.

KEYWORDS

steel scrap, quality of steel scrap, sources of creation, balancing model.

1. INTRODUCTION

The main products of ferrous metallurgy, iron and steel are still indispensable in many industries. Besides iron ore, the main raw material of steel production is steel scrap (referenced as "scrap iron"), which is an integral part of the charge in all modern processes of steel production. For different processes share of steel scrap is different and it is in the range of 20-100%. Thus, for the production of crude steel in the converter it is necessary to provide 20% of the steel scrap in the charge, 50% for the production in the Siemens Martin furnaces and 90% for the production in the electric arc furnaces. For production of steel castings, scrap iron is used in 100%.

Average consumption of the steel scrap is about 400-500 kg/t of crude steel and is not the same in all parts of the world. From this amount 84% is used to produce steel castings, while 16% is used to produce pig iron.

From the economic point of view the reasons for steel scrap processing lie in the fact that the cost of steel production from scrap is up to four times lower in comparison with the cost of steel production from ore, which is reflected to the following (Kaplan & Ness, 1987):

- energy consumption in the steel production from scrap is about four times lower compared with consumption in the steel production from crude ore,
- using the steel scrap requires less investment because it is directly processed in steel plant without melting in the blast furnace,
- the use of steel scrap increases the work productivity, because there is a small amount of work consumption per unit of product,

- well prepared and classified steel scrap decrease the time of charging and melting in smelting aggregates, thereby increasing the productivity of aggregates and so on.

Furthermore, the quantity and quality of the iron ore deposits in nature decreases, while the quantity of steel scrap increase every year. Iron ore reserves are estimated at about 95 billion tons, which is enough for exploitation for the next 190 years without recycling. This is obvious if we take into account the fact that the production of steel enhanced about 30 million tons, which was in the beginning of the twentieth century up to 1,200 million tones in 2009th year (Steel Statistical Yearbook, 1987).

2. QUALITY OF STEEL SCRAP

Collected steel scrap contains a certain amount of impurities and trace elements, and within appropriate limits their presence can be tolerated. However, the increased content of some of these elements leads to a negative impact on the quality of the produced steel. The contents of nickel, copper and tin in the steel may influence on the changes in microstructure, deteriorating its properties. Copper and tin can be concentrated above the maximum level on the surface of steel, for example of ingots and cause brittleness of this steel and the poor state of the steel surface. The maximum copper content of the steel that is allowed is 0.05% for reinforcing bars, 0.30% for ordinary carbon steel, 0.10% for the high quality steel and 0.05% for "deep drawing" steel.

Some of trace elements in the steelmaking process can be eliminated. Silicon and chromium can be removed by oxidation in a furnace while nickel and molybdenum remains in the steel, increasing its hardness and impact resistance, but reduce its weldability. Arsenic in the smallest quantities causes brittleness of steel.

Alloyed steel scrap has a high value, and if its composition is known, it can be used as an addition to a metal charge for steel production of the desired composition. Sometimes ordinary carbon steel with unknown composition in terms of alloying elements creates a problem.

Trace elements may be endogenous or exogenous nature. Endogenous are an integral part of the steel, i.e. scrap resulting from it, and can only be determined by chemical analysis of steel scrap. Exogenous are usually present in the form of a coating on steel, for example zinc, tin, aluminium, and others.

Trace exogenous elements may be removed from the steel scrap by previous shredding and crushing and magnetic separation. For their extraction process, there are also other technical solutions. Non-ferrous metal coatings on the steel are removed by chemical method. If coatings are not removed from the steel scrap, it will become an endogenous impurity in the steel, unless it is not removed in the melting process. If it is possible, all exogenous trace elements should be removed before melting process, because their presence in the steel make difficulties in obtaining the steel with appropriate composition and increase the cost of production.

Steel scrap often contains non-metals such as rubber, wood, dirt, etc. Most of them can be removed in the process of steel production. However, if there is more than allowed, they may affect to the increase in the content of sulphur and phosphorus in the steel. Since these materials are electrically non-conductive, may cause the load of electrodes and failure of electric arc furnaces. Otherwise, non-metals can cause inconvenience and the following adverse effects:

- part of the present non-metals represent a proportional loss of ferrous substance;
- the share of present non-metals requires a smaller or larger amount of lime, which increases the total weight of the slag and reduced utilization of metallic charge;
- increased amount of slag, requires increased energy consumption per ton of produced steel.

For various types of steel products it is very important content of unwanted elements in the resulting steel scraps. For products such as re-rolled rod products, a higher content of trace elements is tolerated, than for example in cold rolled sheets. This must be taken into account when steelmakers prepare the charge.

The problem of steel scrap quality affects the whole steel industry, but the most on the electric-arc furnace steelmakers whose production based solely on a steel scrap. The integrated steel production process is simpler because it uses less steel scrap, while the poor quality of steel scrap can be improved by greater share of solid or liquid iron or direct reduced iron. In the case of use the oxygen-converter process it is possible to more efficiently remove those trace elements that have a greater affinity to oxygen. In the production of electric arc furnace removal of trace elements is not possible. Decreasing the content of trace

elements in the steel scrap, i.e. in the metal charge may be done by adding the appropriate amount of white or directly reduced iron.

Steel scrap is usually classified into classes according to its origin and quality. In the nomenclature of the UN / ECE (UN/ECE Nomenklature, 1990), iron and steel scrap are classified according to the origin, on the waste generated in the steel industry, including metal forming industry and steel foundries and steel scrap from sources outside the iron and steel industry and steel foundry.

There are several classifications of scrap by quality. Most countries have their own classifications which are in accordance with the domestic trade scrap. Because the U.S. and Western European countries are the most important world exporter of scrap, their classifications are commonly used around the world.

Considering of scrap classes, classifications can be significantly differ. Nevertheless, all classifications use the same quality criteria and labelled class, taking into account the physical and chemical properties of the scrap.

Physical properties, such as size of pieces and bulk density are given quantitatively. The upper limit of the length, width and height, and the lower limit of density are specified for the larger pieces of scrap and hydraulic pressed bales or hand-packed scrap. The lower limit of density is specified for the pieces and briquetted scrap.

Also, the origin of scrap also is taken into account. Regarding to the origin, class scrap can be characterized by production process in which it occurs (scraping drilling, cutting off), old products from which is produced (the breaking of the ship, the railroads, scrap from dismantling), and others.

For steel producers it is important to know the chemical composition of the scrap as a raw material and chemical composition of the steel, which makes as a final product. This information exists in the classification of scrap only in the case of alloyed scrap. The content of alloying elements must be known in order to use as a source of alloy in the production of new alloyed steel. As opposed to the alloyed scrap, the basic chemical composition of carbon steel scrap and scrap of cast iron is not specifically indicated in any classification. Some classifications limiting the content of alloying elements in unalloyed scrap, to make it so different from alloyed scrap. For example, content of alloying elements in carbon steel scraps and cast iron by scrap classification in the U.S., shall not exceed the limits shown in Table 1.

Table 1. Alloying elements in carbon steel scrap and cast iron: the case of the United States

Residual elements to the scrap	Content (%)
nickel	0,00
chrome	0,20
molybdenum	0,10
manganese	0,65

Table 2. Maximum allowed content of trace elements in the steel scrap

Classification	Classes of waste	Specification	
ECSC (1972)	33 Shredded scrap	Tin (Sn)	0,02% max.
		Copper (Cu)	0,15% max.
		Sulfur (S)	0,04% max.
		Phosphorous (F)	0,04% max.
United Kingdom (1979)	3A Fragmented scrap	Tin (Sn)	0,03% max.
		Copper (Cu)	0,20% max.
	3B Fragmented scrap	Tin (Sn)	0,03% max.
		Copper (Cu)	0,25% max.
France (1991)	33 Fragmented scrap	Tin (Sn)	0,02% max.
		Copper (Cu)	0,25% max.
	IB Burned urban scrap	(Cu+Ni+Cr+Sn)	1% max.
	NIB Unburnt urban scrap	(Cu+Ni+Cr+Sn)	1% max.

Content of trace elements in waste classifications are treated in two ways. The first and more frequently used method is descriptive specification which excludes external sources of trace elements. Thus, some classification of waste indicate that there should be no material with metal coatings, solder, tin compounds,

or pieces of non-iron materials. Other less commonly used method consists in the specification of maximum allowed content for different trace and non-specific components. Several examples are given in Table 2.

Modern technology of high quality steel production impose new demands regarding to the quality of scrap and ensuring continuous quality in the delivery of scrap metal. This requirement is particularly important for producers to ensure constant steel quality, compatible with the end customer and steel consumer requirements. Constant scrap quality means a uniform quality level of scrap, with a minimum deviation from delivery to delivery. The statistical scrap quality control is the most important means for ensuring the continuous scrap quality (Pflaum, 1989). It must be applied over the entire line of scrap handling, from collecting and sorting through the procedure of processing of metal scrap.

3. SOURCES OF IRON AND STEEL SCRAP CREATION

Scrap generated in the production and processing of iron and steel or as refuse in production is called the processing scrap (Wastes from Industries, 2006; Sokić et al, 2010; Ilić et al, 2010; Ilić et al, 2006). Processing scrap generated in the iron plant during the production of iron in blast furnaces, in the steel plant during the production of steel, in foundries and rolling mills in the production of semi-finished or finished iron products immediately returns to the process of steel making as raw material and is called own or circulation steel scrap. Scrap generated in the mechanical processing by end-users is called processing scrap.

Another large group of iron and steel scrap represents amortization scrap, which is often called collecting scrap (Ilić et al, 1993). Products made from iron and steel have limited usable cycle, after which due to physical wear or technological obsolescence lose usability properties and become amortization scrap i.e. raw material for steel making.

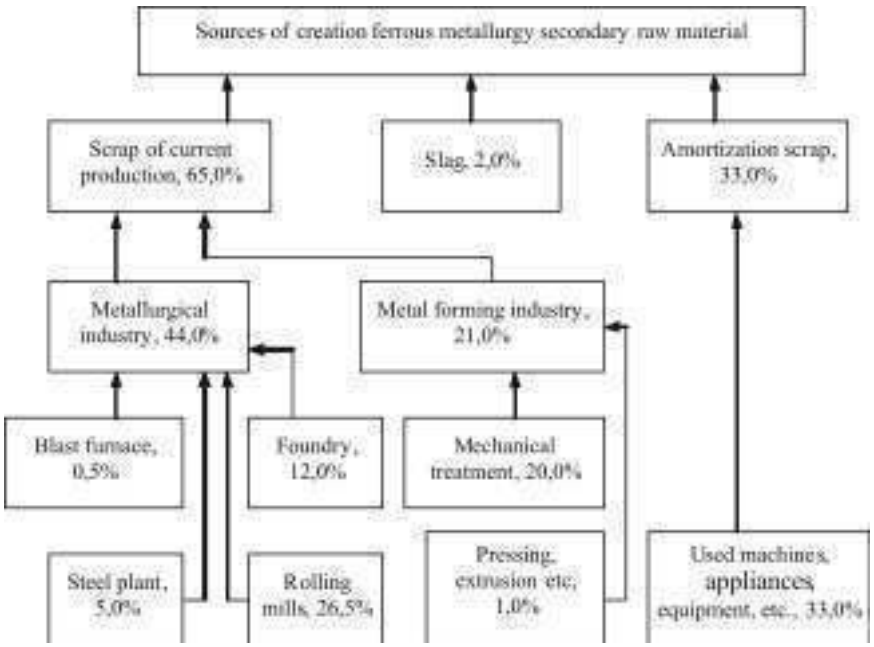


Figure 1. Technological flow-sheet of generating ferrous metallurgy secondary raw materials

The main sources of creation the production scrap and the amortization scrap of iron and steel (Figure 1) are the following (Volobuev et al., 1980): 1 - production of iron and steel; 2 - plants for processing of iron and steel, 3-amortization of final products made from iron and steel (amortization scrap), 4-processing - treatment of slag.

All iron substance that once separated from the ore are circulating through the production and consuming cycle, until they are completely depleted in the form of irreversible losses, after more circular resumptions (Ilić et al, 2010).

Amount of iron and steel production scrap grow with industrial progress, i.e. with growth of steel production and with growth of its processing level. This type of steel scrap does not accumulate with time because it is continuously consumed and processed immediately after the creation in the production and processing of steel.

Opposed to it, amortization steel scrap is not consumed immediately because the various steel items differ in the length of working life, and return to the production cycle of amortization steel scrap has a cumulative character.

Half of the world steel production is performed by using iron ores, and the other half by remelting of steel scrap. Scrap created in the production process are 2/3 of the total steel scrap, while 1/3 corresponds to the amortization scrap (Ilić, & Stopić, 2001).

4. BALANCING MODEL FOR ESTIMATION OF STEEL SCRAP CREATION

The application of balancing model for estimating of steel scrap creation is based on the balancing of circulation, processing and amortization scrap in the previous period and calculating the coefficients of their generation, which are used as the basis for successful modelling.

Quantity of generated steel scrap is the sum of circulation scrap, processing scrap and amortization scrap generated in one year and can be expressed as:

$$S_n = S_n^a + S_n^b + S_n^m \qquad (1)$$

where $S_n^a, S_n^b, S_n^m i\ S_n$ represent the amounts of circulation, processing, amortization and total scrap generated in year *n*.

Direct method for estimating the amount of circulation scrap and processing scrap consist from determine of the total amounts of scrap by summing the quantity of scrap from all technological sources according to the origin. Unfortunately, available statistical data of iron and steel scrap do not include information on their creation, but only on consumption.

Estimation of the amortization scrap creation in one year, by using the direct method of summing would be more complex. Due to the highly branched collection network of these scrap and the lack of data on amortization scrap generation, it is almost impossible to estimate by direct method. Existing statistical data refer to the consumption of amortization and processing scrap and it is usually different from the amount of generated scrap. Only in the case when the amounts of generated and consumed scrap are equal, equation (1) is applied.

The lack of statistical data on the scrap generation requires a different approach to estimate the availability of steel scrap. The close relationship between the formation of all three types of scrap and the production and consumption of steel allows a different approach to estimate the total generated scrap. This approach is based on data of production and consumption of steel and the numerical values of the coefficients related to the scrap generation.

Creation of circulation scrap S_n^a in year *n* is given by the following equation (Čavić et al, 1991):

$$S_n^a = C_n^{'} \times \frac{K^a}{100} \qquad (2)$$

where: - $C_n^{'}$ apparent domestic production of crude steel in the year *n*, in tons,

- K^a circulating scrap generation coefficient, in percent

Apparent domestic steel production, is the domestic production of crude steel C_n corrected for the imports and exports balance of crude steel ΔC_n

$$C_n^{'} = C_n \pm \Delta C_n \quad (3)$$

Creation of processing scrap S_n^b in year *n* is given by the following equation:

$$S_n^b = P_n \times \frac{K^b}{100} \quad (4)$$

where: - P_n is consumption of produced steel in the year *n*, in tons,

- K^b is processing scrap generation coefficient, in percent

In the absence of annual statistical data on actual consumption of finished steel, we can use the data on apparent consumption of steel in the equivalents of finished steel $P_n^{'}$. In this case P_n in equation takes the form of $P_n^{'}$, which is normally defined as the apparent consumption of finished steel by the following equation:

$$P_n^{'} = C_n \times E \pm \Delta P \quad (5)$$

where: - *E* is coefficient for the conversion of crude steel in the finished steel,

- ΔP is balance of exports and imports of semi-finished and finished steel

A crucial step to precision, with which will be assessed the annual production of circulation and processing scrap is choice of numerical values of the coefficients K^a , K^b and E.

Creation of amortization scrap S_n^m in year *n* is given by the following equation:

$$S_n^m = P_{(n-T_{av})}^{'} \times \frac{U_{avp}}{100} \quad (6)$$

where T_{av} is average time of return of amortization scrap, in years.

U_{avp} is calculated from the U_{av} by the equation:

$$U_{avp} = \frac{100 - \sum_{1}^{5} 1_i}{100} \times U_{av} \quad (7)$$

where: - U_{av} is coefficient of the average medium degree of revaluation, in percent,

- 1_i represents all non returnable losses, in percent.

Their average value is estimated at 26%. If the mean value of U_{av} = 55%, then the acceptable mean value is U_{avp} = 40%.

Estimation of total scrap sources of scrap is made by this methodology, using UN / ECE database of steel. Sources of circulation, processing and amortization scrap in equation (1) is calculated using the equation (2), (4) and (6) respectively. The values of the coefficients K^a and K^b, which are used for calculation in different countries are given in Tables 3 and 4.

Table 3. The values of circulating scrap generation coefficient K^a

Country	Year		
	1980	1990	2000
Austria	0,17	0,13	0,11
Belgium	0,21	0,17	0,15
Bulgaria	0,23	0,20	0,18
Romania	0,23	0,20	0,18
Yugoslavia	0,23	0,17	-
Federal Republic of Germany	0,18	0,10	0,10

Table 4. The values of process scrap generation coefficient K^b and average time of return of amortization scrap T_{av}

Country	Year			
	1980	1990	2000	T_{av}
Austria	0,14	0,14	0,14	15
Belgium	0,14	0,14	0,14	15
Federal Republic of Germany	0,14	0,14	0,14	15
Bulgaria	0,13	0,15	0,14	20
Romania	0,13	0,15	0,14	20

The rate of utilization of steel scrap in relation to the calculated total annual quantity of generated scrap can be determined from the ratio of the total consumption of steel scrap and total generated steel scrap. This rate in the world varies from 84% to 93%, and generally it is considered as relatively high.

The share of total generated steel scrap in the world production of crude steel is about 55%. This means that in the steel production, scrap is becoming more important input then the primary raw material.

In all these cases, we used the mean value of U_{avp}=40%.

In the structure of scrap sources the most important is amortization scrap and it is expected a slight increase of its generation in the future. The share of circulation scrap in the total steel scrap sources equally decreases due to improvements in technology of steel production.

5. CONCLUSION

For further development of crude steel production besides iron ore, great importance have steel scrap, which is applied in all modern processes of steel production. For different processes share of steel scrap is different and it is in the range of 20-100%, depending on the applied melting process.

Steel scrap contains a certain amount of impurities and trace elements, which presence is allowed within appropriate limits. However, the increased content of some of these elements leads to a negative impact on the quality of the produced steel. The main source of creation of iron and steel scrap are in the production of iron and steel, in the plants for processing of iron and steel and amortization of final products made of iron and steel. Scrap created in the production process are 2/3 of the total steel scrap, while 1/3 corresponds to the amortization scrap.

Balancing of total generated steel scrap in the observed year represents the sum of partial balances of circulation scrap, processing scrap and amortization scrap. Estimates of the formation of certain types of scrap are based on data of production and consumption of steel and the numerical values of the coefficients related to the scrap generation.

The utilization rate of steel scrap represents the ratio of the total consumption of steel scrap and totally generated steel scrap, and its ranges from 84% to 93%.

ACKNOWLEDGEMENT

This work is part of realization of projects N°34002 and N° 34023 that are supported by the Ministry of Education, Science and Technological Development of the Republic of Serbia.

REFERENCES

Kaplan R. S. and Ness H., 1987. Recycling of metals. *Conservation & Recycling*, 10, 1, pp. 1-13.

Steel Statistical Yearbook 2009, 2009. *Steel Statistical Yearbook 2009*, International Iron and Steel Institute, Brussels.

UN/ECE Nomenklature, 1990. *Notes and Definitions Supplement to the Steel Statistical Bulleting, ECE*, Geneva.

Pflaum D.A., 1989. Residual problems and the scrap industry, in Residual and Unspecified Elements in Steel, 1042. *ASTM STP*, Philadelphia, pp. 11-25.

Wastes from Industries (Case Studies), 2006. *Industrial Waste Treatment Handbook (Second Edition)*, Woodard & Curran Inc , pp. 409-496.

Sokić M. et al, 2010. Izvori i prognoza nastajanja otpadaka gvožđa i čelika. *Reciklaža i održivi razvoj*, 3, 1 pp. 35-46.

Ilić I. et al, 2010. *Reciklaža metaličnih sekundarnih sirovina*, ITNMS, Beograd.

Ilić I. et al, 2006. Reciklaža metala iz amortizovanog i proizvodnog metalnog otpada, *I Simpozijum o reciklažnim tehnologijama i održivom razvoju sa međunarodnim učešćem, Zbornik radova*, Soko Banja, pp. 142-155.

Ilić I. et al, 1993. Savremeno stanje reciklaže metala. *XXV Oktobarsko savetovanje rudara i metalurga*, Bor, pp. 587-590.

Volobuev V.F. et al., 1980. *Zagotovka i pererabotka vtoričnih metallov*, Metallurgija, Moskva.

Ilić I. and Stopić S., 2001. Reciklaža metala iz amortizovanog i proizvodnog otpada. *Tehnika – RGM*, 4-5, pp. 15-23.

Čavić A. et al, 1991. Methodology of Quantitative Estimate of Iron and Steel Scrap Arisings. *Ironmaking and Steelmaking*,18, 1, pp. 59-67.

4th International Symposium on Natural Resources Management
"Sustainable Development and Green Economy in Transition Countries"
31st May -1st June, 2014, Faculty of Management Zajecar, Republic of Serbia
www.fmz.edu.rs

ITALIAN NETWORK CONTRACTS: CAN CULTURAL DIMENSIONS INFLUENCE A NETWORK STRUCTURE?

Maria Teresa Riggio[1]
Francesco Saverio Massari[2]
Donato Calace[3]

[1]*Lum Jean Monnet, Casamassima Italy*
riggio@lum.it
[2] *Lum Jean Monnet, Casamassima Italy*
massari@lum.it
[3] *Lum Jean Monnet, Casamassima Italy*
calace@lum.it

ABSTRACT

This article investigates on the importance of networking for enhancing companies competitiveness, especially for resource restricted companies (SMEs).
To promote collaboration between enterprises, Italy implemented a law on "Network Contracts" in 2009. As the study will show, the governance of a Network Contract influences directly a network's performances, but there are also other important factors to be considered. Culture is one of these, therefore Hofstede's national cultural dimension will be examined, using a case study design approach. The results show that this tool is completely in line with the Italian culture, and thus can be considered as an effective instrument that companies can implement in order to enhance their competitiveness.

KEYWORDS

Networking, Innovation, Internationalization, SMEs, National Culture, Network Structure.

1. INTRODUCTION

The Italian productive system is mainly composed by SMEs[1]. Italy for more than 99.7%, is made up of small and medium-sized enterprises (the EU average is 99.1%). The small size, makes difficult the internationalization and limits the investments in innovation (Hall, Lotti, & Mairesse, 2009). The SMEs cannot easily find the financial resources (both public and private) to allocate for innovation. Furthermore partnerships for innovation are restricted to traditional partners such as suppliers (AIP, 2007). At the same time, the SMEs have difficult relationship with the banking system. Other reasons are related to socio-cultural factors and connect the low propensity in R&D investments, with a governance focused on the family control.

Operating in a network, it is possible to take benefit of external specializations and focus more on what you excel; take advantage of various types of economies and cost reductions; introduce new ideas and different views that reduce complexity and develop innovation; reduce risks, which are shared among several

[1] The category of micro, small and medium-sized enterprises (SMEs) is made up of enterprises which employ fewer than 250 persons and which have an annual turnover not exceeding 50 million euro, and/or an annual balance sheet total not exceeding 43 million euro (European Commission 2012).

participants; promote new standards and introduce new technologies in the market; acquire a global orientation in searching for new opportunities and resources (Gulati, 1998; Kogut, 2000).

In Italy, collaboration, is typically developed inside "districts". However, with the change of the economic dynamics, the district is losing its competitive advantage, even though it is still important for the Italian economy (Palmieri, 2010). Unlike what happens into the "district", nowadays, innovation needs a project shared by the various stakeholders and significant common investments in knowledge and resources.

When you begin to explore new "lands" which require substantial investments, being unconsciously in a network, as in the case of the district, is not enough. Being in a network with identified partners requires a conscious choice and a strategic plan (Rullani, 2004). At the same time, if you want to innovate in a modern perspective, it is necessary to extend the old "short" networks which are a characteristic of the districts, making them more cross-sectorial and cross-territorial.

More and more Italian companies are following the logic of collaborating inside a network and this is increasingly done through the use of a recent tool: the "Network Contract"[2] (known as Contratto di Rete). The Network Contract seems to meet these needs, transforming the concept of the industrial districts in systems open to non-local processes and competences. Thanks to the Network Contract, district networks can become more stable, better governed and more extended (more cross-sectorial and more cross-territorial).

With this tool, two or more entrepreneurs commit oneself to practice in common one or more economic activities falling within their social objects, with the dual purpose of increasing mutual ability to innovate and to increase the market competitiveness of the new formed entity. With the network it is intended to give "legal significance" to forms of collaboration between companies aimed to "sharing work together" in different contexts, from the legal protection of relationships with suppliers and customers, to industrial property, reaching out to the relationship with the banks.

The study survey of van de Vrande et al. (2009), highlights that the main barriers on the adoption innovation for SMEs are managerial, organizational and cultural. Especially corporate organization and culture arise when SMEs start to interact and collaborate with external partners. These are seen as the most important barriers that firms face (van de Vrande et al. 2009).

Ceci and Iubatti (2012) explain how the diffusion of innovation is enabled by network relationships: the presence of trust, shared values and mutual objectives facilitates the commencement of a difficult and risky path, such as that characterizing the adoption of innovation. In particular, a network characterized by strong relationships increases trust that in turn enhances knowledge sharing because of the existence of trust (Ceci and Iubatti; 2012). When partners trust each other's behaviors, tend to foster knowledge exchanges that are essential for the development of networks (Gulati, 1998; Mellewigt et al., 2007).

As a matter of fact, is important to view innovation not only in terms of process and product, but also in terms of organizational and cultural aspects. In the next section after a brief introduction on networking, I will focus on the importance for Italian companies to collaborate inside networks in order to enhance their competitiveness, especially through the use of the Network Contract. By examining the essential elements of a Network Contract I will try to understand how a network structure helps increasing performances and see that this relationship is mediated by cultural dimension. Hofstede's framework will help me to make some predictions, understanding which cultural factors can influence the governance of a Network Contract. All this will be analyzed an tested trough a case study design approach. My research will be guided by the following research questions: What influences a network structure? Are there any cultural differences that impact on the network structure of a Network Contract? How does this network structure influence performances?

2. THEORETICAL FRAMEWORK

The present study aims at analyzing how national culture can influence a network structure that in turn determinates performance developing innovation and internationalization activities.

Culture does not influence performance directly, but how a network decides to organize itself. As a result the relationship between Network Structure and performance is mediated by national culture. The conceptual framework is depicted in Figure 1.

[2] Legislative Decree February 10 2009, n.5 and further modifications

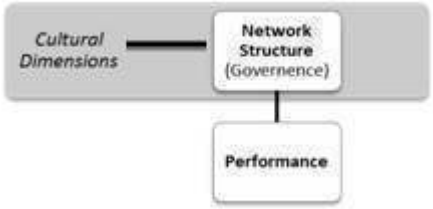


Figure 1. Conceptual Framework

2.1 Networking and Network Structure

In the past few years there have been many empirical studies, aiming to understand how economic activities occur in a Network Structure (Gulati 1998; Kogut, 2000; Ahuja, 2000; Gulati et al., 2000). Firms have been for long recognized as embedded in networks – both for professional and social exchange relationships (Gulati et al. 2000; Ahuja, 2000; Vasilenko et al. 2011).

Networking plays an essential role, and brings different benefits for companies that participate in a network of relations. These can be declined in terms of economies of scale, scope economies and transaction. Risk is also reduced inside networks because it is shared among several actors. Furthermore, a network multiplies the uses of knowledge, putting into action business intelligence (Gulati, 2000). Companies can take advantage of external specialization and focus more on what they excel, integrating their core competences with those of other partners.

Scholars have largely devoted their attention to increasing their understanding of network dynamics, studying factors that enable the creation of networks, their inner characteristics, and the distinctive features that determine their unique ways of knowledge sharing and transfer (Gulati, 1998; Powel et al., 1996; Kogut, 2000; Ahuja, 2000; Gulati et al., 2000). Most of them examined interfirm relationships from a variety of theoretical perspectives, levels of analysis and outcomes (e.g., Burt 1992; Coleman 1988; Gulati, 1998; Gulati, Nohria, & Zaheer, 2000; Kogut 2000; Ahuja 2000), affirming that alliances enable firms to gain access to resources, particularly when time is of the essence (Gulati 1998; Kogut 2000).

Therefore, being inside a network is beneficial for resource-constrained firms, who can enjoy relationships and resources typical of a more established ones (Powel et al., 1996).

2.2 The importance of Networking: an Italian prospective

Networking is beneficial for resource-constrained firms, who can enjoy relationships and resources typical of more established ones (Powel et al., 1996). Inter-organizational networks are strategic alliances with other SMEs, big companies or other individuals, that bring positive influences for SMEs, since they can access to resource difficult to develop on their own, guaranteeing at the same time, a high flexibility and enhancing their growth capacity (Powell et al. 1996) enhancing innovation and internationalization.

An important study on Italian SMEs (Hall, Lotti and Mairesse; 2009) affirms that Italian SMEs practice an "innovation without research". Thanks to their new model the authors show that Italian SMEs are not less innovative than foreign ones, but make innovation without research, since they invest less in R&D activities. This is one of the various consequences for Italian firms, highly specialized on traditional productions with a low technological content. In fact, most of the Italian SMEs operate in traditional sectors with a labor-intensive orientation, which today are mostly exposed to competition coming from many emerging countries. Furthermore partnerships are restricted to traditional partners such as suppliers and cannot easily find the financial resources (both public and private) to allocate for innovation.

The high costs of capital for innovation activities - which in Italy is the highest of Europe - discourages investments for R&D activities. At the same time, the SMEs have difficult relationship with the banking system. While in other economic systems we have specialized agents (e.g. venture capitalist) that are able to intercept, evaluate, and finance R&D projects, in Italy the rarity of these figures generates less opportunities of accessing to finance (Hall et al., 2009). Moreover, at the Italian SMEs lack in manufacturing, distribution,

marketing and so "relational competence" (Hall et al., 2009). In most cases, small and medium enterprises act as large workers strongly oriented "to the task, and less to relations" (Ghiringhelli and Pero, 2010).

Other important reasons are related to socio-cultural factors and connect the low propensity in R&D investments, with a governance focused on the family control (van de Vrande et al. 2009; Hall et al., 2009; Lee et al. 2010; Bianchi et al., 2010; Gronum et al., 2012) with a pyramidal structure (which is quite common in Italian SMEs).

2.3 Network Contracts and network structure

As a forerunner in this framework, Italy adopted Network Contract in 2009 under the auspices of the Small Business Act, that following the direction recently sketched by the European Union, promotes the development of inter-firm cooperation strategies to foster enterprises' innovation and growth. The European Commission, found this tool very innovative and in line with the principles contained in the SBA. Collaboration in fact is considered an effective solution and is mentioned among the practical measures to implement the SBA.

After four years from the introduction of the Network Contract procedure[3] and with three changes in legislation[4] (in this small length of time) in order to develop this new institution, the Network Contracts left the "running in-phase" and since 2011 many of them were signed. This tool is not specifically targeted to SMEs, but it is a general tool of collaboration to be used by enterprises of any dimension. However the law is suited for SMEs, in fact helps them overcoming limitations due to their dimensions without causing them to lose independence, while also enabling them to collaborate with firms of different dimensions (Ferrari, 2010). Network Contracts can be considered as an "open based" contract, the regulation provides only a framework scheme identifying the essential content of the contract and leaving to the freedom of the parties the definition of specific clauses according to their needs and to the circumstances in which they operate[5]. The network contract allows two or more enterprises, on a purely contractual basis, to jointly perform one or more economic activities in order to increase their potentials for innovation and internationalization (Guzzardi, 2013). In fact, companies collaborate and share know-how, invest in R&D, plan international strategies on the base of a common purpose that is identified by each company. This common objective is specified also in the "network program". The flexibility of the network contract is evident in the preparation of the network program that can require different levels of aggregation and mutual commitment, from the simple cooperation, exchange of information or services, to the joint practice of one or more activities falling within the object of their own business. The governance model adopted may be lighter or heavier, providing the absence or presence of a common body (optional), as well as the adoption of more complex model that identifies an executive committee internal to the common body, the nomination of the network manager (offering technical and professional support in the implementation of the contract), etc. The network can remain a simple contract (defined as rete-contratto) with no autonomous subjectivity, or become a collective formation with autonomous subjectivity (defined as rete-soggetto) although not personified. So, even if it is recognized to the network a proper subjectivity, the possibility of acquiring a juridical personality is missing.

2.4 How National Culture influences Network Structure

There are various analytical models developed to investigate cultural differences with regard to business organization (Trompenaar, 1993; Hall, 1990; Hofstede, 1983). Among these, the one that best suits the analysis of relationship between cultural variables and network relationships is the model proposed by Hofstede (1983). The reason is that it is one of the most established models of analysis and reviewed in the organizational literature.

[3] Born from the art. 3 co. 4 ter, 4-quarter and 4-quinquies l.d. February 10 2009, n. 5, and converted with modification by Law April 9 2009, n.3.

[4] As already mentioned, the discipline was modified several times in 2009, 2010 and 2012, arriving to the current set-up that finds its focus on the Law December 17 2012 n.221.

[5] Art.42 (Reti di imprese) L. n. 122/2010 ; Art.45 L. n.134/2012 ; art. 36 comma 4 L.D. n. 179/2012.

Hofstede (1983) in his statistical analysis saw how the values of similar employees in different countries revealed common problems, differing from country to country, in four different areas[6]:"Indvidualism versus Collectivism (IDV)", "Large or Small Power Distance (PDI)", "Strong or Weak Uncertainty Avoidance (UAI)", "Masculinity versus Femininity (MAS)". These dimensions are relative, do not change over time and express a dominant culture.

INDIVIDUALISM (loose social relationships, self-realization, independent relations)	**COLLECTIVISM (tight social relationships, trust for the group, interdependence relations)**
HIGH POWER DISTANCE (respect for high power roles)	LOW POWER DISTANCE (valorization of differences)
STRONG UNCERTAINTY AVOIDANCE – aversion to risk (rigid codes, formality, anxiety and stress)	WEAK UNCERTAINTY AVOIDANCE – propensity to risk (flexibility, innovative capacity, tolerance)
MASCULINITY (high profile, assertiveness, need for success)	FEMMININITY (modesty, quality of life, excessive state aid)

Figure 2. Hofstedes' dimensions of national culture

If we explore the Italian dominant culture through the lens of the Hofstede's four dimension model, we can get a good overview of the deep drivers of Italian culture[7]: Italy, in common with other southern European countries and some countries in Central Europe where the Roman Empire has left its mark, has a relatively high index in the hierarchical distance. At a score of 76 Italy is an Individualistic culture, "me" centered. This dimension does vary in Southern Italy where less individualistic behavior can be observed. Individualistic cultures, are very oriented toward personal success and therefore characterized by a higher entrepreneurial spirit, this seem to be less receptive to the development of a Network Contract. Therefore, considering the differences between North and South, Italy can be viewed as being in a "half way between the Individualism and Collectivism sphere"[8].

This is well embraced with the concept of networks that have been hailed as a third organizational form, between markets and hierarchies (Kogut; 2000)[9].

Since the 70s, Italian collaboration was typically developed inside "districts". However, with the change of the economic dynamics, the district is losing its competitive advantage, even though it is still important for the Italian economy (Palmieri, 2010). From this I believe that the examined Italian Network Contracts are perfectly in line with the Italian culture, which arise from the logic of the districts. Not surprisingly up to now, 1.213 Network Contracts were signed (November, 2013 - data from Info Camere Italia).

Considering Power Distance dimension (50/100) the score shows that Italians expect power distance. In Southern Italy all the consequences of PDI are even more evident. Admittedly, this score sits in the medium rankings and Italy's lower power distance score shows that Italy is working to de-emphasize the differences between its citizen's power and wealth. Italy then is in half way between "high and low" PDI, coherent with the IDV dimension, considering Italy not too much individualistic neither collectivist.

In business, this dimension leads to rather formal behavior, in fact we have Network Contract that nominate a network manager, creating a common fund, creating a common body, arriving to the acquisition of a legal subjectivity (if wanted) with the so called rete-soggetto (presenting a heavy structure). Today only 55/1.213 Network Contracts are rete-soggetto, this is in line with the original intention of the legislator of making the Network Contract a slim and light support and facilitation to the business activity.

From this I assume that Network Contracts, as in the intention of the legislator, are considered as a flexible model for inter-firm collaboration. The governance model adopted may be lighter (rete-contratto) or

[6] There is also a fifth dimension independent of the four others and is called "confucian dynamism" opposing a long-term or short-term orientation in life and work (Hofstede; 1990). Each dimension has an index value between 0 – 100. These dimensions where found through multivariate statistics and theoretical reasoning. The value for each nation helps compare with other national cultures.

[7] These information were taken from Hofstede's web site www.geert-hofstede.com

[8] This is possible also comparing the score to other national cultures, since Italy it is not so Individualistic as U.S. and also not so Collectivist as Hong Kong.

[9] In fact a network has been defined as a hybrid coordination mechanism of economic activity that combines the advantages of both the traditional governance mechanisms of vertical integration and market exchanges. Markets are more consistent to the individualism (with a high power distance) sphere while hierarchies to the collectivism one (with a lower power distance), networks are in fact in the vast gray area between the two extremes of a complete independence - market - and a high dependence – hierarchy - (Cafaggi, 2008)

heavier (rete-soggetto), and this is coherent with the 50/100 PDI score, assuming that Italians believe that hierarchy in business should be respected, but they are favoring also horizontal relationships and lighter forms of governance. In fact horizontal networks represent almost the 63% of the signed Network Contracts (D'Amico et al., 2013), comparing to the vertical ones, which represent 37% .

At 70 Italy is a considered masculine society – highly success oriented and driven. Being part of a Network represents a key dimension, especially for SMEs, that see the Network Contract as a collaboration tool helping them reaching growth, that otherwise could be difficult to reach (Ferrari, 2010). This reflects the high score of Italians in MAS dimension, as the working environment is the place where every Italian can reach his/her success. Therefore competition among colleagues for making a career can be very strong, and so they try alternatives of gaining competitiveness (like being part of a network). This score, compared to other national cultures, is not very high but is coherent with the IDV dimension. We can say then that Italians are yes considered as a masculine country, but since it is a dominant score, this cannot be generalized (this is true for all the analyzed dimensions).

At 75 Italy has a high score on uncertainty avoidance which means that as a nation Italians are not comfortable in ambiguous situations. Formality is important and Italians wish to avoid ways of dealing with uncertainty, for this reason I expect that Italians are more easily inclined to enter inside the logic of the Network Contract. Since 2009, even if the law saw many changes, now it is guaranteed the distribution of a formula having well-defined characteristics with already tested success.

The existence of the Network Contract is already an important factor on his own, since informal collaborations creates high uncertainty, and so formalizing them helps avoiding this ambiguity and helps companies work better. In Italy companies, in order to enhance business relationships, need to join a legally recognized tool of collaboration. This is a strong indicator UAI, since Italian companies needed the law in order to effectively operate together.

As already it is possible to affirm, many Italian companies (especially SMEs) are signing more and more Network Contracts. After four years since the establishment of the first network of companies, the desire to work as a team now involves almost 6.000 companies (November, 2013; data from Info Camere Italy). As affirmed above, the differences found are statistical in nature, so the national culture originated is a kind of average pattern of beliefs and values, and should not be generalize to every individual within that nation.

Hofstede's framework helped me to make some assumption, understanding which cultural factors can influence the governance of a Network Contract.

In the following section I will analyze three case studies, and on the basis of the cultural factors emerged, I will try to understand the relationship between "cultural dimensions" and "network structure", which in turn enhances performances. My research will be guided by the following research questions: What influences a network structure? Are there any cultural differences that impact on the network structure of a Network Contract? How does this network structure influence performances?

3. RESEARCH METHODOLOGY

The following section adopts an empirical approach, supporting the theoretical indications presented above observing cases studies that implemented the Network Contract.
I will do so through an in-depth investigation understanding how cultural dimensions impact on networking, and how companies are increasing their innovation and internationalization activities. According to Info Camere Italia (November 2013) we have 1.213 Network Contracts already signed, and almost 6.000 participating companies. Since 2009, year when the instrument was introduced, not enough time went by in order to make relevant quantitative studies (Bank of Italy, February 2013). For this reason, I will adopt a qualitative approach, more specifically a multiple case study design, based on interviews and company visits to the three networks under investigation.

Case selection and size

I selected three Network Contracts following a specified protocol: first I analyzed Network Contracts that have at least one year of operation in order to obtain more reliable results (data were obtained by the Italian Chamber of Commerce, section Info Camere, November 2013). After an initial phase of contact, where companies have been submitted to a brief informative telephone interview (reaching 200 companies of 52

Network Contracts), I selected those cases whose experience has shown higher managerial and organizational implications, following a technique of theoretical sampling indicated by Eisenhardt and Graebner (2007).

Once having obtained their availability, these were selected and interviewed. For the purpose of this study, I selected three cases particularly suitable for illuminating relationships and logic among construct (Eisenhardt and Graebner, 2007). These three case studies will be called with fantasy names: Alfa-net, Beta-net and Gamma-net (also companies participating to the networks will have fantasy names) .

The purpose of this explorative study is testing how cultural dimension can influence the governance of a Network Contract and how this has implication on performances. I think that this is a small enough sample to fully answer to my research question and will allow me to point out sufficient results.

Details of the Italian Network Contracts and the companies involved inside the network are set out in Table 1 (*Summary of Case Details*).

Table 1 "Summary of Case Details"

NETWORK CONTRACT	YEAR	REGION	INTERVIEWED COMPANIES	FOCUS OF THE NETORK CONTRACT	ACTIVITY
ALFA-NET	2011	Emilia Romagna	• Circle Ltd • Square Ltd • Triangle Ltd	innovation	development of an experimental waste collection system
BETA-NET	2013	Puglia	• One Ltd • Two Ltd • Network Manager (external)	Innovation and internationalization	Develop innovative products in the field of precision mechanics
GAMMA-NET	2011	Puglia Toscana Veneto	• Sun Lp • Moon Ltd	marketing	local promotion, workshops, events, trade fairs

Data collection and analysis

As guided by Yin (1989), I collected the main data through recorded semi-structured interviews, ensuring for all similar procedures, for a total of 8 interviews. These interviews were conducted mainly to the responsible for decisions related to the Network Contract (e.g. President or Representative/Responsible of the Network Contract). For each case, at least two interviews were made, this in order to guarantee the validity and coherence of information, collected from different point of views.

Considering the roles of the respondents, together with the president[10] of the network, for each case study it was interviewed a representative of one of the member companies: this because I wanted to listen to the experience and the voice of the companies involved in the network. In addition, the analysis developed for each case was submitted to the interviewees, so that they would guarantee the correct and faithful data retrieval of the information collected through the testimonies. It was satisfied the criteria that the informant must be a prominent and well-informed person in the case selected, on the basis of his/her expertise in the areas relevant for my research (Yin, 1989).

To supplement to the interview material, I collected secondary data, both internal material and published material, that were relevant for the study. To have a clear overview of the supplemental material collected. Where possible, I examined websites of the Network Contracts/Companies, before the interview this in order to gain background information and identify specific issues useful for the interview. I also collected internal documents, like the certificate of incorporation of the Network Contract, where I found a better definition of the network program specifying the common purpose together with strategic goals and economic activities implemented by the network.

Following Yin's (1989) suggestions, I maintained a database of all the recorded interviews, transcripts and notes. Using interview recordings was very helpful and also very important to ensure that none information got lost.

Thanks to supplementary data, it was possible to draw a brief overview of the green Network Contracts selected before making the interviews and proceed in-depth with the research.

[10] In his absence or unavailability, it was interviewed the subject referred to as representative or responsible for the network contract

- *Alfa-Net* was founded on August 4, 2011and is composed by three SMEs all coming from Emilia Romagna (Circle Ltd, Square Ltd and Triangle Ltd - as it is possible to see from Table 1, these three companies where all interviewed). The aim of the relationship is to develop a new project through the commercialization of a new technologically advanced product in the field of urban solid waste. It is, in particular, an electronic system able to monitor users refuse in normal waste bins, distributed throughout the area. In addition, the technology allows you to tighten up the bins when not in use. Thanks to an electronic key, it is possible to unlock them and record data access. The development of the product has been possible thanks to the participation of a large multi utility of the territory, H-Group, which holds 40% of its patent (external to the network). The remainder is equally distributed among the three members of the Network Contract. *Alfa-Net,* created a "light Network Contract" (no common fund) with the only nomination of the President and a Technical Manager. The President is responsible for business relationships with customers, and a Technical Manager, acting as a Project Manager, follows the technical and electronic part for the development of the hardware at the base of the new product.
- *Beta-Net* was founded on January 24, 2013 and is composed by seven SMEs operating in the field of the precision mechanic, located between Bisceglie and Molfetta (Puglia). The participants have years of experience, also international, within the industry. With this agreement their intent was to strengthen their planning capacity in innovation and internationalization activities.
  The purpose of the network is strengthening *Beta-Net* competitive advantage, and so of their group members. This is done through: the development of their value proposition brought to the market, the introduction of products and services with higher added value and the strong orientation towards internationalization. *Beta-Net* created a "heavy Network Contract": they have established a common body made up from the President and four other members. The President has the function of management representative of the network guiding the activities of the common body. They have also provided the network with a common fund. After obtaining the legal subjectivity the common fund became a joint stock, having also the VAT number in order to stipulate contracts.
- *Gamma-Net* was founded on July 7, 2011and is composed by eleven companies coming from Puglia, Toscana and Veneto, which operate in the context of alternative energy sources. The purpose of the network is "the creation of an innovative organizational model designed to create strategic and operational synergies between the members". Under a common brand, the participating companies are aiming to increase their competitiveness through the development of communicative activities, capturing potential business opportunities. *Gamma-Net* created a "light Network Contract" (no common fund) having a common body (nominated by the11 companies) guided by the President. This is supported by Cloud Inc. an external company which operates in the consultancy field. Therefore, while the strategic and operational decisions are the responsibilities of the common body and the President, the external support deals with the administration of the network.
  After the creation of the website and the development of promotional activities, *Gamma-Net* has entered in a stalling situation, continuing up to now. Some companies, in fact, do not adhere anymore to the Network Contract.

3. RESULTS

The experiences of *Alfa-Net*, *Beta-Net* and *Gamma-Net* describe the experience of network relationships, that companies together with other individuals have shown on the marketplace, testing this recent tool.

As already specified, the aim of this study was to understand how cultural dimensions influence a network structure that in turn influences performances: therefore the result brought to understand other important factors to be considered, answering to the question "*when does a network contract brings results*?".

In particular, the analysis is structured in the first instance by examining: 1. the "working prerequisites" that constitute a solid base for a Network Contract, going then into detail investigating 2. the "success conditions" of a network; as a final point, 3. the "performances" are taken into account with the specific purposes for which the legislature has introduced this new tool into our legal order: internationalization and innovation.

1. Working prerequisites

"Knowing and trusting each other"

Since 2009, many companies are nowadays drawing up more and more Network Contracts, and after many changes in the law, this tool is being more trusted by SMEs, guaranteeing the distribution of a formula having well-defined characteristics with already tested success. The existence of a Network Contract is already an important cultural factor itself: is a strong indicator of UAI, since Italian companies needed the law in order to effectively operate together, acquiring different resources and competences, and doing things that independently it is difficult to do.

"*Working through a network you can do something that alone you could not afford. We do not have expertise in the field of electronics, software, or plant design. The network is the only way for small companies like us to work not only on behalf of third parties, but to develop a new product and have direct contact with the market" (Alfa-Net).*

Knowing and trusting each other is an important factor, since it helps reducing uncertainty, and thanks to higher trust, the companies involved in the Network Contract work better.

Formality is important and Italians wish to avoid ways of dealing with uncertainty. As shown in their interviews, this tool is offering the possibility of formalizing existing relationships and enhancing more stable and durable ones. In the case of *Beta-Net*, the Network Contract is seen as a bridge that helped companies get together, but whose aim is to develop a Joint Stock Company (in Italian S.p.A) in the future. Indeed, we see how trough he creation of this new entity, it is strongly felt the need of making more stable the existing relationships. This helps in overcoming the high UAI that Italians showed in Hofstede's national culture model, and for this reason Italian SMEs are more easily inclined to enter inside the logic of the Network Contract.

The companies knew each other before the Network Contract: the tool did not bring to the collaboration. Rather, the collaboration has led to the Network Contract, proving to be an effective way to formalize the existing relationships (*Alfa-Net*).

In order to develop an efficient Network Contract you need to know each other. Trust between people is essential, as well as their capabilities and their reliability. (Alfa-Net).

You must believe in the network and in the people who run it. On the other hand, the network allows us to do things that otherwise we could not do that alone (Beta-Net).

You cannot make a Network Contract without knowing already each other. This tool helped formalizing a temporary relationships, in order to create a stronger one in the future (*Beta-Net*).

"Enabling force"

Another working prerequisite is the enabling force, who facilitates the relationship among partners, introduces the instrument to the companies, identifies the opportunities for creating shared value, helps building trust between companies that do not know each other, so it is someone who "*cultivates the seed and then develops the relationship*" (*Gamma-Net*).

This was essential for *Gamma-Net* since the companies did not know each other and operated in different regions. Unfortunately in this case, the aim of supporter institution (Cloud Inc.) was giving an external support to the network, acting as a service provider. *Gamma-Net* affirms that one of the problem of their failure, was due to the lack of an enabling force who could lead and coordinates the network activities.

The enabling force can be seen also related to the nomination of the Network Manager who offers technical and professional support in the implementation of the Network Contract (as is it possible to see in *Beta-Net*), or even one or more companies that operate inside the network. This was the case of Alfa-Net, where there are two leader companies (Circle Ltd and Square Ltd) even if their role is due more to a simplification of normative, administrative and bureaucratic requirements, rather than an operating function. Circle and Square act as drivers of network activity, while Triangle operates similar to a subcontractor.

From what we have said so far, we can affirm this is a phenomenon that demonstrates the novelty of this business model, especially when compared to the Italian business culture, focused on family control.

The network created in this way can be defined as "pushed" as mostly encouraged by the centripetal force of this supporter, rather than the spontaneous initiative of their members.

In Hofstede's national cultural model, Italy ranks at 50/100 with PDI, showing that Italians do believe in hierarchy[11] accepting authority. Here le leadership of this enabling force is accepted, being the primary decision maker of the Network Contract.

I think it is normal that different organizations have a general mistrust in working together, certainly emphasized even here in the South of Italy, so for this reason and for a certain way of doing business, that is for sure not participative, you need a neutral person who can represent the element of trust, a trustee representative that allows individuals to communicate with each other (*Beta-Net*).

The actors who formed the network were overly presumptuous: no one has taken the lead or involved the partners in projects going beyond the first steps taken.(Gamma-Net)

"*Focus of the network program*"

The focus of the network program is the object, the specific theme around which all the members activities rotate. It is the purpose of the partnership, the direction towards which it is oriented: *Alfa-Net* was born in order to develop innovation through an experimental waste collection system, being possible thanks to the large buyer (H-Group); *Beta-Net* aim is to develop innovation and internationalization developing precision mechanic products; *Gamma-Net*, instead, wants to promote the territory trough business activities, with a focus on marketing. As evident, the perspectives, strategies and actions will change depending on the focus of the network program. The program is represents the strategic path planned to implement the and take advantage of those "enabling forces" that led to the network structure. A focus centered on a scarce proposal of value, implemented by a with weak and vague program, cannot lead to positive results.

"Participating companies"

The choice of participating companies is a very critical factor for determining the performance of the network. "*The crucial point is to put together the right companies in order to collaborate in an efficient way*" (Alfa-Net).

The network asset, constituted by ties of relationships, competences and by the roles played by the participating companies, is defined in this process. Managing the trans-territorial, multi-sectorial and multi-dimensional issues of the network depend on the choice of the partners. While for the networks that put together companies that already know each other this moment is naturally derived, physiological of the personal and professional relationships already existing (as affirmed by Alfa-Net: "*the collaboration has led to the Network Contract"*) for "pushed" network contracts, where there is an enabling force acting as an aggregator, the choice of partner becomes a key challenge not only for the success of the partnership, but also for its existence.

For example, in *Gamma-Net*, they have modified the initial structure of their member companies before finding a stable equilibrium. In particular as it was showed, *Gamma-Net* is stuck at a crossroads, also for their inaccuracies in selecting the participating companies.The absence of these preconditions, or their intrinsic weakness puts to the test of the survival of the network, and its ability to successfully pursue its goals.

The trans-territorial, multi-sectorial and multi-dimensional, are managerial issues arising from the choice of the members that can become a source of competitive advantage or an obstacle to the proper functioning of the Network Contract.

Gamma-Net, for example, has experienced significant operational difficulties combining companies of various sizes and legal forms (from small Ltd to large Joint Stock Corporations , international in scope), coming from very distant geographic areas: "*Probably one of the errors of setting up the Network Contract was to involve firms of different sizes. Large companies already carry out most or part of the typical activities of the sector. So it becomes difficult for other smaller businesses to make a significant contribution. We also had problems in relation to the willingness to cooperate from the most large companies. On the other hand, however, there were also small companies that were not structured: they were simple engineering consultants. Other realities instead had a purely speculative philosophy. The network would have had different perspectives if it had put together companies of the same size but s aimed at specific segments of the industry and market (Gamma-Net).*

[11] Since 50% is an average of the lowest and highest score, it can be said that they favor also horizontal business relationships.

For example, *Alfa-Net* preferred to keep out of the Network Contract, the large buyer of the product, the H-Group, concentrating its activities in a specific geographic area and putting into system the expertise relating to various sectors (telecommunications, electronics, mechanics).

In the cases of *Alfa-Net* and *Beta-Net*, different or complementary skills, coming from different sectors involved was an essential and strategic option allowing networks in reaching ambitious targets for the development of green technologies and for internationalization opportunities. In fact firms acquire experience and knowledge trough multi-sectoral relations (Selsky and Parker, 2005; Russo, 2011), that enables companies to develop and find new opportunities.

We know that if you want to grow and you want to deal better with internal and external markets, the fact of aggregating similar skills, or even completely different ones, is extremely important, this has to be followed by a high trust between partners involved in the network, in order to create an entity which has a higher weight and is able to find the best opportunities that individual companies and others do not recognize (Mr. Vincenzo Loverre – Kad3 Group, Exon Centauri).

Table 2. Working prerequisites

WORKING PREREQUISITES
1. Knowing and trusting each other 2. Enabling force 3. Focus of the network program 4. Participating companies

2. Success conditions

Once the network contract has been signed, the purposes of the partnership have been identified, the program has been shared, and the common identity has been founded, the cooperation can count of a solid base. The elements discussed in the previous section, as already mentioned, are the working preconditions: they represent the goals that the Network Contract has planned, but not sufficient to ensure the success of the alliance.

To make this happen the network must be able to rely on a portfolio of resources and competences, of value, rare, inimitable and well organized. In fact, they are the heritage of the network, those assets able at identifying a competitive advantage, making economically profitable the opportunities that the working preconditions listed above have been identified. It is clear that the set of resources and competences of the network goes beyond the simple sum of those of its members: it is the result of the cooperation created through the tie modality and relationships: "*We believe the combination of our competences must be greater than the sum of our know-how, thanks to a multiplier effect. The shared competences are the basis to find our points of contact. On the competences you optimize business opportunities, investment evaluations and internationalization strategies" (Beta-Net).*

The key for the success of a network is the relational competence of the company to be able to transmit this knowledge to the involved partners. It is a process of coopetition, which at the time of creating the partnership it is joined the negotiation of the contract that dictate the rules of the alliance.

As seen in theory, the governance model adopted may be lighter (rete-contratto) or heavier (rete-soggetto). Lighter structures of Network Contract are more in line with the intention of the legislator in providing to Italian companies - especially SMEs - a flexible tool of collaboration, facilitating the innovation and internationalization, and so competitiveness and growth.

In Hofstede's national cultural model, Italy ranks at 50/100 with PDI, showing that Italians do believe in hierarchy but favor also horizontal business relationships (average score). The Network Contract seems to be perfectly in line with the Italian culture, since there is the possibility of modifying the strength of the relationship, choosing to have in the contract the common fund, acquiring the legal subjectivity, etc.

Alfa-Net and *Gamma-Net*, adopted a light structure (rete-contratto), deciding not to acquire the legal subjectivity because creating a new entity could generate a greater rigidity with a loss of their independence, also it would let them feel closer to a consortium or limited company (in case of juridical personality), not taking full advantage of the flexible collaborative system.

Beta-Net adopted a heavy structure (rete-soggetto), introducing in its contract very detailed rules of procedure, including rules of withdrawal, exclusion and entry of new members, they also included a common fund and a common body composed by the President and members of the network, and they also nominated a Network Manager (external), arriving to the acquisition of the legal subjectivity. This in order to avoid any type of difficulties with third parties, who do not consider the network as a common entity.
However, we must not, make the mistake of considering the network structure as a determinate variable at first glance through a plan. On the contrary, the empirical evidence shows that the identity of the networks, the interaction between the internal organizational structure of firms and of the network, is a result of intentional choices and emerging reactions: the network structure is likely to change in the time, in a dynamic way, responding to both exogenous needs (changes in legislation, advances in technology) and endogenous needs (coopetition, opportunities, strategies of single members of the network). This is even more true in the case of the Network Contract, due to its intrinsic flexibility.

Table 3. *Success Conditions*

SUCCESS CONDITIONS
NETWORK COMPETENCES: Network Capabilities
NETWORK RESOURCES: Network Structure

3. Performances

All the interviewed affirmed that establishing a network of relations, can be an avenue for SMEs that want to innovate but do not have the necessary resources and capabilities acquiring a global orientation in searching for new opportunities. In fact entering in a Network Contract, played an essential role in facilitating their competitiveness (Alfa-Net and Beta-Net). The participants were conscious of the fact that today there is an incredible need for them to operate in a system of relations in which the value creation becomes a process of co-generation of value, aiming to enhance their potential for innovation and internationalization, thanks to this recent tool that guarantees extreme flexibility. The two networks were set up in order to connect multiple knowledge, link together more individuals under a contractual basis that admits a certain degree of flexibility in interfirm-collaborations. Both networks were born for a specific purpose, enhancing both innovation and internationalization activities with a common purpose specified in the “network program”.
Through the Network Contract the intention of the legislator was to improve , individually and cooperatively, the innovative capacity and the competitiveness on the national and international market of the member companies.

The success of a partnership realized by this instrument shall then be measured in terms of the results achieved by the network in relation to the objectives of competitiveness, internationalization and innovation that will be pursued in the network program. Only an empirical analysis of the data may verify if today the instrument has effectively responded to the Italian production system , with respect to the intentions of the norm. As already stated previously, the amount of data is still not sufficient to perform this type of examination. However, the evidence of the case studies shown in this study provide a detailed description of the mechanisms and conditions under the Network Contract that lead to innovation and internationalization activities, increasing the competitiveness of the involved companies.

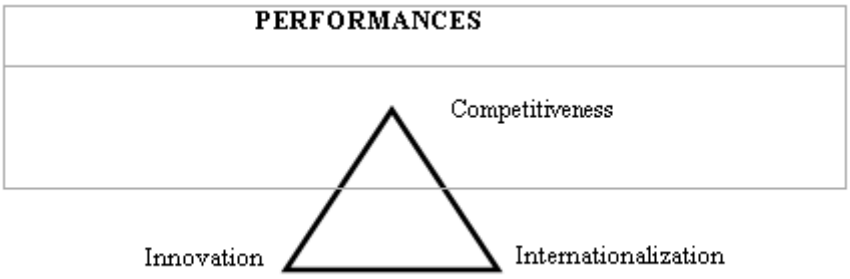


Figure 3. *Performances*

In terms of innovation, both *Alfa-Net* and *Beta-Net*, focused its their activities on the development of an innovative product. However, the issues and objectives with which they followed innovation activities, are significantly different.

Alfa-Net focuses on the development of a new product with a strong technological component. However, the relational competences that distinguishes this network transforms the way in which the innovative effort is made. The monitoring system of the electronic waste collection system has led to the registration of a patent shared among the members of the Network Contract and the end customer, the giant utility H-Group, in a perfect spirit of co-creation of value with the final user.

The goal of *Beta-Net* is to be recognized on the market thanks from their product. They produce components for large companies that build production machines, and they do this with a high devotion toward innovation. In terms of internationalization, the network obtains different advantages not only related to exports or in the possibility of opening foreign branches for relocating the production., but it also allows to share the relational wealth and access to foregin large networks in a more rapid, effective and efficient way. Moreover, since there is a higher visibility, they are more facilitated in participating to intemational projects.

4. DISCUSSION AND CONCLUSION

Clearly indicate advantages, limitations and possible applications. Synthesizing the findings of this study it is possible to build a management model that outlines the conditions that determine the level of performance of a Network Contract (of course mediated by the cultural dimension and high trust).

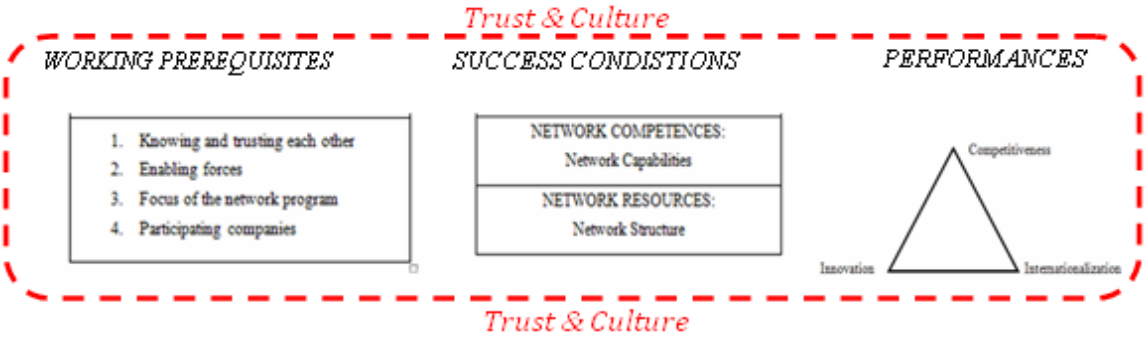


Figure 4. Network Contract

Both working prerequisites and the success conditions are essential in order to realize performances coherent which the purposes of the Network Contract. A cooperation of companies with resources and competences of value, rare, inimitable and well-organized, oriented towards a non-strategic goal, pursuing a weak and vague network program, has no long-term prospects: what lacks is the motivation founding the aggregation. The result is a disintegration of the partnership, the lack of interest of the participating members, who prefer,

where possible, to carry out projects independently, since they do not recognize the possibility of creating value through the synergy. Similarly, a network with grounded working prerequisites but poor of resources and competences, will hardly be aware of the potentials of the strategic plan.

The results show that the success of an alliance depends on the ability to select their partners within the network of relationships ensuring an adequate balance of competences between partners operating in different sectors (Russo, 2011). In the case selected this was essential in order to develop innovation and internationalization activities, in order to commercialize innovative products outside and inside the domestic market (*Alfa-Net, Beta-Net*).

As seen in the case of Alfa-Net and Beta-Net, different skills coming from different sectors involved was crucial and strongly needed, putting together different skills that allow the network in reaching ambitious targets for the development of new technologies and for internationalization opportunities. Next to this, other crucial elements in order to help the Network Contract work in a proper way, there are the trust between companies and entrepreneurial culture. *"The first condition that enables the sharing between firms is personal, based on trust that is developed among people who operate in this type of relationship*" (*Alfa-Net*).

As anticipated, in the case of pushed networks, the enabling force plays, a key role in building trust between companies that do not know themselves. Similarly, the entrepreneurship view that the members of the network share must be open, innovative, detached from traditional culture based on family control. For this reason Hofstede national culture model was observed and compared to the essential elements that constitute a Network Contract.

As seen in this study, companies that operate in a Network Contract work in different sectors and regions and organize themselves with independence joining forces on the base of a common project. The tool is considered as a flexible collaborative system that promotes the development between inter-firm cooperation strategies to foster enterprises growth and increasing innovation and competitiveness. Even if is still a "work in progress", many Italian companies are drawing up green Network Contracts and this is showing how many of them are overcoming high obstacles, by operating in the logic of a network. As seen, the law is suited for SMEs, especially for Network Contracts who are all coming from the same area (*Alfa-Net, Beta-Net*).

The case studies show how member companies have found an answer to the age-old dilemmas that contaminate the historically productive system of small and medium-sized enterprises.

In the case studied, the reasons for cooperating were the lack of internal knowledge that forced the SMEs involved to source new and externally developed knowledge and expertise, as well as to get external actors involved in the innovation and internationalization process, gaining from complementary resources in order to spread the risks and to compensate for a lack of R&D capacity. It is a dimensional issue, the concentration in traditional and unskilled sectors and, the lack of resources to invest in R&D. "*Nowadays it is unthinkable for small companies like ours to have 4-5 researchers on a project, or have so many other working alone. Through a network it is possible gain in-depth knowledge that otherwise would not be possible to afford. It is about creating a group who move forward the development of a finished product"(Alfa-Net).* In both *Alfa-Net and Beta-Net* cases, networking helped overcome dimensional limitation and enjoy resources typical of more established companies and raise their competitive development. Sharing knowledge flows belonging to different areas was essential, since companies if taken individually, would not be able to hold. Not surprisingly, the Network Contract helped the realization of both the ongoing project for *Alfa-Net and Beta-Net*. In both Alfa-Net and Beta-Net, SMEs found unique ways of knowledge sharing and transfer, integrating core competence with those of other individuals (Gulati et al., 2000; Ahuja 2000; Russo 2011; Vasilchenko et al., 2011; Robinson et al. 2012).The network reveals a new type of enterprise that engages relationships in order to acquire resources and competences, choosing a third view compared to the hierarchy and the market. Therefore, it is possible to develop the coopetition model that overcomes the traditional "soloist" of the Italian entrepreneur - particularly in the South - and also open new avenues essential for the relaunch of the economy, such as the collaboration with the supporting institutions (universities, institutes, research centers) and the resulting technology transfer.

As seen in the theory, the Network Contract is defined in two categories: the light structure and the heavy structure, both models were analyzed in this study and it is not possible to say that one is better than another, since both studies are cases of success. Some participants affirmed that the creation of a new legal entity could create rigidity, losing their independence; for sure the possibility of acquiring the tax liability could help relations with third parties but linkages between partners will be for sure more rigid. Lighter forms of coordination, may be particular suitable in preliminary stages of cooperation among SMEs, but heavier structure may be essential when for example, through the Network Contract, firms collaborate to perform

R&D activities that could be beneficial to their own business or collaborate to patent and commercialize an innovation.

In my opinion it is important to follow the original intention of the legislator, which is reflected in the European Commission's decision of 26 January 2011 on the case no. C(2010)8939 – here the network contract was supposed to represent a light and slim support and facilitation to the business activity, being understood that it is possible in opting for more structured and evolved forms and evolved of aggregation (but different from the Network Contract). The recognition of the legal subjectivity, staying to this prospective, would open the door to a configuration of the institute that is intended to be an unnecessary duplication of tools already available for SMEs. Furthermore, from the case studies analyzed, and from the growing number of companies that every day stipulate a Network Contract, it is possible to affirm that the tool is in line with the cultural dimensions analyzed by Hofstede, providing a concrete support for the Italian SMEs, being a very useful instrument in dealing with the dimensional limitations and with other obstacles that SMEs nowadays face when competing alone. So, as a result we can say that SMEs need to heavily draw on their networks that can be considered as knowledge networks that tie together specialized competencies of a broad set of partners, customers, and suppliers to find missing resources (Van de Vrande, et al., 2009).

REFERENCES

AIP (Associazione Italiana Politiche Industriali), Fare reti d'impresa. Dai nodi distrettuali alle maglie lunghe: una nuova dimensione per competere, *Il Sole24Ore ed*., 2009.

Aldrich, H., "Organizations evolving", *Sage Publications*, 1999.

Anand B.N., Khanna T., "Do Firms Learn to Create Value? The Case of Alliances", *Strategic Management Journal*, 21(3):295-315, 2000.

Ahuja G., "Collaboration networks, structural holes, and innovation: a longitudinal study", *Administrative Science Quarterly*, 45:425-455, 2000.

Bentivogli C., Quintiliani F., Sabbatini D., "Le reti di imprese", *Banca d'Italia*, 2013.

Becattini G., Mercato e forze locali. Il distretto industriale, *Il Mulino*, 1987.

Cafaggi F., "Il contratto di rete", *Il Mulino*, 2010.

Ceci F., Iubatti D., "Personal relationships and innovation diffusion in SME networks: A content analysis approach", *Research Policy*, 2011.

Chesbrough, H., "Open Innovation: The New Imperative for Creating and Profiting from Technology", *Harvard Business School Press*, p.1-227, 2003.

Coviello N.E, Munro H.J., "Growing the entrepreneurial firm: Networking for international market development", *European Journal of Marketing*, 29: 49–61, 1995.

CONFAPI (Confederazione Italiana della Piccola e Media Industria Privata), Università LUM Jean Monnet, Reti di imprese per le PMI, Programma di Ricerca Anno Accademico 2010/2011, Edizioni Cespim, 2011.

Daily G., Ehrlih P., "Population sustainability, and the Earth's carrying capacity", BioScience 42(10), 1992;

Donaldson, T. and L. E. Preston, "The Stakeholder Theory of the Corporation: Concepts, Evidence, and Implications", *Academy of Management Review* 20(1):65-91 1995.

Eurobarometro - *SMEs, resource efficiency and green markets,* 2012.

Eisenhardt K.M., Graebner M.E., "Theory Building from cases: opportunities and challenges", *Academy of Management Journal* 50(1), 2007.

Ferrari C., "The Italian Network Contract: a new tool for the growth of enterprises within the framework of the SBA", *The Columbia Journal of European law online*, 2010.

Ghiringhelli C., Pero L., "Le PMI in Italia. Innovazione, strategie, modelli organizzativi", *APOGEO*, 2010.

Gronum S., Verreynne M.L., Kastelle T., "The role of networks in SMEs, innovation and firm performance", *Journal of Small Business Management,* 50(2):257-282, 2012.

Green Italy, "L'economia verde sfida la crisi", Rapporto 2012.

Gulati R., "Alliances and Networks", *Strategic Management Journal*, 19 (4):293-317, 1998.

Gulati R., Nohria N., Zaheer A., "Strategic Networks", *Stretegic Management Journal*, 21: 203–215, 2000.

Hall B.H., Lotti F., Mairesse J., Innovation and productivity in SMEs: empirical evidence for Italy, Small Business Economics, 33, 2009.

Head B., "Assessing network-based collaborations: effectiveness for whom?" *Public Management Review*, 10(6): 733-749, 2008.

Hart, S.L., "Beyond Greening: Strategies for a Sustainable World", *Harvard Business Review*, 66-76, 1997.

Hart, S.L., M.B. Milstein, "Creating sustainable value", *Academy of Management Executive*, 56-67, 2003.

Hofstede G., "The Cultural Relativity of Organizational Practices and Theories", *Journal of International Business Studies*, 14(2), 1983.

Hofstede G., "Measuring Organizational Cultures: A Qualitative and Quantitative Study Across Twenty Cases", *Administrative Science Quarterly*, 35(2), 1990.

Hofstede G. "Dimensionalizing Cultures: The Hofstede Model in Context", *Online Readings in Psychology and Culture*, 2(1), 2011.

Hau-Siu Chow I., "The Role of Social Network and Collaborative Culture in Knowledge Sharing and Performance Relations", *SAM Advanced Management Journal,* 2012.

Johanson J., Vahlne J.E., "The internationalization process of the firm: a model of knowledge development and increasing foreign market commitment", *Journal of International Business Studuies,* 8(1):23–32, 1977.

Johanson J., Vahlne J.E.,"Business relationship learning and commitment in the internationalization process". *Journal of International Entrepreneurship* 1(1):83–101, 2003.

Johanson J., Vahlne J.E., "The Uppsala internationalization process model revisited: from liability of foreignness to liability of outsidership". *Journal of International Business Studies* 40(9):1411–1431, 2009.

Kogut B., "The Network as Knowledge: Generative Rules and the Emergence of Structure", *Strategic Management Journal*, 21 (special issue), 405-425, 2000.

Lee S., Park G., Yoon B., Park J., "Open innovation n SMEs. An intermediated network model", *Research Policy*, 39:290-300, 2010.

Lubin D.A. and Esty D.C.: "The Sustainability Imperative", *Harvard Business Review*, 42-50, 2010.

Massari F., "Being Innovative. Le implicazioni gestionali e organizzative dell'innovazione aziendale", *Cacucci,* 2007.

Massari F., Morrone D., Maffei M., "La sostenibilità ambientale. Nuova opportunità di sviluppo per le aziende e i territori", *Cacucci,* 2011.

McEvil B., Marcus A., "Embedded Ties and the Acquisition of Competitive Capabilities", *Strategic Management Journal*, 26(11):1033-1055, 2005.

Miles, M.B., Huberman, A.M., "Qualitative Data Analysis: An Expanded Sourcebook", London: Sage, 1994.

Nidumolu R., Prahalad C.K. and M.R. Rangaswami, "Why Sustainability is now the key driver of Innovation", *Harvard Business Review*, 56-64, 2009.

OECD – Organization for Economic Development "Annual Report", 2009.

Oviatt B. M., McDougall P. P., "Entrepreneurship and modeling the speed of Internationalization", *Entrepreneurship Theory & Practice,* 537-553, 2005.

Palmieri D., "Un obiettivo di reddito in comune", in *Perché fare reti, l'impresa*, n. 2, 2010.

Perrini, F., & Tencati, A., "La responsabilità sociale d'impresa: strategia per l'impresa relazionale e innovazione per la sostenibilità", *Sinergie* n.77, 2008.

Porter M.E., "Competitive Advantage of Nations", *Free Press*, 1998.

Poewll W.W., Koput K.W., Smith-Doeer L., "Interorganizational Collaboration and the Locus of Innovation: Networks of Learning in Biotechnology", *Administrative Science Quarterly*, 41(1):116-145, 1996.

Reggio R., "La rete accelera credito e competitività", il Sole24Ore, 18 apr. 2011.

Ricciardi A., "L'impatto della crisi sui distretti industriali: tendenze evolutive e scenari futuri", in Il Ponte, n.4, 2010.

Ricciardi A., "I distretti dell'Osservatorio: sintesi dei fenomeni più rilevanti emersi dal II Rapporto, in Osservatorio Nazionale dei Distratti Italiani. Il Rapporto, 2010.

Robinson S., Stubberud H. A., "Innovation networks in European small businesses", *Proceedings of Academy of Studies in International Business,* 12(2):1-5, 2012.

Russo A., "Alleanze strategiche e network di conoscenza. Centralità e multisettorialità nell'industria fuel cell", *Sinergie*, 86: 166-186, 2011.

Russo A., Nygaard S., "Trust, coordination and knowledge flows in R&D projects: the case of fuel cell technologies", *Business Ethics. A European Review,* 17(1):23-34, 2008.

Rullani E., "La conoscenza e le reti: gli orizzonti competitivi del caso italiano e una riflessione metodologica sull'economia di impresa", *Sinergie*, 61/72:148-186, 2003.

Rullani E., "Economia della conoscenza. Creatività e valore nel capitalismo delle reti", Carocci, 2004.

Rullani E., "L'economia della conoscenza nel capitalismo delle reti", *Sinergie* 76:68-90, 2008.

Selsky J.W., Parker B., “Cross-Sector Partnerships to Address Social Issues: Challenges to Theory and Practise”, *Journal of Management*, 31(6): 1-25, 2005.

Simon H, Zatta D, “Campioni nascosti. Come le piccole e medie imprese hanno conquistato il mondo”, *Il Sole24Ore*, 2007.

Torkkeli L., Puumalainen K., Saarenketo S., Kuivalainen O., “The effect of network competence and environment hostility on the internationalization of SMEs”, *Journal of International Entrepreneurship*, 10:25-49, 2012.

Valsilenko E., Morrish S., “Networks in the exploration and exploitation of Internationalizaion opportunities by information and communication technology firms”, *Journal of International Marketing*, 19(4):1547-7215, 2011.

Van de Vrande V., De Jong J.P., Vanhaverbeke W., “Open innovation in SMEs: trends, motives and management challenges”, *Science Direct*, 29:423-437, 2009.

Yin, R.K.. “Applications of Case Study Research – Design and Methods”, *Sage*, 1989.

4th International Symposium on Natural Resources Management
"Sustainable Development and Green Economy in Transition Countries"
31st May -1st June, 2014, Faculty of Management Zajecar, Republic of Serbia
www.fmz.edu.rs

ENERGY SYSTEM OF SERBIA IN POST-CRISIS PERIOD, BASED ON RENEWABLE ENERGY SOURCES, AS A SIGNIFICANT FACTOR OF SUSTAINABLE ECONOMIC GROWTH AND DEVELOPMENT

Ignjatovic Slobodan*
Associate professor PhD, Faculty of Management
Zajecar
* *E-mail address: slobodan.ignjatovic@fmz.edu.rs*

ABSTRACT

Serbia is encountered with both consequences of global economic and financial crisis, which affected mostly all world countries in the first decade of 21st century, and consequences of incomplete transition process, which lasts in Serbia since the beginning of 1990's. Re-industrialization, as a way to change the existing post-crisis economic model of growth and development, is in a delayed period and that process, having in mind it requires great energy consumption, can be accelerated, dynamized and provide sustainable economic development through investments, primarily in energy, based on renewable energy sources. The aim of this paper is to analyze post-crisis period of Serbia, whose economy is in recession phase with double bottom, enormous and non-utilized energy potential that is based on renewable energy sources and risks in energy sector, which is crucial for economic recovery of Serbia.

KEY WORDS

Renewable energy sources, risk, economic growth, re-industrialization, crisis, recovery.

1. INTRODUCTION

Global economic crisis has emerged as a consequence of the US mortgage market collapse, but it rapidly assumed the characteristics of general global financial crisis with consequences in economic recession (J. Stiglitz, 2010). Global economic crisis didn't circumvent Serbia, and there are official data regarding this of the Government of the Republic of Serbia, NBS, IMF and other international institutions. It is still a dilemma to what extent and whether macro and micro instability in Serbia is only a consequence of economic crisis or transition process as well, which is still in progress and, unfortunately, still lasts.

Serbian economy is in double crisis: global economic crisis and transition crisis, which support one another and make the effect stronger. Global economic and financial crisis has discovered that previous

* e-mail address: slobodan.ignjatovic@fmz.edu.rs

model of economic growth and development of Serbia is not sustainable and it needs to be changed if we want to avoid the fate of underdeveloped and indebted country.

Members of the National Economic Development Council of the Government of the Republic of Serbia propose the concept of reaffirmation of industrial economy as assumptions of structural changes and sustainable development as the exit from vulnerability of Serbian economy. Owing to the positive growth rate of 3.7% in 2013, economy has found the way out of recession, but the issue of sustainability of that growth is important, since basic structures of instability are not eliminated. In fact, Serbia is still in transition recession. (Djuricin, Vuksanovic, 2012).

Rational solution is to invest to energy based on renewable energy sources (RES), because this industry branch has an enormous multiplier of investments and they have export aims.

Chance of Serbia, for rapid recovery and sustainable economic growth is in green economy that equally treats nature as a resource and man as the manager of this resource.

Energy potential of renewable energy sources in Serbia is significant and estimations say that they are more than 5.6 million tons of oil (toe) equivalents per a year, which corresponds, according to experts, somewhat less than a half of annual needs for energy of entire country. The greatest potential in Serbia is believed to be biomass. Biomass potential is estimated to approximately 3.44 oil equivalent or 61% of overall potential. In addition 1.67 million toe is within non-utilized hydropotential (29%), 0.18 million toe in geothermal springs (3.1%), 0.2 million toe in wind energy (3%) and 0.24 million toe in solar radiation (4.2%). (Energy Balance of RS, 2013)

In conditions of global economic and transition crisis in which Serbia is found, it is important for all the subjects, primarily state and companies, adjust their business with the following principles of sustainability and that is: 1) to do business economically rational with their value; 2) to be socially responsible and 3) that their business does not impair balance with nature.

These principles of sustainability provide the elimination of negative effects of crisis and establishment of such business model that provides sustainability.

A few facts lead to a conclusion that future economic growth in Serbia will inevitably be relied on energy consumption. Namely, energy sector in Serbia is the largest one in the aspect of capital and incomes. In addition, energy based on RES will be a precondition of successful and rapid industrialization, magnet for foreign investments, as well as a lever for overall economic and social development.

During the following decade, in which it will join EU, Serbia has a big task to accomplish, to harmonize its macroeconomic projections, even in renewable energy sources field with strategy “Europe 2020”.

Strategy is based on: (1) smart growth that implies economy of knowledge and support to innovations, (2) sustainable development that promotes more efficient usage of natural resources and energy, and (3) inclusive growth that implies strengthening of economy, high employment, social and territorial cohesion (Fren, 2010).

Further, the analysis will be aimed at: Main features of post-crisis period and causes of such situation, Energetics and energy potential of Serbia, Renewable energy sources in the function of sustainable development and development of Serbia and Risks in energy sector, which is crucial for economic recovery of the country.

2. MAIN FEATURES OF POST-CRISIS PERIOD AND CAUSES OF SUCH SITUATION

Over the last decade, Serbia recorded relatively high economic growth. GDP in the period from 2001 to 2008 has grown by the average rate of 5.4%. However, consumption was the initiator of this economic growth because funds achieved from privatization and foreign investments used for funding unsustainable trend of consumption increase and deepening the deficit of current account, which reached its highest amount of even 20% in 2008.

It became obvious that growth based on consumption became unsustainable and that Serbia will have to take take intensive economic reforms in order to re-orient on growth model that initiates export.

This new situation is presented in reports „Post-crisis model of economic growth and development of Serbia“ and “Serbia 2020” published 2011. These documents are mutually related and main directions of what is in wider public called “new growth model” are stated within it. Macreconomic movements in Serbia for the period 2002-2013 ae presented in Table 2.1.

Table: 2.1. Macroeconomic indiscators for Serbia 2002- 2013

Indicator	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Real growth of GDP, in %	4.3	2.5	9.3	5.4	3.6	5.4	3.8	-3.5	1.0	1.6	-1.5	3.7
Consumer prices, in %	14.8	7.8	13.7	17.7	6.6	11.0	8.6	6.6	10.3	7.0	12.2	4.9
unemployment, in %	13.3	14.6	18.5	20.8	20.9	18.1	13.6	16.1	19.2	23.0	22.4	20.1
Current account balance of payments, in % GDP	-4.2	-7.8	-13.8	-8.8	-10.1	-17.7	-21.6	-6.6	-6.7	-9.2	-8.3	-2.0
Budgetary deficit in %	-4.3	-2.6	-0.3	0.3	-1.9	-1.7	1.7	-3.4	-3.7	-4.2	-5.0	-5.6
Public debt, in %	72.9	66.9	55.3	52.2	37.7	31.5	29.2	34.7	44.5	48.7	59.2	61.7
External debt, in %	58.7	55.9	49.8	60.1	60.9	60.2	64.6	77.7	84.9	77.5	85.6	81.9
Exchange rate of RSD to EUR (average)	60.6	65.1	72.6	82.9	84.1	79.9	81.4	93.9	103.0	101.9	113.4	114.18

Source: RDB, RBS, NBS, MF.

Transition model based on privatization of social property has encountered the crisis of its validity. Recession strikes have intensified negative effects of privatization process (enormous unemployment, social expenses, worsening of work conditions), changed social climate on efficiency of privatization, increased critical distance (Candeias, 2010).

The greatest drop of activities in Serbia is recorded in real sector, primarily industrial production. Value of industrial production in the period 1990-2010 has dropped by 60% contribution of industry to GDP was reduced from 31% to 15%, while the number of industrial employees dropped from 1.03 million to 0.3 million.

Unlike Serbia, Czech Republic, Poland, Slovakia and Hungary, during transition are characterized particularly by accelerated growth of industrial production. (Boskovic, 2011).

For two decades in transition, Serbia has lost almost 1/3 GDP (while the other neighbouring countries have long ago surpassed the GDP level from pre-transition period: Hungary 138%, Slovenia 156%, Croatia 111%, Romania 128%, Bulgaria 114%) and even more dramatic is that today in Serbia the level of industrial production is found below 40% of industrial production from 1989. (Ignjatovic, 2011).

Instead of emphasizing the construction of adequate institutional infrastructure appropriate for market economy, the emphasis is on main postulates of "Washington Consensus" (Mitrovic, 2010).

The Government of the Republic of Serbia has in 2008 adopted “National Strategy of Sustainable Development” that defined sustainable development as target-oriented, long-term, comprehensive and synergic process that affects all aspects of life (economic, social, ecological and institutional) at all levels (National Strategy of Sustainable Development, 2008).

Great encouragement is positive signals in relation to the approaching of Serbia to EU. However, in order for institutionalized framework and behavior of Serbia and economic parties to be recognizable for EU, there are many issues to solve and achieve many goals set (Development concept of the Republic of Serbia up to 2020 (2010). (Table 2.2)

Table 2.2: European Union and Serbia: Current situation and development goals

Performances	EU 2010	EU 2020	Serbia 2010	Serbia 2020
Employment of population from 20-64 years (%)	68	75	49	65
Investments in research and development (% GDP)	1.9	3.0	0.3	2.0
Share of energy consumption from renewable sources in total consumption (%)	16	20	12	27
Energy efficiency (toe/1000$ of GDP)	0.21	0.17	0.96	0.57
Population from 30-34 years with a university degree (%)	31	40	21	30
Poverty rate (less than 60% of median Of available population's income)	16	12	17	14

Source: Europe 2020, Bureau of Statistics of the Republic of Serbia

During the entire pre-crisis and post-crisis period, there are deficits of current account and budget, which, along with losses in public sector and deficit of pension fund, represent main structural imbalances that are cured by debt growth (public and private). Table 2.3

Table: 2.3. Vulnerability indicators in Serbia 2013

Performances	Indicators	Reference value	
Transition production gap	29%	0%	PRODUCTION PERFORMANCES
(inflation + unemployment)	34.60%	< 12%	
Twin deficit			
Balance of current payments	2%	< 5%	
Budget	5.6%	< 3%	
Indebtedness			FINANCIAL PERFORMANCES
Public debt/GDP	61.7	< 45%	
External debt/GDP	81.9	< 90%	
External debt/Export	185.8	< 10%	
Credit rating			
S&P	BB-/negative prognosis	Investment rank > BB	
Fitch	BB-/negative prognosis	Investment rank > BB	
Export of goods/GDP	33.7%	> 50%	COMPETITIVENESS
Currency depression (3Q2013/3Q2012)			
Nominal	2.4%	< -5%	
Real	8.0%	< -3%	
Global competitiveness index	101 od 144	65-SEE average	
Corruption perception index	72 od 177	59-SEE average	
Ease of doing business	93 od 189	60-SEE average	
Economic freedoms index	95 od 178	62-SEE average	

Source: RBS, NBS

Vulnerability indexes are shown which precisely refer to the ability of economy to annul negative effect of stress factors. Exposure to risks is enormous. Operative performances are below reference value, financial performances are below or on the limit of reference value, while competitiveness is by far below the level of Southeastern European countries.

3. ENERGETICS AND ENERGY POTENTIAL OF SERBIA

Energetics, as the most important part of economy, can be defined as main element of sustainable development, where primary use of fosil fuels and renewable energy sources through the range of energy that leads twards the increasing of energy efficiency.

In accordance with the needs for energy, economic possibilities and duties that have resulted from international agreements, Ministry of Energy, Development and Environmental Protection has legally determined and defined the Energy Policy of the Republic of Serbia.

Main national goals are defined that include: energy infrastructure development plan, introduction of modern technologies in energy sector, reduction of the final energy consumption growth, increase of energy efficiency, increase of the use of renewable energy sources (Law on Energetics, 2011).

Energetics sector in Serbia plays an important role in economy as the biggest economic sector.

Serbia is among 20 most intensive countries in the world according to the energy use per GDP unit. In addition, Serbia emits relatively big amounts of gases with greenhouse effect that originate from combustion process. According to the data of International agency for energetic (for 2009), Serbia is among 10 carbon-mosr intensive economies in the worlds. On the other hand, there is a great potential for energy efficiency and reduction of gas emission with greenhouse effect, which implies a great obligation for Serbia in the following period.

Current state of energetic sector represents a great challenge for the Government of the Republic of Serbia and energetic sector, having in mind future integration of international (energy) markets, as well as integration into European Union. European Union has adopted a decision for the development with low level of carbon emissions with sustainable energy to be the main carrier of its development strategy for 2020.

Energetic sector of Serbia has certain advantages: favourable structural capacities for electrical energy production (1/3 hydropower plants and 2/3 thermopower plants for lignite), favourable natural conditions – water potential and coal (lignite), and good connections of electrical energy transfer system with neighbouring countries. However, electrical energy system also has its defects: electrical energy infrastructure in Serbia, according to experts' opinion, has become technologically obsolete, and its reconstruction requires significant investments and operative efficiency is at low level.

Energy resources and potentials of the Republic of Serbia consist of fosil fuels (coal, oil and natural gas) and renewable energy sources. Structure of energy reserves of fosil fuels of the Republic of Serbia is presented in Table 3.1.

Table 3.1. Geological reserves of fosil fuels (millions of toe)*

Energy resource	Balance and off-balance geological reserves	Total geological reserves
Stone coal	2.77	4.02
Brown coal	37.7	45.17
Brown-lignite coal	134.25	193.00
Lignite	780.00	1.698
Oil	10.14	50
Natural gas	3.37	50
Oil shale	-	398

Source: Energy Balance 2013.

*Explanation for toe (ton of equivalent oil). One ton of equivalent oil is 41.868 GJ or 11.630 MWx of electrical energy or two tons of stone coal, i.e. 5.586 t or raw lignite.

Reserves of more quality energy, such as oil and gas are symbolic and make less than 1% of geological off-balance reserves that are highly explored, while the rest 99% of energy reserves make up different types of coal, with largest share of lignite, more than 95% in balance reserves.

Total technically available potential of renewable energy sources in the Republic of Serbia is estimated at 5.65 million toe per year. Of this potential, we already use 1.054 millions of toe biomass (mostly for heating) and 909 thousand toe of hydroenergy. Table: 3.2.

Table 3.2. Review of technically usable potential of RES

RES type	Available technical potenti that is used (millions of toe/year)	Unutilized available technic potential (millions of toe/year)	Total available technical potential (millions of toe/yea
BIOMASS	1.054	2.394	3.448
Agricultural biomass	0.033	1.637	1.67
Residues from agricultural cultures	0.033	0.99	1.023
Residues in orcharding and viticulture	-	0.605	0.605
Liquid manure		0.042	0.042
Wood (forest) biomass	1.021	0.509	1.53
Biodegradable waste	0	0.496	0.496
HYDRO ENERGY	0.909	0.770	1.679
For installed capacities up to 10MW	0.004	0.151	0.155
For installed capacities from 10MW to 30MW	0.020	0.102	0.122
For installed capacities over 30MW	0.885	0.517	1.402
WIND ENERGY	0	0.103	0.103
SOLAR ENERGY	0	0.240	0.240
For production of electrical energy	0	0.046	0.046
For production of heat energy	0	0.194	0.194
GEOTHERMAL	0	0.1	0.180
For production of electrical energy	0	0	0
For production of heat energy	0.005	0.175	0.180
Total from all RES	1.968	3.682	5.65

Source: Energy Balance of 2013.

Ambitious and commiting goal for Serbia is 27% of energy consumption from RES in its gross final consumption of energy up to 2020, which can logically be expected if we are familiar with evaluated technical and usable potentials of RES of 5.6 Mtoe per a year and if it measurably reduces the use of fosil fuels and import of energy and increases safety and sustainability of energy system of the Republic of Serbia. Therefore, energy production is a key factor of energy stability and strategic national goal. Diagram: 3.1.

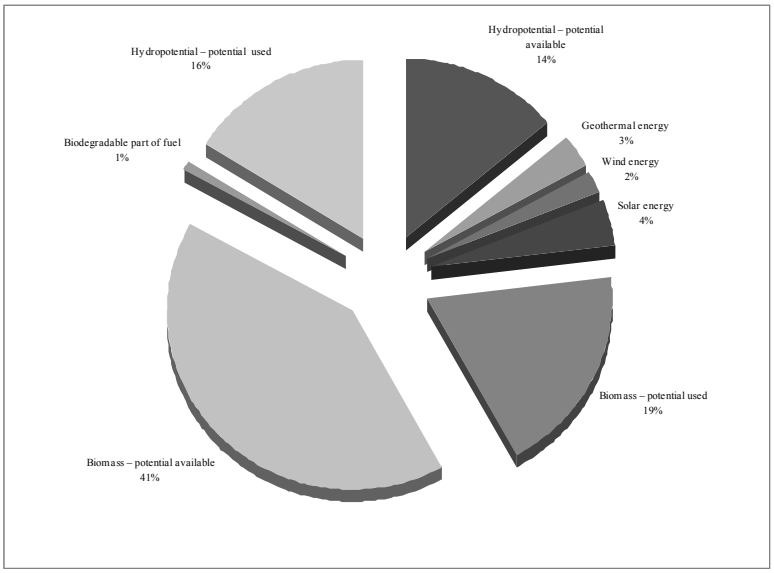


Figure: 3.1. Evaluated technical and usable potential of RES
Source: Energy Balance for 2011.

Serbia is rich with sources of "pure" energy from the nature, solar energy, wind, river flows, geothermal sources and biomass, of which it currently uses 35% of the total available technical potential evaluated for reaching the goal in 2020. In total domestic production of primary energy for 2013, renewable energy sources have a share of 16%, i.e. 1,968 Mtoe, i.e. 58% of solid biomass, 41% of hydropotential, and less than 1% of biogas, wind, solar and geothermal energy. Priority of the strategy of energetic development in Serbia is the efficient use of energy from RES in a way to encourage economic development of the country ad raise awareness on environmental protection. Diagram: 3.2.

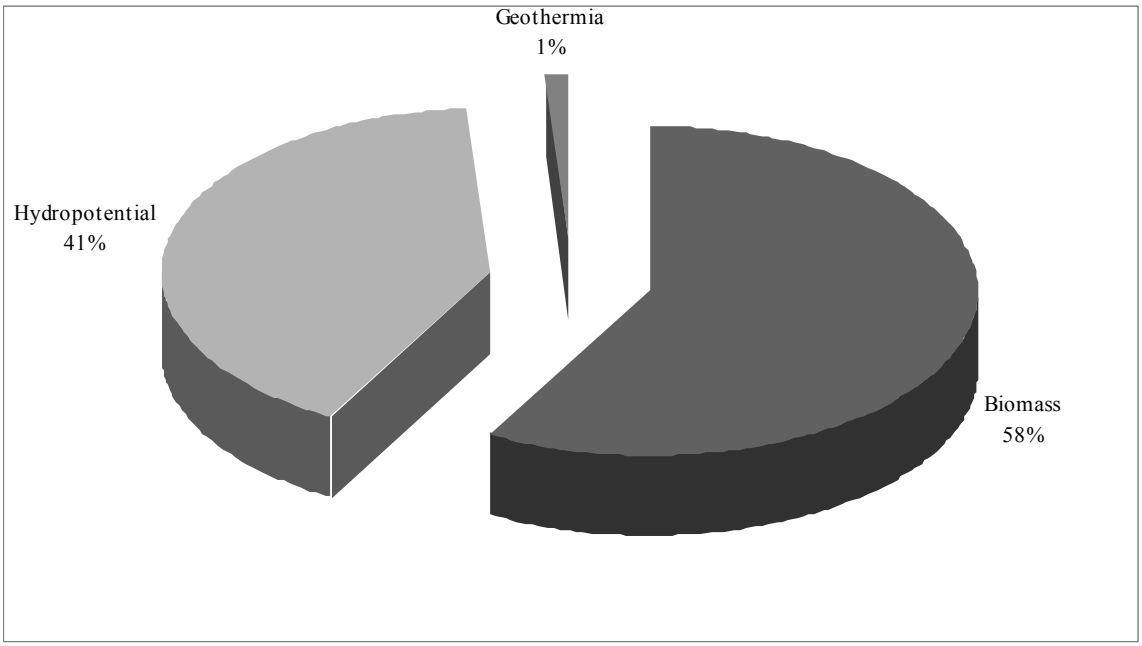


Figure: 3.2. Share of RES in domestic production of primary energy
Source: Energy Balance for 2011.

Oriented on implementation of energetics strategy, Government of the Republic of Serbia already provides support measures: adopts and improves legal framework for energetically more efficient usage of energy from renewable sources, gives economic incentive according to established scheme of support for energy production from renewable sources, through direct financial stimulations and appropriate tax policy, adopts measures that will encourage sustainable market of biomass (renewable energy with the highest potential of usage), advances and verifies efficiency of administrative procedures for investments in RES field, introduces the system of energy management, systematically promotes the best practices from EU countries and plans domestic projects in RES field.

There are many factors that affect the share of RES in energetic system, and those are economic, technological, political, social and demographic. Line Ministry of Serbia does everything it can to increase the security of country's energy system and establish it legally, improve technologically, use available and "green" resources, encourage economic growth with them and eliminate political factor of instability, as well as import factor of dependence, all of that for the purpose of sustainable energetics.

Total consumption of final energy in Serbia in 2011 was 10,042 millions of toe and consumption of primary energy in the Republic of Serbia in 2011 was 16,192 millions of toe.

With a share of 13.3% in consumption of primary energy in 2011, the Republic of Serbia also has a significant role in regional market of energy (Diagram 3.3).

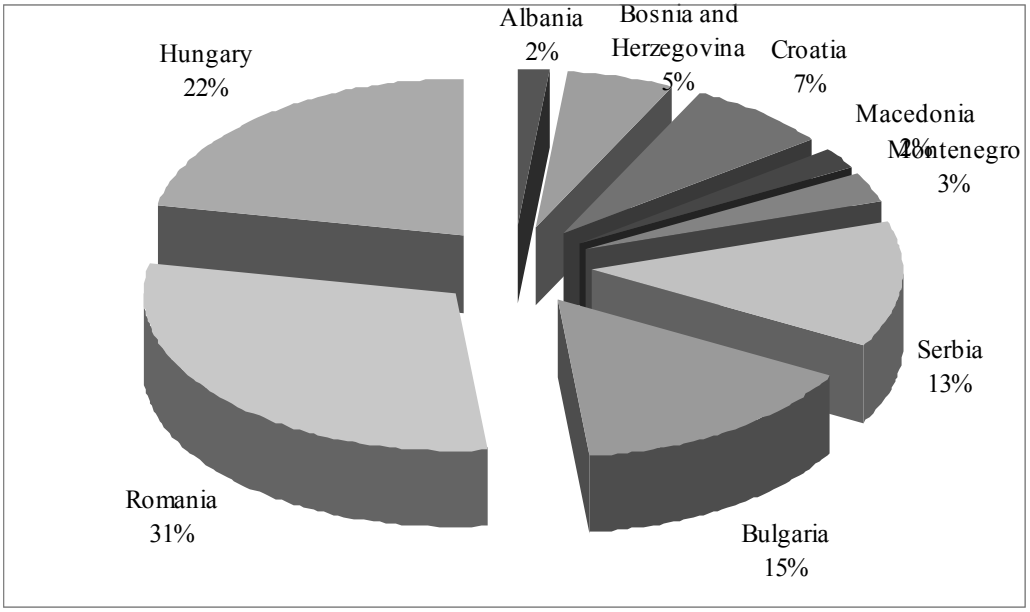


Figure: 3.3. Structure of primary energy consumption in the region in 2011
Source: Energy Balance for 2011.

From agreat number of factors, which classify energetic among the most propulsive branches of economic growth and development, we will mention some:

- Energy efficiency becomes the main problem, which is pointed by the growth curve of electrical energy consumption;
- Current geopolitical situation with dominance of interest, decrease of energetics resources in the world and impact of energy on living environment, have contributed for the energetics, environmental protection, economy and efficiency become unique problem of humanity;
- Energy from fossil fuels: coal, oil, oil derivatives and gas, which, although it makes about 85% of the total energy production in the world, is discredited by arguments in the sense of undesired impacts on living environment, both on regional level and in the aspect of global warming;
- Energy crisis, as well as impact of production and electrical energy consumption on the environment create the need to bring further industrial development to the level that is environmentally acceptable, by its scope and form;

- Connection of eneregtics with other economic branches is the basis of overall development of each country;
- Usage of renewable energy sources and technology implementation based on reduced gas emission support sustainable development.

In addition to energy efficiency and energy savings, renewable energy sources play crucial role in each sustainable energy strategy, whose goals are: accessibility in the aspect of prices, availability in the aspect of sufficient amounts, acceptability in the sense of environment preservation.

4. RENEWABLE ENERGY SOURCES IN THE FUNCTION OF SUSTAINABLE ECONOMIC GROWTH AND DEVELOPMENT OF SERBIA

In order to change economic reality of Serbia, the chance is in proper comprehension of resources it has, and those are sustainable resources, those that can be used today, but also remain for future generations to use, without the change in characteristics and quantity. Big chance of Serbia, in order to achieve desired economic growth and development, is to change orientation, to turn to creation and development of green economy. Issue of unemployment is global problem, but Serbia in the aspect of unemployment, mostly persons aged 25-45, is at the top of the world list, and this is the main reason for it to turn to opening green workplaces. That the attitude regarding the significance of green workplaces is changed is also proved by pre-election promises of political leaders to the voters of Serbia, that green economy is a chance for a few thousand of unemployed.

Green economy gives Serbia the following benefits and contributes to:

- Sustainable agriculture, which should produce healthy organic products, intended for the export;
- Food processing industry that will finalize products from agriculture with zero level of preservatives and additives use;
- Renewable sources (hydro and wind capacities in Serbia are mostly unutilized), if we keep in mind that production of energy from renewable sources employs 2,7 workers per one worker from traditional energy sector per MW of produced energy, it is clear what are the capacities of this sector;
- Recycling and exports of recyclates;
- education of so-called green managers who will, in addition to classic education in management, also master in energy, moral investing, social responsibility, green agriculture;
- increase of attractiveness of economy and increase of foreign direct investments;
- transfer of new knowledge and technologies;
- increase of export;
- Energy independence and increase of life environment quality (Andjelkovic Pesic, 2007).

In contemporary conditions of increasingly intensive globalization process, energetic faces a several requirements: 1) Energetics will, according to all development scenarios, for a relatively long future period have the task to provide economy and society with significant amounts of energy and energy, as well as the tendency of reducing energy intensity, i.e. consumption per a unit of monetary product; 2) for the energetic to be more pure, i.e. to mainly rely on renewable energy sources, and less exhaustible resources; 3) for the production and consumption in the future to leave as little as possible negative consequences on living environment, water, air, soil, and directly on entire food chain and human health and 4) the energetic faces the issue of energy efficiency and energy market (Draft of Energetics Development Strategy of RS, 2013).

Duty of Serbia in the aspect of energy efficiency comes from Directive 2012/27/EU, which came into force on December the 4th 2012 and all member countries are obliged to undertake energy saving measures in the amount of 1.5% average of the total energy amount in the last three years. Member countries are also obliged to develop Long-term strategy of the reconstruction of public and private, residential and commercial buildings up to 2020. One of the possible ways to achieve high energy efficiency is cogeneration (production

of electrical energy with simultaneous usage of waste heat), by which we achieve high efficiency up to 90%. Cogeneration is attributed special attention and significance in countries of European Union. In Serbia, with the Statute on incentives for producing electrical energy by using renewable energy sources and combined production of electrical and thermal energy, of the Government of RS, prescribed incentives for the purchase of electrical energy and subventions of costs for the buyer of such produced energy are closer. Unlike developed countries, which have given cogeneration greater significance and where cogeneration plants are most frequently excluded from taxation or where incentives are about 20 eurocents per kwh, in Serbia there is only a gradation of incentives where bigger CHP plant has less incentives.

In March 2013, the Law on efficient energy use was adopted and development of bylaws is near to its end in this field. The aim of Serbia is to reduce energy consumption by 9% up to 2020, which is a demanding, but achievable goal.

In order to increase energy efficiency in Serbia, the Fund for the Improvement of Energy Efficiency was established as a budgetary fund of the Republic of Serbia. The fund started working in 2014 and means from the fund are aimed for the project of increasing energy efficiency in public sector, as well as projects of citizens and private sector in the same field.

For the purpose of increasing energy efficiency and development of renewable energy sources, Serbia introduced another financial obligation in the bill for electrical energy – fee for the encouragement of renewable energy sources, which is calculated by the following formula:

Fee for encouragement of RES = Spent κwh x 0,081 din/κwh

Energetics is one of the most intensive economic branches in the aspect of investments. It has multiple effects on economic results of activities in this field, as well as entire technological basis of society, and it represents one of basic foundations of overall development of each country. Secure and safe supply of energy, its availability under transparent and non-discriminatory conditions, production and usage in accordance with the principles of sustainable development are preconditions for successful functioning of each society, for raising competitiveness of national economy and, finally, the welfare of citizens. This is especially important in the period of economic crisis in which the Republic of Serbia currently is.

Provision of energy safety, development of energy market and overall transition towards sustainable energetic are imposed as crucial priorities of energy development of the Republic of Serbia, i.e. principles on which we need to develop energy support in the following period.

Development of energetic of the Republic of Serbia should be such that its effects on environment are minimal. However, eneregtics in Serbia will also have to be market-based and economically efficient, to the extent that it generates own development, but also to represent a generator and secure basis of country's development.

When we talk about RES, we must keep in mind the cause and effect relations between energetic based on RES and agriculture. Namely, great amounts of RES, primarily biomass, come from agriculture, from growing of crops, industrial and roughage, them from the residues from pruning fruit cultures, as well as residues from farms, and based on this we could say that RES are generated from husbandry, orcharding and animal husbandry.

Total production of biomass from one-year agricultural cutures in our country is higher than 12.5 millions of tons per a year. Only in Vojvodina, per a year we obtain between 6 and 7 tons of plant residues which correspond to the amount of 2.5 millions of tons of oil.

From fruit pruning, each season, we obtain a great amount of plant residues 1-2 t/ha, which is usually burned. Energy potential of biomass in animal husbandry which is suitable for production of biogas is estimated at 42 000 tons (Ministry of Energetcs, Development and Environmental Protection, 2012).

Renewable energy sources that come from agriculture would affect the development of rural areas through additional engagement of local labour for production and usage of biomass. As renewable energy is the real future of entire world and our great developmental and export chance, it would come to the overflow of funds and capital into agrarian sector, which would largely contribute to the development of agriculture.

Based on renewable energy sources, 87 projects were implemented based on: solar energy 8, wind 1, geothermal energy 2, hydro energy 48 and wind 28. (Portal of Energetics of Serbia, 2013)

Investments which are in Serbia planned for 2013, they are planned in the amount of 1.000.000 dinars, more than 60% will be aimed towards energetic as priority branch for industrial development, i.e. sustainable economic growth and development (Dnevnik RTS, 20.02.2014).

5. RISKS AND CHALLENGES IN ENERGETICS SECTOR OF SERBIA

The issue with energy is one of the most important components of global and systemic risk and, having in mind the instability in the world, each economy needs to take care of the required amounts and sustainability of energy. From that aspect, in Serbia, there are three big challenges: 1) sufficient amounts of energy of one country and trading character of its products could help in elimination of the gap in production and increase of investments in the sectors given; 2) compatibility with EU in the aspect of environmental issues and in the following years we must use our resources for mitigation of climate changes and increase of the amount of energy that comes from renewable sources and 3) adoption of new price policy, because determination of full prie of electricity in Serbia cannot be postponed any longer.

In each economy, energy sector represents a sector with significant implications for industrial development. We already spoke that re-industrialization is inevitable path for ssutainabel economic developmet of Serbia. Serbia doesn't have many options. Expansion of energy production is one of them. Energy setor is capital-intensive. On the other hand, demand for energy will be increased in the future. We expect that energy demand growth in Serbia will be stable; the rate of 1.0-1.5% is predicted in the long run (Serbian Energy Agency, 2012.) Favourable characteristics of energetic sector in Serbia make it a logical choice for state industrial policy. Annual demand for primary energy in Serbia is about 16 Mtoe. Today, about 40% of this amount is obtained from the export. The larger part refers to oil and gas. Prices of oil and gas are converged towards the EU level. In addition, due to Serbian-Russian partnership, the issue of supply is solved and investments in this field seem promising. However, there is enough room for improvements, particularly in the segment of electrical energy. This particularly refers to the sector of electrical energy and the field of its creation, retail and distribution. In many countries, liberalization is initiated from energy creation, which is logically credible. However, there are many other examples where retail activities were open for competition prior to the creation and distribution, or with retaining monopolistic regimes in energy creation and distribution (Fiorenzani, S. 2006).

There are two inefficiencies in the sector of electrical energy, in production and in consumption. Sector of electrical energy is still very well arranged, but its profitability is far below its potential due to low price level. In addition, efficiency is lower than the standard required by EU. From 2008, all buyers of electrical energy except for households have a right to buy electrical energy on open market by market, competitive prices. When electrical energy is not evaluated properly, it leads to inefficient consumption. This results in expectation of reforms that concern both price level and efficiency. Serbian households, as well as industry, pay the lowest price of κwh in Europe.

Total consumption of electrical energy per capita is 60% from the average of EU27, while GDP per capita was almost half of it, 35% of the average of EU27. Low prices of energy are main reason for this. Electrical energy represents 28% of final energy consumption and it is produced in big plants of hydropower and thermopower plants that use domestic lignite. Production structure is changeable and mostly it depends on hydrological conditions. Principally, electrical energy that hydropower plants use is within the range from 30% to 35% of the total production of electrical energy. Net efficiency of thermopower plants in Serbia is low and existing capacities are mostly amortized for a long time. Net efficiency is about 30% lower than in power plants of newer generation, while average age of power plants is over 30 years.

Without any doubt, energetics sector, as the number one priority for reindustrialization, requires adequate industrial policy. However, this industrial policy is related with several risks: 1) systemic risk due to global imbalance between supply and demand for energy, which is manifested in high instability of prices and bilateral agreements; 2) risks related with complete liberalization of electrical energy market (which is expected in 2015) in accordance with EU Directives. After complete liberalization, prices of electrical energy in Serbia will most certainly be much higher than they are now; 3) risk refers to stable and sufficient sources of financing the expansion and modernization of capacities. When the gap in production is enormous, attraction of investors will be brought into doubt. Chinese investors are active in the segment of heating energy. European Bank for Reconstruction and Development and German Development Bank has shown interest for funding particular ecological projects. In addition, European Investment Bank is interested in investing in the electrical energy transfer system. As for the gas, the realization of Sout Stream project is in progress. The investors from EU, China and Russia are not the only ones. National investment funds dispose with the biggest sums of financial capital that waits for an opportunity to be profitably invested. Attraction of these funds could be the next big task for Serbian Government and 4) risks are related to technical

obsolescence and ecological incompatibility of physical capacities. In the previous six years, power plants were repaired, production of coal is increased, pollution reduced and transfer networks fixed. However, many old power plants will be replaced in the following few years as they are getting close to the end of their life span and because they do not meet the environmental standards of EU. This brings about the risks of finding sufficient financial sources for investmens in replacement of old capacities, in addition to the ones.

6. CONCLUSION

Global economic and financial crisis has discovered that previous model of economic growth and development of Serbia is not sustainable and that it needs to be changed, if we wish to avoid the fate of underdeveloped and overindebted country. For the exit from vulnerability of Serbian economy, the concept of industrial economy's reaffirmation is suggested, as an assumption of structural changes and sustainable development. Since basic structural instabilities are not eliminated, Serbia is still in transition recession. As a rational solution, theer appears investing in eneregtics based on RES, because this industrial branch has an enormous multiplier of investing and these investments have export goals. Future economic growth in Serbia will inevitably be relied on energy production. Namely, energetic sector in Serbia represents the biggest sector in the aspect of capital and income, energetic based on RES, will be the precondition of successful and fast re-industrialization, magnet for foreign investments, as well as the lever for overall economic and social development. Without any doubt, energetic sector, as number one priority for re-industrialization, requires adequate industrial policy. However, this industrial policy is related with a several limitations, due to: global imbalance between supply and demand for energy, electrical energy market liberalization, stable and sufficient funding sources and ecological incompatibility of physical capacities.

REFERENCES

J. Stiglitz, 2010: The Stiglitz Report: Reforming the International Monetary and Financial Systems in the Wake of the Global Crisis, The New Press, New York

D. Đuričin, I. Vuksanović, 2012: ISN'T OUTPUT MORE IMPORTANT THAN INFLATION IN IMPOTENT ECONOMY: SERBIA'S ECONOMIC POLICIES REVISION, Ekonomika preduzeća, 1-2/2012, pp. 13-32

Energetski bilans Republike Srbije za 2013. godinu, www.merz.gov.rs

Postkrizni model ekonomskog rasta i razvoja Srbije 2011-2020. www. Fren.org.rs.

Candeias, M. (2010). Krise der Privatisierung. In: They gonna privatize the Air. Privatisierung, Kapitalismus und Wider stand. Berlin: Antifaschistische Linke

G. Bošković, 2011. " Nužnost izvozno orijentisane strategije reindustrijalizacije Srbije" Ekonomske teme, 2/2011, pp. 235-249.

S. Ignjatović, 2011: " Inplact of global economic crisis on the economu of Serbia and sustainable development in post-crisis period", Serbia facing the challenges of globalization and sustainable development, Belgrade, Serbia, pp. 35-45

B. Mitrović, 2010: „Perspektive zakasnele ekonomske tranzicije u Srbiji" Ekonomske teme, 4/2010, pp. 607-614.

Nacionalna strategija održivog razvoja (" Službeni glasnik RS", br. 57/2008).

Koncept razvoja Republike Srbije do 2020. godine (2010), www. Predsednik.rs

Zakon o energetici (" Službeni glasnik RS", br. 57/11, 80/11 i ispravka 93/12).

M. Anđelković Pešić, 2007, Six Sigma Philosophy and Resource-Based Theory of Competitiveness: An Integrative Approach, Facta Universitatis, Series Economics and Organization, 4(2): 199-208

Nacrt Strategija razvoja energetike RS, 2013. www.merz.gov.rs

Ministarstvo energetike, razvoja i zaštite životne sredine, 2012. www.merz.gov.rs

Energetski portal Srbije, 2012. www.energetski.portal.rs

Dnevnik RTS, 19,30 časova, 20.02.2014.

Serbian Energy Agency, 2012. Aktivnosti Agencije za energetiku. Tržište energije Srbije 2005-2010. Belgrade SEA.

Fiorenzani, S. (2006). Quantitative methods for electricity trading and risk management. New York: Palgrave Macmi

4th International Symposium on Natural Resources Management
"Sustainable Development and Green Economy in Transition Countries"
31st May -1st June, 2014, Faculty of Management Zajecar, Republic of Serbia
www.fmz.edu.rs

SUSTAINABILITY OF E-COMMERCE IMPLEMENTATION IN "PLANINKA" COMPANY

Saša Ivanov[1]
Dragiša Stanujkić[2]
Gabrijela Popović[3]

[1]*Faculty of Management Zaječar, park šuma Kraljevica bb, 19000 Zaječar, sasa.ivanov@fmz.edu.rs*
[2]*Faculty of Management Zaječar, park šuma Kraljevica bb, 19000 Zaječar, dragisa.stanujkic@fmz.edu.rs*
[3] *Faculty of Management Zaječar, park šuma Kraljevica bb, 19000 Zaječar,gabrijela.popovic@fmz.edu.rs*

ABSTRACT

This paper describes the basic concepts of digital economy, which includes online communication, business transactions, trade in goods and services, providing service and financial services, and all other actions and activities that follow the business and for the realization of which is the necessary computer network and Internet, in business of "Planinka" Company, Kuršumlija.

KEYWORDS

Digital economy, web site rank, web shop.

1. INTRODUCTION

In tourist industry, there is an increasing number of services offered to the tourists that are based on the use of the Internet as a main communication channel. The development of the Internet has contributed to big changes in the manner and efficiency of the work of business systems. The Internet has completely changed the way of doing business; geographical borders are disappearing, as well as language barriers and currency limitations. Simple and fast communication is made possible, transfer of great amount of data to great distances, simple publication and updating of multimedia documents and their continuous availability, digital delivery of goods and services, establishing virtual organizations. All this presents elements of new methods of running a business, the so-called electronic business, which is a basic element of digital economy.

2. „PLANINKA"COMPANY - KURSUMLIJA

The company was created in 1964 "Planinka" year, joining restaurants in Kursumlija and Kursumlijska, Prolom and Lukovska Spa. „Planinka" famous break bottled water, for which the demand is so great that hardly settled the needs of the market. Since this water makes the beer taste wonderful, you do not go into the general sale because of 150. 000 liters consumed in buildings "Planinka". Within "Planinka" the tepihara, located in Lukovska Spa, which produces hand-knotted and hand-tufted rugs of exceptional quality. Planinka posedije high class hotels in Prolom and Lukovska Spa, as well as in Kursumlija, and since 2009. The company manages a natural phenomenon Đavolja Varoš, a place that is a miracle Serbia,

and we are free to say and world wonder of nature. Having in mind that the company's goal is to provide new services to the clients in the field of tourism, they continue to offer innovative concepts of business and in that way secure top quality to their clients. Besides meeting the increasing needs of their clients, both in price and quality, on-line shop tends to conquer the market of selling package tours and providing services related to searching for the real needs of the clients and its easiest way of achieving efficient business.

3. CURRENT STATE OF THE COMPANY'S WEB SITE

"Planinka" has partly started e-business in 2012 when they presented on the Internet by its sites for promoting Kuršumlija tourism.

Figure 1. Prolom Banja web site
Source: http://www.prolombanja.com/

Figure 2. Lukovska Banja web site
Source: http://www.lukovskabanja.com/

The aim of "Planinka" then was to present itself on the Internet and introduce the public to Kursumlija tourism both on national and foreign market. Using these sites "Planinka" has finally managed to reach foreign tourists due to local environment, the variety of tourist product itself, richness of the cultural heritage (architecture, tradition, old crafts and their products), richness of healing mineral waters, as well as the hospitality and cordiality of the residents and the uniqueness of the phenomenon of Đavolja Varoš, presented as one of the to world wonders. For the time being, the company has taken a solid position on the Internet space, which can be observed based on the following data.

By using the Alex system (http://www.alexa.com/) they have conducted an analysis of rank of the site and the sites of similar companies, mentioned in the following text. The "Planinka" web site has hits in the rank of 2.561,808.

Figure 3. „Planinka“ web site rank
Source: http://www.alexa.com/

4. RANK AND THE COMPETIOTION ANALYSIS

A large number of companies that are in keeping with the modern trends and technologies are currently on the market and they have placed their tourist offer on the Internet and have a very good position.

Mentioned companies are:

1. ”Genex“ – Kopaonik (http://www.kopaonik-genex.com/),
2. ”Mona Hotel” - Zlatibor (http:// www.monazlatibor.com/)
3. Hotel “Merkur“- Vrnjačka Banja, (http://www.vrnjcispa.rs/),
4. Institut “Niška Banja“, (http:// www.radonnb.rs/)
5. Banja Vrujci, (http://www.banjavrujci.rs/)

Competitive advantage of the company is greater and more stable if it offers values, either in product or in services, that can not be easily imitated (Bakić, 2010).

Prolom water and Đavolja Varoš are strengths (advantages) of Planinka. Prolom Water is unique by its composition and healing characteristics (there is no copy of it), and Đavolja Varoš is presented to as the world wonder, which is definitely an advantage with the competition mentioned. In addition, the advantage of „Planinka“ is that, besides summer offer, it has a develpoed winter one, that is it possesses ski runs and ski lift in Lukovska Banja.

5. DEFININING COMPANY'S PROBLEMS

In order to place „Planinka“in the same rank as the already well-positioned companies at the market, it will have to solve the problems it is facing on the space.

The problems are:

1. Low interactivity, dynamics and tourist communication
2. Placing of goods/services by the Internet
   - Lack of direct sell to the end beneficiaries and the system for online reservation (B2C business)
   - Lack of direct cooperation with business partners and sale to other companies (B2B business)

It is very important to establish interactivity, that is two direction communication with the site visitors. In that way it is possible to obtain very useful information on the quality of its services so that the management could use it for creating better business policy. Also, it is possible to understand the wishes and interests of the tourists and conduct the personalisation of certain parts of the web sites.

B2B is the most important form of e-trade. The greatest range of on line transactions in the worlds is carried out by B2B trade. It is very important to establish cooperation with all the participants in the business process that are prior to the end user - suppliers, mediators, and distributors (Blagojević, 2010).

Based on the previous competition analysis, reviewing the current state on the market, „Planinka“ company has realise the advantages of modern information technologies and the purpose on introducing e-trade in its business system.

6. SWOT ANALYSIS

The purpose of SWOT analysis is to isolate key issues and facilitate strategic approach of the company. The analysis includes setting the quality and relevant criteria for estimating, and later the estimation itself according to the set criteria.

Table 1. SWOT analysis of „Planinka“ company

Strength	Weakness	Available possibilities	Threats
The quality of the services offered	Lack of financial investment	Hotel construction in Đavolja Varoš.	The volatility of the market
Trust, reliability, built distribution network	A small team of people who work on the development of electronic business, whose implementation is at the beginning	Winter tourism development and expansion of accommodation facilities	Variability Legal Terms and Conditions
Spas of Prolom Lukovska and Kuršumlijska.	Lack of e-commerce system for online booking	Development of mobile business and mobile commerce	Underdevelopment of Internet infrastructure.
Natural resources, mineral water, hot water 35 degrees	The lack of mobile business.	Professional training of staff	Hacking website, sigurnst on the Internet

7. DEVELOPMENT STRATEGY

The project being finished, which means input of its content and work of all the services mentioned, work is planned with the direct control of management team, as well as the preparation for the first stage of improving the portal itself.

The idea is to educate the human resources in the organization itself that will be responsible for the content related to their part of work. This stage plans several levels of training and education of the system administrators. In addition, in the first stage of improvement it is designed to translate the site into at least one foreign language (English), in order to present the contents to foreign tourists as well. In addition to the translation itself, it is planned to create additional material designed for the foreign tourists, as well as the suitable marketing campaign for the target market.

In the second stage of improving the system it is planned to develop a web presentation and the system for on line booking for mobile phone users. In the second stage, payment system via mobile phones is to be realized.

8. PORTAL IMPLEMENTATION

With the aim of solving the problems mentioned it is necessary to approach e-trade in the following way:

1. Develop a vertical portal (e-trade model) and enrich it with interactive services
2. Develop B2C application (e-trade model), web shop on line booking system.
3. Develop B2B application (e-trade model) on the portal.

Based on the previous competition analysis, review of the current state on the market, Internet marketing plan, the company realizes the advantage of modern information technologies and improves its business by developing services and applications of digital economy.

With that purpose it is necessary to develop:

- e-mail lists,

- impression books,
- surveys,
- public forums,
- contests,
- Internet Relay Chat-IRC,
- virtual postcards,
- blogs.

9. DEVELOPMENT B2C APPLICATIONS

B2C means retail sale electronically, that is sale to end users. Sale by the Internet has reached an expansion with the occurrence of this model of trade (Bakić, 2010).

With the aim of solving the third problem, "Planinka" has to develop, as soon as possible, B2C application with the purpose of direct sale by the Internet and the possibility of on line booking. In that way, the tourists, no matter of how distant they are, could buy and order certain vouchers 24 hours a day, whole year.

As an addition to each tourist portal is the online sale.

With the help of the component Simple Shop Galores, taken from site, http://extensions.joomla.org/, we manage to realize “Planinka” Web Shop, that is electronic shop of “Planinka” company.

Figure 4. “Planinka” company web shop

Step 1. It is necessary to register on the portal itself, with the aim of user verification.

Step 2. Catalogue review, of the categories in the catallogue and the products in the categories.

As part of Planinka web shop, there are two categories, that is two spas where “Planinka“ has accommodation facilities.

Figure 5. Web shop catalogue

Figure 6. Review of products in the category Lukovska Banja

Step 3. Choice of products, placing products into basket (the amount), erasing, as well as addition of total value of the products chosen.

Figure 7. Selection of products

If the selection is good, you go to the Checkout option, and if it is not, you mark the product and use the Update option.

Figure 8. Review of basket products

After the successful shopping, it is necessary to book the date with the use of on line system.
Administrative part - Review of the shopping done:

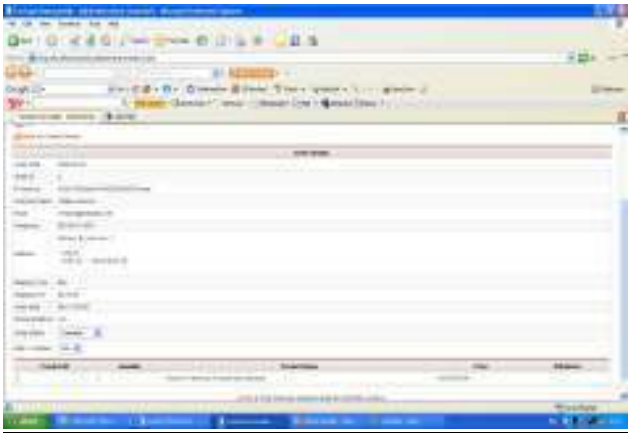


Figure 9. Review of the shopping done by the administrator

Having bought the voucher, it is necessary to book the date when you want to use the selected destination by the on line booking system for the bought vouchers.

Figure 10. On line booking system for the bought vouchers

In addition to the on line booking system for the bought vouchers , there is also a system independent of the Web shop Company, designed for the users who want to book accommodation facilities that are not included in the Web shop, but for which the offer is in the company's price list.

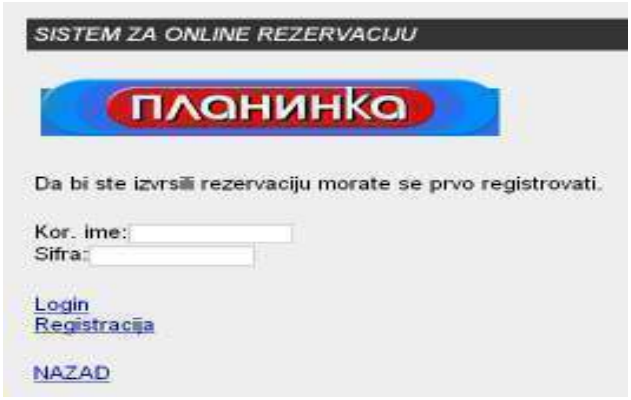


Figure 11. Independent system for online booking

Having registered and successfully logged in, it is possible to book by the form for online booking.

The form having been successfully completed and the data forwarded, a page is opened that confirms that the reservation has been done successfully with its description.

Figure 12. Review of successful booking for the “Kopaonik“ hotel

10. THE BENEFITS FOR THE COMPANY OF THE SOLUTIONS OFFERED

The benefits are follows:

- The orders are done 24 hours a day, even during sleeping hours,
- The market is being expanded,
- Buyers decide to buy more easily, the rule of impulsive shopping,
- Fewer price for the product and services presentation by on line catalogues than in any other way. The company can make a significant saving if it opens a virtual shop instead of the

physical one, since it does not need to pay leasing of the premises, large number of employees, etc.,
- Fast and simple review of sale and reservations.

11. BENEFITS FOR THE USER

The benefits for the user are follows:
- Possibility of shopping and booking 24 hours a day all the 365 days,
- Lower price,
- Variety of selection,
- Special services,
- Greater benefits;
- Fast delivery,
- More fun.

12. DEVELOPMENT OF B2B APPLICATION

B2B technologies (Buhalis, 2003):
- Make easier transactions for the sale of products and services among organisations,
- Enable the integration of the supply chain,
- On line supply of merchandise of one company for the other.

Business partners (current and potential), during their first visit to the dealer service, fill in a form for the opening of, and then they (the next day, at the latest) a person in charge answers that forms a profile of the company in direct contact, as well as the user account.

The distributors have the price list offered in many options. The first one being in the Excel format, which is very useful since you can directly work with it, or it can be used for creating your own price list. This makes it easier to great extent and is faster for the distributors.

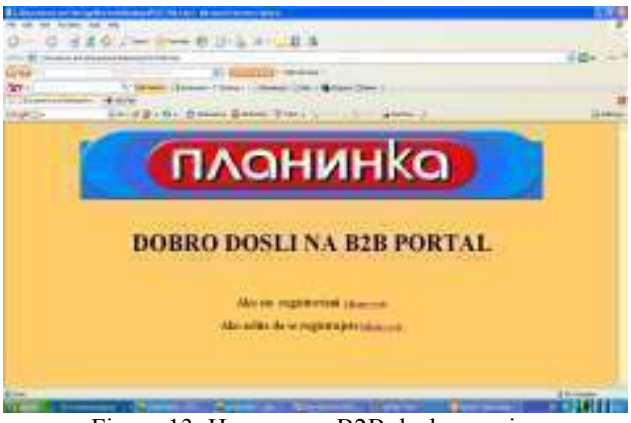


Figure 13. Home page B2B dealer service

The order form is designed for the registered companies, agencies, it gives them the possibility of ordering (buying) vouchers electronically, very fast, with certain advantages.

Figure 14. Vouchers order form

13. BUSINESS ANALYSIS

Business analysis is shown in Table 2 and 3.

Table 2. Business expenditure for 2012. (operating statement)

The structure of other business expenses on Dec 12,2012 is as following: in 000 RSD.		
1	Transport costs	32.065
2	Maintenace costs	5.800
3	Rent costs	2.983
4	Promotion costs	26.740
5	Other services	8.140
6	Advising costs	3.088
7	Presentation costs	5.692
8	Insurance	5.638
9	System of payment costs	3.755
10	Fees	690
11	Taxes	5.756
12	Public utilities	16.845
13	Other costs	62.337
	TOTAL:	**179.529**

Table 3. Other business expenditures for the period 01.01-30.06.2013, after using e-transactions

The structure of other business expenses on June 30, 2013 is as following: in 000 RSD.		
1	Transport costs	12.447
2	Maintenance costs	4.616
3	Rent costs	1.213
4	Promotion costs	11.456
5	Other services	4.026
6	Advising costs	805
7	Presentation costs	1.972
8	Insurance	1.212
9	System of payment costs	4.774
10	Fees	330
11	Taxes	3.455
12	Public utilities	8.337
13	Other costs	31.515
	TOTAL:	**86.158**

14. PROMOTION COSTS ANALYSIS

Promotion analysis includes:

1. Promotion costs during the first six months in 2012 - 13.370.000 RSD
2. Promotion costs during the first six months in 2013 - 11.456.000 RSD

Promotion costs have been reduced, after presenting the company on the Internet, for 1.914.000 RSD for six months, which means that the company has reduced promotion costs in 2013 in comparison to 2012 for approximately 15%, which thus shows that presence of the company on the Internet has significantly paid off in terms of promotion costs.

Table 4. Sale incomes for 2013 in 000 RSD

1	Revenue from domestic sales	311.254
2	Sales in foreign markets	49.073
	TOTAL:	**360.327**

Table 5. Other expenditures in 2013 in 000 RSD

1	Transportation costs	12.447
2	Maintenance costs	4.616
3	The cost of rent	1.213
4	Cost of Events	591
5	The cost of advertising and advertising	10.865
6	Other services	4.026
7	Cost of counseling	805
8	Entertainment expenses	1.972
9	Insurance premiums	1.212
10	The cost payment service	4.774
11	Memberships	330
12	Tax expense	3.455
13	Compensation expenses in the communal. good.	8.337
14	Other expenses	31.515
	TOTAL:	**86.158**

The project will influence the rent costs for app. 20%, propaganda and advertising costs for app. 5%, other costs (inventory, electricity, etc.) for 1%, which in figures is:

- Rent costs will be 969.000,00 din (saving 244.000 RSD)
- Advertising costs: 10.321.750 RSD (saving 543.200RSD)
- Other costs: 31.199.850 RSD (saving 315.000 RSD)

So that the total planned expenditures for 6 months in 2014 will be 85.055.800 RSD, which is less in comparison to 2013 for 1.102.200 RSD.

Also, the sale increase is expected as well as sales incomes on the domestic market for app. 15% and sales income on the foreign market for app. 5 %, which in figures is:

1. Sales incomes on the domestic market (15% increase) - 357.942.100 RSD
2. Sales income on the foreign market (5% increase) - 51.526.650 RSD

Total planned sales incomes in the first half of 2014 409.468.750 RSD.

Table 6. Sale incomes for 2013 and 2014 in RSD

Sale incomes in first half of 20113	Planned income sales for 6 months in 2014 after using e-transactions
311.254.000	**409.468.750**

15. WEB SITE RANKING AFTER USING E TRANSACTIONS

In Figure 15. you can see that there is an increase of web site traffic. The company's site recorded 2.561,808 hits before e-transactions, and today it is 9.517.484 which is definitely the result of the innovations at the web site.

Figure 15. "Planinka" site ranking after using e-transactions

Based on the analysis of the site's ranking, before and after using e-transactions, it can be concluded the company's rank on the market is better after introducing e-business.

By introducing e-business the company improves its business, reduces costs, increases sales incomes and secures better position on the market.

16. CONCLUSION

By introducing e-commerce, as a modern service of digital economy into the business system of "Planinka" e-shop is being opened, on line booking system and dealer service, which enables not only on line presentation of its products and promotion on the Internet, but also buying and trading products by the Internet. In this way, it leads to business costs reduction and better position of the company on the market, and the tourists are enabled to do shopping of the vouchers from any place and at any time, that is to make reservations of accommodation, very quickly and efficiently and at the same time be satisfied with the service quality.

REFERENCES

Bakić, O., 2010. *Marketig Tourism*. University Sungidunum.

Blagojević S., 2010. *Tourism and economic basis and organizational system*. Novi Sad.

Buhalis, D., 2003. *eTourism, Information Technology for Strategic Tourism Management*. FT Prentice Hall, London.

http://www.alexa.com/

http://www.prolombanja.com/

http://www.kopaonik-genex.com/

http:// www.monazlatibor.com/

http://www.vrnjcispa.rs/

http:// www.radonnb.rs/

http://www.banjavrujci.rs/

http://extensions.joomla.org/

4th International Symposium on Natural Resources Management
"Sustainable Development and Green Economy in Transition Countries"
31st May -1st June, 2014, Faculty of Management Zajecar, Republic of Serbia
www.fmz.edu.rs

CHALLENGING MANAGEMENT MODEL OF SERBIAN NATURAL RESOURCES

PhD Svetislav Milenkovic[1], Full Professor
Svetlana Utvic[2]

[1]*Faculty of Economics University of Kragujevac*
34000 Kragujevac, Serbia
E-mail: milenkovics1@sbb.rs
[2]*Faculty of Economics Kragujevac, Serbia*
E-mail: scutvic@yahoo.com

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.

KEYWORDS

Resources, management, basic, destination, EU

1. INTRODUCTION

From the original community to the present day, the natural resources determined the development of the population, and later the image of civilization. Sustainability of their use, which now increasingly emphasizes its highest certificate, was, in fact, received in the original community. That means that what a man possessed, he could also „eat" it. Therefore, the aim of this paper is request to show how today limited natural resources, and even more in the future, may allow the sustainable development of mankind. The future sustainability requires new business models and challenging management of natural resources.

In the turbulent times of modern history, the territory of Serbia was constantly losing and receiving their national identity, which always implied identity conception of natural resources in the territory of Serbia. Today, these resources have not yet been in a range of successful management, because of the many unsolved issues in the transition process. These transition processes have reduced the efficiency of the economy of natural resources and increase the recessionary problems of using such resources. Therefore, management must realize the challenging portfolio of their use by changing their content and elements of in pre-crisis, crisis and post-crisis period. That means that, moving from a complete re-engineering

of the transition, through a comparative marketing, up to competitive consortium of public and private partnerships, management establishes rejuvenation of all those manufacturing processes that have come into the state of irrational exploitation of natural resources.

„Safety and environmental management are an integral part of the governance-management at all organizational levels and in all business functions. For that purpose, management should introduce a continuous process that must be coordinated by social and economic processes (employee safety, protection of the health, etc.)" (Mihajlovic, Stojanović, Ilic, 2011.). Since natural resources are fundamental elements of the environment this means that complete management of the environment is actually target function and management of natural resources in Serbia.

To achieve the proper management of natural resources in Serbia, as an introductory part of the paper, we propose its following principles:

1. A well-designed economic policy of development, protection and use of natural resources. There should be particularly used challenging management models through degression and progression, TQM, applicable models of decreasing costs and the like;
2. Within the strategic management of natural resources in Serbia a good creating of the entire set, from master plan, through action, business plans, to the feasibility studies;
3. Applicability of the business model in a challenging management must be gradual and accepted by all stakeholders. In this measure, it would be provided necessary and a free flow of investment, high-quality knowledge and the latest achievements of technological and scientific progress.
4. Constant analysis and synthesis of results and improvement in the form of achievements of benchmarking optimum;
5. Timely response to problems, quickly identify the shortcomings and constantly rejuvenate the management in organizational units of natural resources in Serbia;
6. Continuity, quality and quantity combined in model „3K" functionality.

2. THE GENESIS OF NATURAL RESOURCES MANAGEMENT

Limited natural resources and economic disparity in their utilization, for more than 50 years have been cause of antagonistic struggle between the developed countries, which are the largest consumers of these resources, and developing countries, which are the largest producers of natural resources. Since the beginning of 70s of the last century, when the energy crisis in the world has become a political and military-strategic crisis, there was a change of utilization style of natural resources. Linear behavior, i.e. valorization by arithmetic mean to the 1970., became the exponential reality, that is, the geometric mean is feature of natural resources extraction.

Having lived under the delusion that natural resources are inexhaustible, and parallel with the development of technology, man is increasingly used and exploited raw materials in large quantities. Perceptions of self-sufficiency and abundance replaced fear and uncertainty for the future survival and economic progress of mankind.

The earliest record of an inappropriate use of natural resources and the sustainability of the process is found in Mesopotamia, that is, in catchment system Tigris and Euphrates. Exploiting earthly resources in unlimited scale and poor irrigation destroyed all potentials for agricultural development. (Grober, 2007.) Ancient Greek philosophers Plato and Aristotle hit the foundations of the modern study of the relationship of man and natural resources. They first observed the effect of man on the uncontrolled deforestation, and later realized that it was actually the satisfaction of human needs the ultimate goal of using all these natural resources. „Plato pointed to the relationship between population size, availability of natural resources and the total area of arable land. With its key position that everything that happens in nature has a purpose and that man is the ultimate goal of the natural order, Aristotle is strongly influence on European thought until the late Middle Ages." (Grober, 2007.)

In its development, the middle ages showed how finding a variety of useful minerals and their processing threatens the other elements of the environment, i.e. original natural resources. That was the first time they feel the consequences of environmental pollution, which degrades the land and forest resources in two ways, as follows: on the one hand the use of wood in the mining industry, and on the other side of deforestation in exploitation area. The destruction of the area where mining has been developed can be seen in many

medieval paintings and other works. Then was recorded a destroying of fish stock in the rivers, by dropping toxic substances from mine, which, at the same time, degrades and water resources. This approach of extraction of natural resources and their management have their own ecological footprint until the nineteenth century, because it was always thought that everything that was destroyed, regenerate naturally. Unfortunately, this linear self-healing natural-resource potential was in all the theories and economic policies the underlying assumption of rapid economic development, up to first energy crisis in the seventies of the last century. Then was definitely understood that the process of self-renewal is linear, but the process of extraction of natural resources becomes exponential. The economy in the twentieth century, i.e. from the 1910th to the 1970th develops a permanent fear that the rapid exploitation of energy and other resources would lead to the collapse of the world economy. This fear has culminated in great economic crisis in the thirties of the last century. However, even today, through recessionary processes in a global economy, the use of natural resources becomes a depressive state of politicians and economists on the one hand, as well as medicine and psychoanalysis, on the other.

Barnett and Morse, in their study, tested the implications of insufficiency of resources at the cost of extraction of resources and at the resource prices products, and came to the following conclusion:

- The costs per unit of all tested products in the study, with the exception of copper and fish, declined during this period much faster than in the previous;
- The relative cost per unit of most commodities has declined. Exceptions are metals, forestry, and fishing. Sudden increase costs were observed in several agricultural products and oil;
- The relative prices of many raw materials have increased from 1957th to the 1975th, which may be associated with the growth of the monopoly power. (Lecomber, 1979.)

From shown we see that, already at that time, has been formed a cost-benefit analysis, which, until today, has a leading role in the management of natural resources. From it, in recent years, evolves in line with the global recession processes, and so called Kaizen costing analysis of costs, in order to preserve the over-use of natural and man-made resources. Therefore, from these proposals are created business methods of natural resources management in the modern world through reengineering, benchmarking, Pigo tax, Kouzovu theorem, Free Rider, comparative marketing, the inevitable competition, and others.

„Economic growth will accelerate rather than slow down, even if natural resources become scarcer in the future." (Lecomber, 1979.) This statement can reasonably be accepted, because scientific and technical progress is growing faster than the exhaustion of natural resources. That further means that new substitutes are constantly creating and waste materials more recycling. Thus enable that the least common resources could be replaced with artificial materials (plastics changing high-quality steel and similar). Therefore, in the whole concept of extraction of natural resources and their management, pessimistic and optimistic and conservative theories are accepted, as well as eco-centric and techno-centric applications such resources.

Trans-boundary natural resource management has come from the growing need for global mobility of people, labor and natural capital. This is actually „Process that improves the management of natural resources, separated by national borders, and to the benefit of all stakeholders in a given area. Global objectives:

- To promote the protection of natural resources that are depleted or degraded by unsustainable use.
- To provide local community benefits from the sustainable use of resources, fighting, among other things, against the exploitation of resources by local elites and foreign investors" (www.docsity.com, 2013.).

Antagonistic struggle between the global world elite for the greater use of natural resources and the global world poverty, has caused that the gap between rich and poor has increased so much that also reflects in technical-technological, socio-cultural, political and geostrategic terms. In this way, the management of natural resources in developing and poor countries is increasingly losing its national identity, that is, population does not know what is theirs, which resources has, what technology to use and which markets to perform with final products.

In a global economy nowhere dominates management of natural resources at the national level, but in all areas starting base of that management is local government. Creating countless individual goals, each of which has its own function, that is, functional objectives set of natural resources management in the area of local government reflects signals to the regional management of these resources which targets of more local governments synthesize in a small number of so called indicative targets, i.e. those who may be carriers of master plans of natural resources in the region. Unifying regional managements of natural resources and analyzing master and action plans of natural resources utilization, we come to a global, primarily to the national objective, i.e. to the feasibility study for rational use of natural resources throughout the national

territory. If the management of the natural resources of a country manages to preserve these resources and based on them to develop a sustainable socio-economic development, then it is a productive, that is, a long-term sustainable -successful.

According to research by Toffler, human history is characterized by three waves: „The first wave, the superiority of agriculture, the second wave superiority of industry and the third wave superiority of technology" (Toffler, 1980.). Contemporary world shows that the exploitation of natural resources in agriculture gets the toughest degradation through genetic modification of everything of which food products, which not only affects the imbalance in the agro ecological system, but it degrades geomorphological characteristics of the area, as well as creating a devastating substitutes. Industrial development is, in a philosophical sense, encompass all pores of socio-economic system, so that the tourism is treated as a resource industry, as well as many other services. This indicates that the management of natural resources is practically been brought to a dead end because of no precise division between primary, secondary, tertiary, quarterly and quintal activities, because they are highly dependent on one another, especially on the flow of various resources.

Due to the dynamics of economic growth and economic development „attribute renewable" should be considered conditionally. „Renewable natural stocks, or funds, if they have the power of regeneration, could be completely exhausted or destroyed, so it can be concluded that belong to the group of exhaustible resources, opposed to power sources, that are considered inexhaustible resources" (Ilić, Popović, Jovanović, 2011.).

Exhaustion of natural resources indicates that management has to behave differently:

- If in use of such resources appears extreme risk, it cannot form a good portfolio, which means that management is wrong and should be completely changed;
- If the risk is big, the management of natural resources can continue to work, except that the worst of its parts must be replaced, or quickly reconstruct;
- If the risk is allowed, or if is very small, the management of natural resources such state accepts, with their use focus on the full sustainability and gradually corrects the small imperfections by substitution and recycling of resources.

„Revolution or ruin - It may sound like a paradox, but now the world needs a revolution in a number of areas in order to avoid a new world war over natural resources" (Karolić, 2012.). Natural resources are increasingly causing the crisis, wars and other conflicts, so the management of these resources in the future will be in fact a crisis. Therefore, it must be prepared to manage natural resources in the period before the crisis, but in time of crisis, to enter with already accepted risk, and in time after crisis to come out more modern, more experienced and with the ability to quickly revitalize and plug in the new socio-economic flows.

The fight for the available investment funds, necessary for the preservation, development and use of natural resources, is more and more problematic. Therefore, the investor Jeremy Grantham argues: „that it cannot indefinitely continue the trend of increasing the number of people who exploit the limited natural resources and the proof of that is increasing prices of metals, oil and food. He believes the planet may submit about 1.5 billion people, while there are now 7 billion, and number is moving towards 10 and 12 billion. Throughout history, except for last 200 years, that number of population has been fueled through the food supply" (Grantham, 2012).

Message to future management of natural resources would be:

- To keep the old, original genetic potential of food resources, to ensure the world population;
- To protect urgently water resources by scientific, technical, technological and psychological conscious methods from further contamination, because the wars for the water will be catastrophic;
- To direct the resources of knowledge in those flows of global, social and economic systems that lead to the well-being of all, and to real redistribution of needed resources in all countries of the world;
- That the protection of natural resources is a global interest and that all interest groups of the world are unique consortium of public and private partnership in preservation, development and use of natural resources;
- That the management of natural resources is dynamic, flexible, reasonable and constantly needed category of modern civilization.

3. CHALLENGING MODELS OF RESOURCE – NATURAL MANAGEMENT

New inventions, new political movements install new challenges in the control mechanism of natural resources, new risks, new forms of public-private partnerships, new motives and goals of new stakeholders, new topography of resource systems, a new crisis and, the worst of all, more and more wars for natural resources. Therefore we can accept the assertion that „the management is activity which carried out certain functions in order to efficiently provide, deploy and utilize manpower and physical resources in order to achieve some goal" (Wren, Dan, 1994).

Linking functions and efforts in efficient management of natural resources implies that the functions aim is to achieve what is provided for the management, and efforts to facilitate that achievement using best strategies, i.e. using the best and cheapest means by choosing the most optimal, most rational and the most time limited ways of use.

The time in which we live and act is rough and economically unstable, which means - resource extremely limited. Therefore, management of natural resources are increasingly requires new business methods which at the same time means the best organization, strategic planning, guiding and control. Such management setting involves challenging risks, and challenging portfolio, which introduces us to the crisis management, and that the one before, during, and after the crisis. In the period before the crisis, it has not yet challenging, does not require new models with ever-decreasing costs, but keeps stable cost-benefit analysis in the supply, production, sales, financial, political and human terms. In time of crisis, that is much shorter than the pre-crisis, management of natural resources must quickly respond, or to change the legislation. During this period, the extremes are not recognized, but only those parts of management that can find solution should be recognized, i.e. large and acceptable elements of the crisis. After the crisis, in system of bankruptcy, liquidation, and regeneration, management of natural resources must always strive to phase of rejuvenation. Based on these findings, we can accept the following challenging models of natural resource management in Serbia:

- Displaying spatial distribution of natural resources, in order for the most detailed were recorded for the location of relevant industries and activities, provides model „designing" the topography of the area. Unifying the latest scientific methods and technical and technological progress this challenging model of management of natural resources with mathematical precision, as in theorem „4 point" indicates in what time and where to introduce greenfield investments, and where brownfield investments. That in same time means proving of management in connecting of all disciplines into a single goal - to develop, in the highest quality way, a co-existential relationship of all economic activity with the least waste and lower costs at selected locations. Such a model management includes: detailed topographic planning of resource area; acceptance of such a distribution of resources and socio-economic activities by all stakeholders; appropriate marketing promotion with fully crafted marketing mix of all the elements that make up the final product created on the basis of the available resources; and well-designed permanent variable, that is, adaptable management all the challenges of the external and internal type. It should be noted that such management must react in crisis situations, and even in a very short time intervals.
- Previously shown model leads us to the next challenging, i.e. benchmarking model or search for the best conception for the use of limited resources, the establishment of sustainable development and economic growth permanently accepted. In the management of natural resources in Serbia, the most important is internal and external benchmarking model, because it is still in our economy and out of economy individual parts of the enterprises, organizations, and other entities are still not compatible with each other. This suggests that the decision cannot be made in the strategy team which continues to causes the process of managing unrealistic, control impossible, and organization non-existent. This means that every element of the process of products creating, based on natural resources, must be part of management. On the other hand, external benchmarking allows the management of natural resources to compare their resources with the best in the region and beyond, and on this basis to try to be the very best, or at least reach the level of the market valuation of the best. Finally, a generic benchmarking within the resource management within Serbia is still difficult to considered as new model, because the elements that make up the support of that model in our country, are still at a low level;
- The future using and managing of natural resources will always be inspired by what assumed to be that: „everyone is motivated by money and the best way for people to do what you want is to give them

financial rewards and penalties to create incentives" (Spolsky, 2006.). Follows from this is that the management of natural resources must take into account the diametric opposites fight, that is, financial rewards and penalties, which is the most sensitive area of economic valuation of natural resources. In Serbia, there can only help stable economic policy, i.e. specified in: financial incentives, subsidies, grants, grant awards, favorable monetary and credit and tax activities, and so on. On the other hand, the laws applicable in the whole world, when considering the most appropriate punishment and reward in our environment, are through so called Pigu tax, that is, unscrupulous exploiter pays. Therefore model „Econ 101" temptingly effects on the management of natural resources in Serbia as educational, stimulating, and degradation mean;

- The biggest problem of modern mankind is losing national identity. This problem is reflected in the valuation of natural resources in Serbia by increasingly losing national confirmation of leadership resources in the international resource market, that is, on the world's largest stock exchanges (e.g. Antimony). Therefore, one of the challenging models of management of natural resources, which may well be applied in Serbia, is the method of „identity". The goal of this model is „to identify people with goals that are trying to achieve. That is much more difficult comparing to other methods and requires serious interpersonal skills. Identity management requires a cohesive, dense team, to feel like a family, so people have a sense of loyalty and commitment to their associates. The second part of this method is to provide people the needed information, so they could focus organization in the right direction" (Spolsky, 2006.). Cohesion among the people, as the most important human resources, and their knowledge, as the most wanted market resources, shows us the first part of the successful management of natural resources, i.e. Strategic Planning. If cohesion between employees, stakeholders and all public and private partners has been accomplished, then it is provided „holy trinity" – strategic plan, tactical plan and operational plan. In other words, everything becomes a unique management entity, i.e. master plan, action plan, business plan and feasibility study. The second part of this model is actually the other structural part of the successful management of natural resources, that is, organizational structure. This structure brings together national, regional and local organizational units including them in international (e.g., EFTA and IBRD, UNWTO, UNEP, etc.). In Serbia, the organizational structure has no coherence between horizontal and vertical connections, especially where there should be holding organization, it is really not a case;
- Recessionary processes in the world and the increasing exhaustion of natural resources presents us yet another challenging but much needed model of natural resource management in Serbia. Because of its primarily psychological structures and social milieu of Serbia, this model has not yet been accepted. That is so called Kaizen costing model, or model savings at all levels of the labor process. It is important that the minimum cost can actually be a huge cost problem (e.g. excessive use of water, toilet paper, brooms to clean, etc.). This management model of natural resources shall be applied where those resources are least abundant or very poor (e.g. Japan);
- Without a well thought out marketing there is not a good use of natural resources. That further causes that has to be specially created marketing management of natural resources with specific organizational units and specific conceptions. However, it is still an integral part of the overall management of natural resources in Serbia. In this regard, in our conditions is not yet developed such management because it does not represent the final and most valuable products created using these resources, but in most cases represents only the resources in their natural state. This presentation of resources attracts foreign investors, but distracts the total profit. In order to avoid this and create our own accumulation, it is necessary that marketing concept in the challenging management of natural resources to have focus on the final product that will get passed on the world market and leave the profit and the accumulation for new investments in our country;
- „Potential value of the research is based on economic techniques for valuing non-market resources, such as environmental protection or pollution impact. These resources do not have the benefits for people, just as its specific aspects have no market price, because they were not directly sold" (Wikipedia, 2013.). Many doubts follow from this. These concerns could be:

a) If these resources have no value for people, they are charged. The cost further reduces the value of the resource, so in an indirect way, these resources have very much value;

b) If the whole landscape a part of a contingent of natural resources, then it affects both mental and physical condition of man. Improving of that situation, based on beautiful landscape, raises its productivity and intensity of labor, which further increases the quality of products and reduce the destruction of resources, and that ultimately raise the value of those resources;

c) In tourism all is commercially valorized because the tangible part of the tourist product, such as unique rock could not give the best enjoyment for tourists without intangible parts (e.g. the sun heating), which in turn increases the value of these resources. Therefore, all of these resources have a market and non-market component, except that the values of some are larger and of some are smaller, and prices, as market allocator of resources, is for first dominant, while for non-market resources is incidental category;

- Everything passes and everything changes, including the manner of use and management of natural resources. Therefore, one of the challenging natural model management in Serbia is reengineering. It actually involves the reconstruction of what is good, and completely changing what is wrong. The challenging is because it has to follow new scientific, technical and technological methods. Therefore, information technology, geo-engineering, and other scientific and technical achievements are relevant indicators of flow rate and response to any information related to the discovery, development, utilization and dynamic management of natural resources in the world and in Serbia; and
- In order to all above state could be confirmed and brought in competitive management entity of natural resources in Serbia, as challenging portfolio management, we have to use a competitive model. In competitive struggle, the identification of what is available and verification of that, through all of what is requested and confirmed, in global economy is, in fact, the main strategic goal of challenging management of natural resources in Serbia.

4. CONCLUSION

„Management is the process of forming and maintaining an environment in which individuals, working in groups, achieve certain goals. This is actually the process of achieving desired results through the efficient use of natural, human and material resources" (Wikipedia, 2013.). However, efficient use is often not fully understood. With exploitation of resources should be considered primarily their limitation. For proper and effective management of the company, in addition to the mission and vision that each company should have, it is necessary to define a strategy that will lead to the realization of the set goals.

There are different models used for the proper management of natural resources, including: benchmarking, reengineering, comparative marketing, the Kaizen costing, conglomerate, competitive and other. Therefore, in this paper an attempt was made to establish a new system of challenging management of natural resources in the Republic of Serbia. The conclusion is that such management is still in embryonic form, but in the future, is very desirable and necessary, because all future projects are based on limitations and low quality of natural resources. For this reason, as the leading premise of challenging management models of natural resources in Serbia in their research projects we accept „that managing project today is a scientifically based and practical confirmed concept which, with the help of appropriate methods of organization, planning and control, perform rational harmonizing of all necessary resources and coordination of performing the necessary actions in order to organize a particular project in the most efficient manner"(Mihajlović, Stojanović, Ilić ,2011.).

REFERENCES

Book

Wren ,D. ,Voich, D., 1994. , *Menadžmen – proces, Struktura i ponašanje,Poslovni sistem*, Grmeč AD - Privredni pregled, Beograd, pp.29.

Grober, U., 2007., *Deep Roots – A conceptual history of sustainable development*, Best.-Nr. P 2007-002 Wissenschaftszentrum Berlin für Sozialforschung (WZB) , pp. 10-20.

Lecomber,R., 1979., *The economics of natural resources*, New York – John Wiley and sons, pp. 24-26.

Tofler, A., 1983.,*Treći talas*, Biblioteka Zenit, Beograd, pp. 28.

Conference paper or contributed volume

Ilić, B., Popović, G., Jovanović, V., 2011., *Značaj i optimalno korišćenje šumskih fondova*, Zbornik radova, VIII Skup privrednika i naučnika, SPIN11, Fakultet organizacionih nauka, Beograd, novembar, 2011., str. 433-438, ISBN 978-86-7680-244-9.

Mihajlović, D., Stojanović, D., Ilić, B., 2011., *Ekološki menadžment u funkciji održivog društveno-ekonomskog razvoja,* VIII Skup privrednika i naučnika, „Operacioni menadžment u funkciji održivog ekonomskog rasta i razvoja Srbije 2011-2020“, SPIN'11, Fakultet organizacionih nauka, Beograd, str. 447-454, ISBN 978-86-7680-244-9.

Vebsite

http://bk.docsity.com/srdokumenti/Prekograni%C4%8Dno_upravljanje_prirodnim_resursima-Slajdovi-Menad%C5%BEment_%C5%BEivotne_sredine,Docsity -Prekogranično upravljanje prirodnim resursima, 2013.

http://hr.wikipedia.org/wiki/Menad%C5%BEment, Wikipedia, 2013.

http://hr.wikipedia.org/wiki/Menad%C5%BEment, Wikipedia Ibidem, 2013.

http://www.joelonsoftware.com/items/2006/08/08.html, Joel Spolsky, „The Command and Control Management Method", 2006.

http://www.joelonsoftware.com/items/2006/08/09.html, Joel Spolsky,,,The Command and Control Management Method", 2006.

http://www.businessinsider.com/were-headed-for-a-disaster-of-biblical-proportions-2012-11?op=1, Jeremy Grantham, ,,Were headed for disaster of biblical proportions", 2012.

http://www.standard.rs/ratko-karolic-svetska-kriza-i-ratovi-za-prirodne-resurse-u-zapadnoj-literaturi-.html, R. Karolić,,,Svetska kriza i ratovi za prirodne resurse u zapadnoj literaturi", 2012.

4th International Symposium on Natural Resources Management
"Sustainable Development and Green Economy in Transition Countries"
31st May -1st June, 2014, Faculty of Management Zajecar, Republic of Serbia
www.fmz.edu.rs

SUSTAINABLE DEVELOPMENT, RENEWABLE ENERGY AND ENVIRONMENT

Slavica Miletić[1], Dragan Mihajlović[2], Bojan Stojčetović[2], Valentina Velinov[4]

[1]*Mining and Metallurgy Institute Bor, ZeleniBulevar 35, 19210 Bor, Serbia*
[1]*slavica.miletic@yahoo.com*
[2]*Faculty of Management Zajecar, Park suma Kraljevica bb, 19000 Zajecar*
dragan.mihajlovic@fmz.edu.rs
Technical school of professional education, Nusiceva 6, Zvečan, Serbia ,
[2]*bstojcetovic@yahoo.com*
[3]*Technical Faculty Bor, University in Belgrade, Vojske Jugoslavije 12, 19210 Bor, Serbia*
[3]*valentina_velinov@yahoo.com*

ABSTRACT

In this paper are presented basics of sustainable development and its legal frame in Serbia. Renewable energy is connected with sustainable development in a way that its can provide development in a sustainable manner. In same time renewable energy can provide development and protection of environment that is compromised using of conventional energy sources.

KEYWORDS

sustainable development, renewable energy, environment

1. INTRODUCTION

We all see that the world consumes vast amounts of energy every day. On one side causing major environmental problems with other large consumption of fossil fuels could lead to the next generation do not have enough for their needs, which directly violates the principle of sustainable development. As the economic growth and development is unthinkable without energy the question is whether renewable energy can gradually replace conventional. Using of renewable energy sources recently become very important, particularly because they can provide sustainable development. The most important property of alternative energy sources is their environmental compatibility. Inline with this characteristic, renewable energy sources likely will become one of the most attractive substitutes in the near future.

Economic development has been strongly correlated with increasing energy use and growth of greenhouse gas (ghg) emissions. Renewable energy can help decouple that correlation, contributing to sustainable development. In addition, re offers the opportunity to improve access to modern energy services for the poorest members of society, which is crucial for the achievement of any single of the eight millennium development goals.

Consumption of non-renewable sources, such as fossil fuels and uranium, reduces natural capital directly. Renewable energy, in contrast, sustains natural capital as long as its resource use does not reduce the potential for future

2. SUSTAINBLE DEVELOPMENT CONCEPT

When the danger of the environmental pollution and the crisis of energy were realized in the 1980s, sustainability started getting more and more attention.

The concept of sustainable development originated with the environmental scope in 1980s (World Conservation Strategy for Conservation of Nature and Natural Resources, 1980), which proposed three basic factors - social, ecological, and economic - which have been continuously developed until today.

The concept of sustainable development gained wide recognition in the international scientific community after the famous report 'Our common future' was published by the World Commission on Environment and Development in 1987. Sustainable development was defined by the Commission as 'development that meets the needs of the present without compromising the ability of future generations to meet own needs'. After 'Our common future' second important event for sustainable development was "The earth summit" in Rio de Janeiro.

The triangular approach of sustainable development takes into account the three dimensions of sustainable development (economic, social and environmental) and tries to assess the sustainability of a given development proposal according to them.

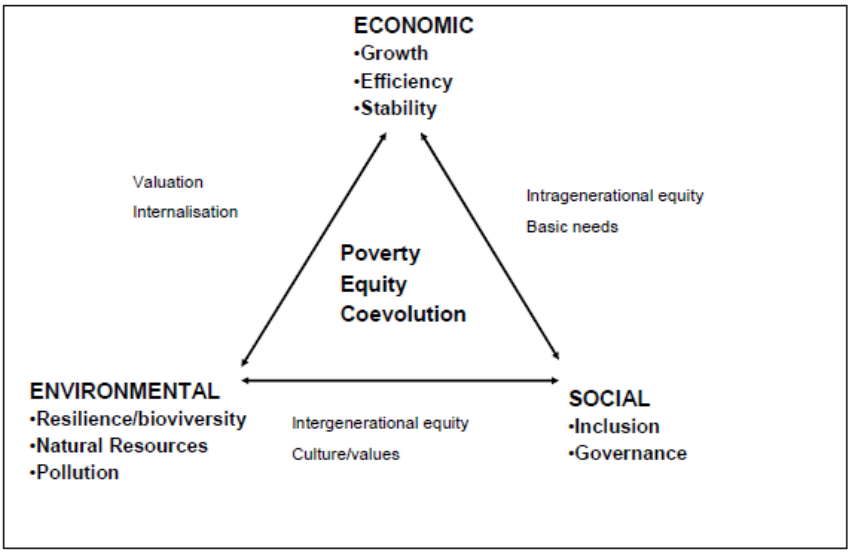


Figure 1. The dimensions of sustainability and their interrelationships. Source: (Munashinge, M.; Shearer W, 1995)

Environmental - Reduction of local and global pollution (among them, emissions of greenhouse gases), lower exploitation of the natural resources in the territory and maintenance of the resilience (ability to adapt to change), integrity and stability of the ecosystem.

Economic - Increase of regional per capita income, improvement in the standard of living of the local population, reduction of energy dependence and increase in the diversification of energy supply.

Social - Some authors stress that SD cannot be achieved without the sustainability of social and cultural systems, which includes the achievement of peace and social cohesion, stability, social participation, respect for cultural identity and institutional development. Reducing unemployment and improving the quality of jobs (more permanent jobs), increasing regional cohesion and reducing poverty levels are key actions at local level to achieve social sustainability. For example, activities such as renewable energy deployment, which are an alternative to traditional agriculture, should be encouraged. This has a particularly positive psychological impact on the prospects of the young local population.

2.1. Sustainable development in Serbian legal frame

Main government document which refers to sustainable development is National Strategy for Sustainable Development (NSSD). This strategy defines sustainable development as a goal oriented, long-term, ongoing, comprehensive and synergetic process that affects all aspects of life (economic, social, environmental and institutional) at all levels.

The aim of strategy is to balance the three key factors of sustainable development: sustainable development of the economy, the economy and technology, sustainable development of a society based on social equality and environmental protection with rational use of natural resources. At the same time, the aim of the strategy is to bring together the three pillars of the whole, which will support an institution.

One of the key priorities of the strategy is the protection and enhancement of the environment and rational use of natural resources, conservation and improvement of the system of environmental protection, pollution reduction and environmental pressures, the use of natural resources that remain available for future generations, which requires achieve:

- Establish a system of protection and sustainable use of natural resources (air, water, land, minerals, forests, fish, wildlife and plant species);
- Strengthening interaction and mutual achievement of significant effects of environmental protection and economic growth, integrating environmental concerns into development policies of other sectors;
- Investing in reducing environmental pollution and the development of cleaner technology;
- Reducing the high energy intensity of the economy of the Republic Serbia and efficient use of fossil fuels;
- Promoting the use of renewable energy;
- Planning of sustainable production and consumption and reduce waste by product unit;
- Protection and conservation of biodiversity.

In Serbia, the market economy is not functioning in a sustainable manner, even at the level of advanced countries in transition, since the mixing policy largely decisive for the economic position.

3. RENEWABLE ENERGY SOURCES IN SERBIA

According to the data available, total potential of the renewable energy sources in Serbia (considering only small hydro plants up to 10 MW) is estimated to 3.38 million toes annually (1 toe = 11.64 MWh). Renewable energy potential in Serbia can cover almost half of its primary energy needs. Utilization of these potentials is currently 18%, but it is almost entirely based on production of electricity in large hydro power plants. Serbia has all the basic potentials for producing energy from renewable energy sources, but estimations point out the fact that Serbia has the most favorable conditions for usage of geothermal sources, wind, and biomass.

Within the new energy category - renewable energy, including biomass, small hydro water flows (with buildings up to 10 MW), geothermal energy, wind energy and solar radiation, it should be noted that in Serbia there are special benefits and the need for their organized use the so-called decentralized production of heat (combustion of biomass and capture solar radiation) and electricity (build mini hydro power up to 10 MW and wind generators up to 1 MW)), to meet the needs of local consumers as well as the delivery of surplus electricity to local network within the power system of Serbia. Some of the most important documents relating to the renewable energy are:

1. The National Sustainable Development Strategy of the Republic of Serbia (adopted in 2008) defines national priorities for sustainable development, among which are the incentives for usage of renewable energy sources in order to protect and improve the environment, as well as to use renewable energy sources in a rational manner so as to make them available to future generations.
2. The Energy Sector Development Strategy of the Republic of Serbia by 2015 (adopted in 2005) emphasizes that Serbia has special advantages and requirements when it comes to organized exploitation of renewable energy sources through decentralized production of electricity and thermal energy (by combustion of biomass and collection of solar radiation) which could be used to meet local consumption, while the surplus could be redistributed within the national power grid.

3. The National Environmental Protection Program (adopted in 2009) recognizes the importance of substitution of fossil fuels and non-renewable energy sources with renewable energy sources in order to protect the environment.

3.1. Wind potential

Regions in Serbia with locations potentially suitable for the construction of wind generators are:

1. Eastern parts of Serbia – Stara Planina, Ozren, Vlasina, Rtanj, Deli Jovan, Crni Vrh. There are locations in these regions with average wind velocity > 6m/s, which corresponds to the power of Pav = (300-400) W/m^2. This area covers about 2000 km^2 and in the future about 2000 MW of installed wind generator power might be built here;
2. Pešter, Zlatibor, Zabljak, Bjelasica, Kopaonik and Divcibare are mountain regions which abound in winds, where measurements may be taken and appropriate suitable micro locations found (at altitudes over 800 m) for the construction of wind generators;
3. Pannonian Plain, north of Danube, wider region of the territory where kosava wind blows also abounds in winds. This area covers about 2000 km^2 and is suitable for the construction of wind generators because the basic infrastructure already exists, from roads to electricity grid, and also because of the vicinity of big centers of electric energy consumption, and the like. In future, it would be possible to install there about (1500-2000) MW of wind generator capacities.

3.2. Solar potential

The potential of solar energy is 15% of total of useful potential of renewable energy sources in Serbia. (Jovanović, Parović, 2009). The energy potential of solar radiation is about 30% higher in Serbia than in Central Europe and the intensity of solar radiation is among the largest in Europe. Average daily energy of global radiation for flat surface during winter ranges between 1.1 kWh/m² in the north and 1.7 kWh/m² in the south, and during the summer period between 5.4 kWh/m² in the north and 6.9 kWh/m² in the south. For the purpose of comparison, the average value of global radiation for the territory of Germany is about 1000 kWh/m², while the value for Serbia is 1400 kWh/m². The most favorable areas in Serbia record a large number of sunny hours and the annual ratio of real radiation and total potential is approximately 50%.

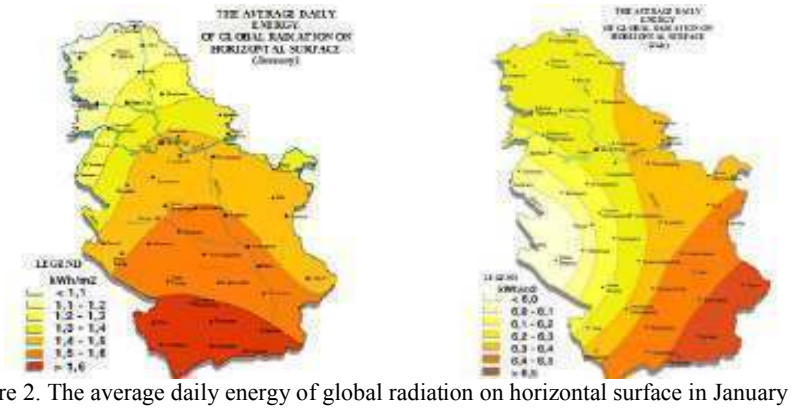


Figure 2. The average daily energy of global radiation on horizontal surface in January and July in Serbia

3.3. Hydro potential

The energy potential of low water flow streams suitable for constructed of small hydro power plants (SHPP), amounts to 0.4 million toe or 3% of total renewable energy potential in Serbia. By using the total energy

potential of SHPP, it is possible meet 4.7 % of total power production in the Republic of Serbia (34 400 GWh/year in 2006) and around 15% of the current power production in hydro power plants (10 900 GWh/year). At about 900 potential sites in Serbia's rivers, including small rivers, there are possibilities for the construction of small hydro power plants (up to 10 MW), with the possible production of 1800 GWh / year.

The energy potential of streams and localities for the construction of SHPP are determined in the document "Cadastre of small hydro power plants on the territory of the SR Serbia out of the territory of Autonomous Provinces of Serbia dating from 1987. Construction on locations outside the cadastre is also possible with the consent of the competent ministries and institutions. The consent is given with reference to maximum utilization of the available energy potential of the given stream.

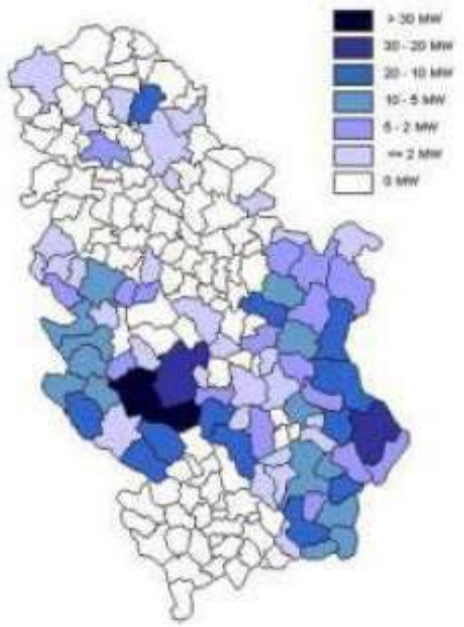


Figure 3. Small hydro power potentials

3.4. Biomass potential

The term biomass is understood as substance, vegetable or of animal origin which can be used as fuel or for industrial production. In Serbia, the biomass is mainly used in the traditional way in the form of energy for heating, cooking and water heating. In addition to these types of use, biomass can be used in plants for production of electricity and heat, then as a raw material for the production biofuel and can be used in the industry for the production of fibers and chemicals.

The northern part of Serbia, the province Vojvodina and territories along the river Sava and Danube are the main areas of sources of waste biomass. About 30% of the territory is under forests and 55% territory of arable country. Forest area is located to the south, east and west. The total energy potential of biomass in Serbia is estimated at 2.7 toe. It is estimated that each year in Serbia produced a total volume of 12.5 million tons of biomass, of which 9 million tons in Vojvodina (72%). Analysis of the structure of biomass residues from agricultural production shows that more than half resources lies in maize biomass, more than a quarter in the straw cereal, especially wheat, and the remainder of about 15 percent in crop residue sunflower, soybean, canola or cutting remnants of orchards and vineyards. On the other hand, the potential of forest biomass as well as other important resources biomass Serbia, lie in the processing of approximately 1.5 million cubic meters of forest growth per year in the form of slices, slices, bark, sawdust. (Jovanović, Parović, 2009).

3.5. Geothermal potential

Geothermal energy is defined as heat from the Earth. It is a clean, renewable resource that provides energy around the world in a variety of applications and resources. According to some assessment the potential of geothermal energy in Serbia amounted 2300 GWh by year (100 locations with sources). (Despotovic, 2012)

In Serbia only uses geothermal energy from geothermal and mineral water, mainly in the traditional way, most for spa and sports and recreational purposes. The use of geothermal energy for heating and other energy use is at an early stage and very modest compared to the potential of geothermal resources. Estimated power of the existing geothermal wells in Serbia is about 160 MW of which are currently used by approximately 100 MW. Geothermal energy potential of a particular area can be displayed by density geothermal heat flow (quantity of the geothermal heat in each second through an area of $1m^2$ of the Earth's interior comes to its surface). Average values in Europe are about 60 mW/m^2, while in Serbia these values much larger: more than 100 mW/m^2. Lands in Serbia have been constructed from hard rock and Because of such favorable hydrogeological and geothermal characteristics in Serbia is about 160 sources of geothermal water with temperature higher than 15 ° C. The hottest sources in Vranjska Banja where the temperature is up to 96°C.(Jankovic, 2009)

In Vojvodina there are 62 artificial geothermal sources (wells) of the total yield of 550 l/s thermal power of 50 MW. The part of Serbia south of the Sava and the Danube there are another 48 wells with an estimated capacity of 108 MW. These data suggest a high potential for the exploitation of geothermal energy in our country, which is currently almost fully realized. Greatest importance for Serbia will have direct use of geothermal energy for heating in rural and urban areas and the development of agriculture and tourism.

3.1 Sustainable development and renewable energy

The term “renewable” refers largely to the naturally regenerative nature of the energy source, whereas sustainability has a broader scope, including economic, social and environmental considerations.

The relationship between renewable energy and sustainable development can be viewed as a hierarchy of goals and constraints that involve both global and regional or local considerations. Though the exact contribution of renewable energy to sustainable development has to be evaluated in a country specific context, renewable energy offers the opportunity to contribute to a number of important sustainable development goals:

1. **Social and economic development** – there is a strong connection between economic growth and energy consumption. Without energy sources development can not be achieved. On the other hand in aim to reach desired growth often is necessary a lot of energy which production can demand a lot of resources and its conventional production is not align with sustainable development principles;
2. **Energy access** - From a sustainable development perspective, a sustainable energy expansion needs to increase the availability of energy to people that currently have no or limited access to them. In 2010 almost 20% of the world population, mostly in rural areas, still lack access to electricity. Using of renewable sources in poor and rural areas could increase access to energy;
3. **Energy security** – stable energy supply is a major political concern and a technical and economic challenge facing both developed and developing economies. Decreasing of fossil fuels reserves, political reasons, costs and other can have negative impact on energy security. Renewable energy, on the other hand, present relative independent energy sources which is particularly important for energy poor countries and have positive impact on sustainable development;
4. **Climate change mitigation and the reduction of environmental and health impacts**. Renewable energy sources can preserve environment and to protect it for future generations. Air pollutants,CO_2, global warming, potential catastrophes (for example nuclear), direct physical destruction of habitats and ecosystems, deterioration of habitats due to air and water pollution are just few events that can be avoided with renewable energy sources.

The mitigation of dangerous anthropogenic climate change is seen as one strong driving force behind the increased use of renewable energy worldwide. The potential of renewable energy to increase access to modern energy technologies can facilitate social and economic development. Various types of wastes from agricultural (plant and animal wastes), industrial (sugar refinery, dairy wastes, confectionary waste, pulp and paper,

tanneries and slaughter houses) and residential (kitchen waste and garden waste) sectors are the potential renewable energy sources to attain sustainability and for switchover to waste-to-energy routes.

Energy sources such as solar radiation, the winds, waves are generally considered renewable and therefore, sustainable over the relatively long term. Sustainable energy sources that are abundantly available can:

- Reduce or stop conflicts among countries regarding energy reserves.
- Facilitate or necessitate the development of new technologies
- Reduce air, water and land pollution and the loss of forests.

4. SUSTAINABLE DEVELOPMENT AND ENVIRONMENT

Since the beginning of industrialization, economic development in most countries has been accompanied by growth in the consumption of fossil fuels, with more and more coal, oil, and natural gas being burned by factories, electric power plants, motor vehicles, and households. The resulting carbon dioxide (CO_2) emissions have turned into the largest source of greenhouse gases - gases that trap the infrared radiation from the earth within its atmosphere and create the risk of global warming.

Because the earth's environmental systems are so complex, the exact timing and extent to which human economic activities will change the planet's climate are still unclear. The pollutants emitted into the atmosphere do not remain confined to the area near the source of emission or to the local environment, and can be transported over long distances, and create regional and global environmental problems.

The concept of sustainability has been linked to land development practices, population growth, fossil fuel usage, forest management, aqua-culture, pollution, global warming, limited water supplies, species diversity and extinction, and the types of resources being consumed. All of these impact our environment and the sustainability of ecosystems. Environmental pollution as a result of energy production, transportation, industry or lifestyle choices adversely affects health. Respecting of sustainable principles should preserve environment. Some of nowadays most important environmental problems are:

- **Climate change** –The last decade of the 20th Century and the beginning of the 21st have been the warmest period in the entire global instrumental temperature record, starting in the mid-19th century. Certain naturally occurring gases, such as carbon dioxide (CO2) trap heat in the atmosphere causing a greenhouse effect. Burning of fossil fuels, like oil, coal, and natural gas is adding CO2 to the atmosphere.
- **Pollution of Air, Water and Land –** Some of the most important causes of pollution are: emissions from industry, transport and energy production; unclean technology; inadequate policies and legal regimes; non-implementation of quality standards; unclean technologies and other. Using of renewable energy can largely reduce pollution but also can have some impact on environment. The availability to man of freshwater of high quality is becoming an acute problem in many countries. Water requirements continue to increase with the growth of populations and living standards and the expansion of agriculture and industry.
- **Loss of Biodiversity -** loss of species; loss of genetic resources; agricultural vulnerability; habitat destruction; loss of ecosystems; introduction of disease and invasive species via smuggling. This problems can be caused by: chemicals and pesticides; over harvesting; land conversion; deforestation.

When we consider link between sustainable development and environment we should find a way to provide constant development without environmental damages. But is it possible and how? Using renewable sources of energy may be good start in attempt to achieve sustainable development and protect environment by using of clean energy.

CONCLUSION

Goal of every country is to achieve high economic growth but it has its price. Primarily, its require a large amount of energy that is derived mainly by burning fossil fuels, and many other resources that are needed for the production and economic development are consumed in large quantity. In this way, there is a negative impact on the environment which manifests through climate change, water and air pollution and loss of biodiversity.

Also, since natural resources are limited to their exaggerated spending endangers the needs of future generations and thus we violate the principles of sustainable development. Therefore, it is necessary to find new ways and methods to achieve development that will also will not have a negative impact on the environment.

Renewable energy sources is now perhaps the only solution that makes this possible, and it is therefore necessary to use them wherever is possible and so can speed up sustainable development and provide a healthy environment for future generations.

REFERENCES

Munashinge, M.; Shearer W., 1995. *Defining and Measuring Sustainability*; The World Bank: Washington, DC, USA.

Government of the Republic of Serbia. National Sustainable Development Strategy of the Republic of Serbia Official Gazette RS 57/2008.

Government of the Republic of Serbia, Ministry of Mining and Energy. Energy Sector Development Strategy of the Republic of Serbia by 2015, Official GazetteRS 44/2005

Government of the Republic of Serbia, 2009. The National Environmental Protection Programme, Belgrade.

Kothari R. et al., 2010, Waste-to-energy: A way from renewable energy sources to sustainable development, *Renewable and Sustainable Energy Reviews*, vol 14, pp3164–3170

Tesic M. et al, 2011, Renewable energy policy in the Republic of Serbia, *Renewable and Sustainable Energy Reviews*, vol 15, pp 752–758

Spasic D, Stojanovic M, 2013, Sustainability reporting – theoretical framework and reporting practice in the serbian oil industry, *FACTA UNIVERSITATIS Series: Economics and Organization,* Vol. 10, No 3, 2013, pp. 231 – 244

Karakosta C et al, 2009, Directing clean development mechanism towards developing countries' sustainable development priorities, *Energy for Sustainable Development* vol 13,pp 77–84

Golusin M, et al, 2010, The analysis of the renewable energy production sector in Serbia, *Renewable and Sustainable Energy Reviews*, vol14, pp 1477–1483

Omer M.A, 2008, Energy, Environment and sustainable development, *Renewable and Sustainable Energy Reviews*, vol 12, pp 2265–2300

Duic N, et al, 2013, Sustainable development of energy, water and environment systems, *Applied Energy*, vol 101, pp 3–5

Lund H, 2007, Renewable energy strategies for sustainable development, *Energy*, vol 32, pp 912–919

Economou A, 2010, Renewable energy resources and sustainable development in Mykonos, *Renewable and Sustainable Energy Reviews*, vol 14, pp 1496–1501

Jovanović B, Parović M, 2009, *Stanje i razvoj biomase u Srbiji*, Jefferson institute, Beograd

Despotović Ž, 2012, Obnovljivi izvori energije - stanje i perspektive u svetu i Srbiji, Shrack technik, Beograd,

Janković V, 2009, Geotermalna energija:kako iskoristiti skriveni potencijal Srbije, Jefferson institute, Beograd

4th International Symposium on Natural Resources Management
"Sustainable Development and Green Economy in Transition Countries"
31st May -1st June, 2014, Faculty of Management Zajecar, Republic of Serbia
www.fmz.edu.rs

MANAGEMENT OF RENEWABLE ENERGY SOURCES AS A RESOURCE OF SUSTAINABLE DEVELOPMENT OF SERBIA

Srdjan Zikic[1],
Jane Paunkovic[2]

[1]*Faculty of management, Zajecar, srdjan.zikic@fmz.edu.rs*
[2] *Faculty of management, Zajecar, jane.paunkovic@fmz.edu.rs*

ABSTRACT

The aim of national strategy of sustainable development of the Republic of Serbia is to balance three key factors of sustainable development: sustainable development of economy, sustainable development of the society and environmental protection through rational management of natural resources. Renewable energy sources in Serbia will be one of the most topical issue during the process of its joining EU and they are the most important support of energy independence of Serbia in the future. One of the main goals of sustainable development of the Serbian Energy is promoting the use of available renewable energy sources, mainly biomass, solar and hydropower energy.

KEY WORDS: sustainable development, renewable energy sources

1. INTRODUCTION

Sustainable development is defined as development that meets the needs of the present generations without reducing the ability of future generations to meet their own needs. This concept has been declared a key policy development in the EU and the UN. The possibility of achieving sustainable development of the Republic of Serbia is in introducing, adapting and applying the principles prevailing in the EU, and which are stated in the Lisbon Declaration. Some of the key priorities of the Republic of Serbia, whose fulfillment will enable the achievement of sustainable development by 2017. year are: protection, promotion and preservation of the environment, reduce pollution and pressures on the environment, rational use of natural resources to remain available for future generations, as well as encouraging the use of renewable energy sources (*National Strategy for Sustainable Development*, 2008).

Renewable energy sources are those sources that exist in nature and are fully or partially renewable, such as water and wind energy, solar energy, biomass and so on.The use of renewable energy sources is of a great importance for each country because in that way non renewable energy sources are saved and the environment is protected. All renewable energy sources are ecologically clean. Operating costs of RES are generaly higher than the costs of using traditional fuels, but investment in research and development of RES compared to investment in fossil fuels or nuclear energy are significantly lower. It must be emphasized that without incentive measure taken by the state, the commercial expansion of RES will meet a lot of difficulties.

Renewable energy sources are the topical issue in all developed countries. They will be relevant in Serbia during the process of its joining EU. Renewable energy sources are the most important support of energy independence of Serbia in future. The total energy potential from renewable sources can satisfy a quarter of annual needs in Srebia. Serbia has potential to produce nearly 4 Mten per year from the renewable energy

sources. However, although the Republic of Serbia has favourable conditions, the renewable sources are underused. Hydropower and biomass energy from renewable energy sources, ape currently the most important energy resources of the Republic of Serbia, and as such they are especially emphasized in the Strategy for Priority selective use of renewable energy sources (Petkovic, 2000; Djajic, 2008).

2. RENEWABLE ENERGY SOURCES (GENERALLY)

The term "renewable energy sources" implies energy sources that exist in nature and replenish themselves in whole or in part. Renewable energy sources, also known as lasting energy sources, are those energy resources that are used for the production of electric or heat energy, that is - they represent every useful work whose reserves are constantly or cyclically renewed. The terms "renewable" and "lasting" originate from the fact that energy is consumed in an amount that do not exceed the rate at which it is produced in nature. Renewable energy sources can be divided into two main categories :

1. traditional renewable energy sources, like biomass, hydropower energy, and
2. new renewable energy sources, like biomass, hydropower energy, solar energy, geothermal energy, wind power energy and ocean energy (waves and tides).

Sustainable energy sources are an important energy potential for future, although they still have limited capacities today (less than it was before). Nowadays, the biggest challenge is to find a way to satisfy increasing needs for energy, and at the same time to reduce pollution to minimum. According to the definition given by the United Nations, primary energy produced from renewable energy sources is electrical, heat and mechanical energy at the outlet of the device that uses the source of energy. At the moment about 13 % of the primary energy consumption comes from renewable energy sources. The characteristics of these energy sources are reflected in their inexhaustibility, changeability and suitability for environmental protection (Djurovic, 2005).

The fact is that the investment in renewable energy is five times less than investment in conventional sources and an increasing number of countries have opted for this kind of "green energy". Renewable energy sources implementation in all walks of life is an important condition to realize the concept of sustainable development in the long term which leads to a reduction of harmful gases emission. The importance of economy sustainability is in obtaining adequate energy offers in order to satisfy constantly growing demands for energy. Renewable energy sources are of importance for energy sector in all countries because they are useful for environmental protection and they provide security in energy offers. These energy sources respect the principle of sustainable development, that is, they satisfy the needs of today's generation without any fear that it will jeopardize the possibility of satisfying the needs of future generations (Milanovic, 2009).

3. THE IDEA AND THE CONCEPT OF SUSTAINABLE DEVELOPMENT

Sustainable development implies the development of a society which, using available resources, satisfy human needs but do not jeopardize natural systems and environment, thus providing long-term existence of human society and its surroundings. Sustainable development is most often associated with environment protection, ie. with the effort to find a connection between a concern for the survival of life on the planet Earth and the conservation of natural resources and numerous ecological challenges facing every society, country and mankind as a whole (*National Strategy for Sustainable Development*, 2008). The actuality of the term itself contributes to the environmental threats which are reflected in ecological challenges and problems, such as: global warming, the reduction of the ozone layer, greenhouse effect, forests disappearance, conversion of fertile land into desert land, occurrence of acid rains, the extinction of plant and animal species. In order to preserve the earth for today's as well as for future generations it is necessary for the modern world to be aware of shared responsibility and to harmonize the development with the needs of people and nature. Sustainable development can create favorable conditions for future generations as well as to help conservation of natural resources of the planet (UNDP Program: Human Development Report 2000).

Developing market economy, attitudes and behavior of economic entities are more and more based on the assumption on unlimited natural resources and the possibility to use these resources more intensive and aggressive without taking into account the necessity of their restoration and the protection of natural environment. As a reflection of aggressive behavior of economic entities towards nature in general in the process of unscrupulously exploitation of natural resources natural flows of their optimal reproduction and the protection of natural environment are visibly disturbed on the whole. The concept of sustainable development means a balanced economic, social and cultural development without harming the environment. It will allow future generations to develop themselves at the same or higher level (Djukic, 2011).

The essence of the sustainable development concept is the correlation between economy development and the environment taking into account legality of ecological systems. Such a concept is aimed at the rational use of natural wealth of the country and accordingly at improving the quality of environment as well as the quality of life. In order to achieve sustainable development it is necessary to establish new social values based on knowledge, creativity and ability of human resources, creating high quality staff with a tendency of transforming existing society into a learning society.

4. RENEWABLE ENERGY SOURCES IN THE SUSTAINABLE DEVELOPMENT STRATEGY AND SERBIAN ENERGY POLICE

There is a general impression that Serbia has a good energy potential in the field of renewable energy sources. Permanent physical estimations of renewable sources potentials were being done until last year, however economic estimations have been taken lately. It can be said that the question of renewable energy sources is relevant in all developed countries. The exploitation of renewable sources in Serbia for the electric energy production used to be quite forgotten and secondary subject during previous years which is considered unacceptable, taking into account great potentials for their use. The process of joining European Union requires harmonization of Serbian energy policy and determining targets for the share of renewable sources in the total production of electric energy (Mihajlovic, 2006).

Estimations show that Serbian potential in renewable energy sources is more than 4 million tonne of oil equivalent (toe) per year which, according to the estimation of experts, corresponds to almost half the annual energy needs of the country. That potential is great, especially in comparison with some European countries. However, regarding potentials of some types of renewable sources, Serbia lags. At the moment, biomass energy is the most important domestic energy potential from renewable sources what is emphasized in Energy Development Strategy of the Republic of Serbia up to 2025. Renewable energy potential in the Republic of Serbia amounts to more than 3 Mtoe / year , what is about 25 % of annual consumption of primary energy.

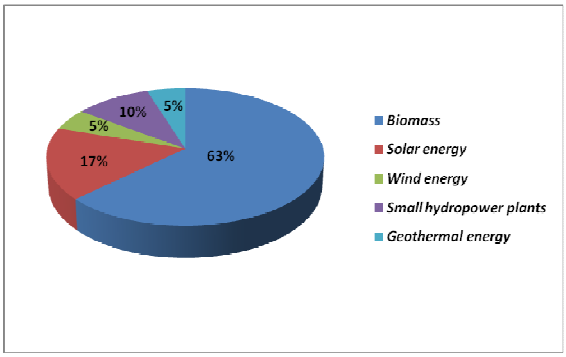


Figure 1. Renewable energy sources - situation in Serbia

The strategy which defined the economic development of the Republic of Serbia up to 2025 as a priority also recognize the selective use of new and renewable energy sources whose aim is slowing down the growth rate of energents import, reducing negative impacts on the environment and adding additional activities for domestic industry and the employment of the local population including adjustment to the practice and legislation of the European Union in this field. In order to increase the use of renewable energy

sources the program provides for the selection and implementation of some of the incentive instruments to stimulate these sources, such as: tax, customs and other incentives, subsidies in the construction of facilities for the use of renewable energy sources, operation of preferential tariff system for energy producers etc. as well as the application of the instruments from Kyoto Protocol (Jovanovic, Stamenovic, Petrovic, imDic, 2011).

Priority development programs of energy sectors in Energy Development Strategy in Serbia up to 2015 are divided into three groups (*The National Energy Strategy of the Republic of Serbia for the period of the 2025th year of the projections of the 2030th year*. 2013):

1. Basic priority - technology modernization of energy facilities and objects - factories
2. Targeted priority – rational use of energy and energy efficiency, substitution of electrical energy used for heating, more efficient energy production, reducing transmission and distribution losses of electricity and heat and efficient use of final energy.
3. Special priority - use of renewable energy sources and more efficient production technologies – use of biomass, small hydropower plants and hydropower multipurpose facilities, research and utilization of geothermal sources and use of solar energy for heating.

Energy Development Strategy in Serbia up to 2025 and the Program for implementing that strategy have given a great importance to renewable energy sources. Ratification of the Treaty establishing the Energy Community (Treaty between EU and the countries from South- East Europe) on July 14th 2006, the Republic of Serbia accepted, among other things, the obligation to implement directives aimed at increasing the use of renewable energy sources, that is Directive 2001/77/EC regarding promoting electricity production from renewable energy sources on the internal energy market and Directive 2003/30/EC promoting use of biofuel and other fuels from renewable energy sources in the sector of transport 89).

5. LEGISLATIVE, INSTITUTIONAL AND ORGANIZATIONAL FRAMEWORK FOR IMPLEMENTATION OF RENEWABLE ENERGY SOURCES IN SERBIA

Up till now, renewable energy sources have been said to be a great potential, but the fact is that only a few months ago the legal framework was completed for the use of that potential. Amendments to the Energy Law Act, as well as sub-legal acts, have entered into force, a model contract with privileged producers has been prepared and National Renewable Energy Action Plan is adopted. The aim of the state in this area, and also the international obligation to the Energy Community, is that Serbia should get 27 % of the final energy consumption from renewable sources by 2025. Achieving this goal will bring Serbia an investment of € 2 billion over the next seven years and additional 1,092 MW new facilities which are an important factor in increasing energy security of the state. National Action Plan exactly defines what are the capacities and what is the pace the goal should be met, and all that provides a predictable framework for investors, the framework they could not find in Serbia earlier (*Energy Law*). The basic objectives of the energy development of the Republic of Serbia are energy security, creating energy market and the functioning of the sector in accordance with the principles of sustainable development, while legal and institutional framework as well as possible directions of their development in the light of the activities of the Energy Community and the EU accession process should enable the achievements of these objectives. The development of legal norms in the field of energy in the Republic of Serbia, in accordance with international commitments, should move towards harmonization with EU regulations and the implementation of the goals and regulations of the European Union in practice. New legal framework in the field of energy, and at the same time in the field of renewable energy sources , was laid down by adopting the Energy Law (Official Gazette of RS, No. 57/11, 80/11, 84/04 and 93/12 revised), Chapter VI - Energy from renewable sources and incentives. National goals of the Republic of Serbia are defined in the field of renewable sources according to the energy needs, economic possibilities and the obligations the state has taken by ratifying international agreements. In order to promote the use of renewable energy sources, Energy Law stipulates the possibility that manufacturers who produce electricity or thermal energy from renewable energy sources can acquire the status of privileged producer of electric or thermal energy (Roggenkamp, 2008). For the privileged energy producers Energy Law has predicted subsidies, taxes, customs and other benefits in accordance with the Law and other regulations which define taxes, customs and other duties, subsidies and other incentives,

but has not created a legal framework for the introduction of an organized system of incentives for the production of electricity from renewable sources that exist all over Europe, such as Feed – in – tariff, but that will be possible by adopting additional amendments to the Energy Law.

6. CONCLUSION

Sustainable development is a harmonius relationship between environment and economy which preserves natural resources of our planet for future generations. It can be said that sustainable development is a general direction to create a better world balancing social, economic and environmental factors. The aim of national strategy of sustainable development of the Republic of Serbia is to balance three key factors of sustainable development: sustainable development of economy, sustainable development of the society and environmental protection through rational management of natural resources.

Interest in renewable energy sources has been growing during recent years. Humankind has become aware of problems of meeting energy needs in the near future, with an environmentally acceptable solution to offer renewable energy. Research and technology development make renewable energy more affordable today than ever before, while the cost of electricity produced from renewable resources are steadily declining.

Serbia has potential to produce nearly 4 Mten per year from the renewable energy sources and that energy potential can satisfy a quarter of annual needs in Srebia. However, although the Republic of Serbia has favourable conditions, the renewable sources are underused.

If Serbia does not take serious measures to secure sustainable development of energy sector, primarily in the form of optimizing the use of domestic renewable energy sources and economically effective use of energy, the energy potential in Serbia can be compromised to the extent that it will become a limiting factor to economic growth. One of the main goals of sustainable development of the Serbian Energy is promoting the use of available renewable energy sources, mainly biomass, solar and hydropower energy. A positive example is a innovation in the Energy Law which was introduced in the categories of privileged producers, who in the production of electricity using renewable sources of energy, where the law predicted preferential incentives for this producers, such as subsidies, tax, customs and other benefits. Plants to produce energy from renewable sources tend to be relatively small capacity, and thus the investment in individual plants also relatively small. Therefore, there is a real basis for the integration of domestic economy in the development of technology, research and production of equipment for the use of renewable energy sources.

RENFERECES

.

Djajic N., 2008. *Renewable sources - state and development in the Republic of Serbia*, the Group for renewables and energy efficiency, Serbian Chamber of Commerce, Belgrade.

Djurovic M., 2005. *Renewable energy - the current situation*. Electrical Engineering

Djukic P., 2011. *Sustainable development - a utopia or a chance to Serbia*. Faculty of Technology and metallurgy. Belgrade

Energy Law, Official Gazette of the Republic of Serbia no. 57/11, 80 /.

Jovanovic O., Stamenovic M., Petrovic J., imDic I., 2011. Possibilities of using renewable energy sources in Serbia. *Ecologica*.

Mihajlovic Z., 2006. *Renewable energy - the future, security or an obstacle*. Energy observer IX

Milanovic M., 2009. *Economics of natural resources*. Megatrend University. Belgrade

National Strategy for Sustainable Development, 2008. Official Gazette of the Republic of Serbia.

Petkovic N., 2000. *Environmental Management*, Faculty of Organizational Sciences, Belgrade

Roggenkamp, M. 2008. *Energy Law in Europe*, second edition, Oxford.

The National Energy Strategy of the Republic of Serbia for the period of the 2025th year of the projections of the 2030th year. 2013. Faculty of Mining and Geology. Balgrade.

4th International Symposium on Natural Resources Management
"Sustainable Development and Green Economy in Transition Countries"
31st May -1st June, 2014, Faculty of Management Zajecar, Republic of Serbia
www.fmz.edu.rs

STRATEGIC AIMS OF SUSTAINABLE DEVELOPMENT: UKRAINE, EUROPE, WORLD

Vasyl H. Gerasymchuk

National Technical University of Ukraine "Kyiv Polytechnic Institute",
Faculty of Management and Marketing, Department of International Economy
37, prospect Peremohy, NTUU "KPI", FMM, IED, ap. 244-1 03056 Kyiv UKRAINE
gerasymchuk.vh@i.ua, gerasimchuk@kpi.ua

ANNOTATION

Attention on trueness of basic factors of sustainable development is accented on a planet: ecological, social, economic. The processes of elimination are described by a man and economy of earthly bowels of the earth. Economic problems are analyzed from positions of competitiveness of personality, firm and country. The special role of leader, strategist in the decision of problems of sustainable development is marked. Measures offer on perfection of organizational mechanism of management by sustainable development in a chained: family – collective – region – state – world – noosphere. Experience of EU is analyzed, Ukraine in the decision of key tasks of sustainable development. Maintenance, structure and indexes of estimation of quality, is investigated. The basic factors of upgrading of life are considered: clean water, clean air, clean food, employment and terms of residence. Introduction of passport of habitant of planet offers Earth.

KEYWORDS

Ecology, economy, globalization, quality of life, social justice, strategy, sustainable development

1. INTRODUCTION

"Historia est testis temporum, luxveritatis, vita memoriae, magistra vitae, nuntia vetustatis (Lat.). –History is a witness of time, light of truth, life of memory, teacher of life, announcer of antiquity". What be going on changes are in society – from the UNO to family, take place due to the not so much persons, as, first of all, to personalities. Humanity every day all anymore disturb devastating processes what be going on our planet: from constantly nascent soldiery operations, varicolored revolutions to contamination of environment (water, air, foodstuffs). Embodiment in life of conception of sustainable development (Rio de Janeiro, 1992) depends on wisdom, mind, persuasions, boldness of ideas and actions of leaders: the Secretary General of the UNO, leaders of countries, governments, parties, religious concessions, TNK. For today economists are led away by the problems of increase of competitiveness – from a salary to WGP. Sociologists convince about priority of human factor. Environmentalists beat at the alarm of relatively irretrievable processes of elimination a man and economy of earthly bowels of the earth [1].

Numbers presumptive geological and geochemical activities of man are able to shock the sizes. Annually at mining from the bowels of the earth of Earth a to 100 milliard of ton of mountain breeds is extracted, the 800 million ton of different metals is smelted, the 500 million ton of mineral fertilizers is brought in soil, burned as a motor fuel and for the receipt of electric power about 3 milliards of ton of oil and oil products. Yet more an amount of the annually burned anthracite coal is 7, 3 milliards of ton (2011). The enormous volume of the burned fuel resulted in that for the last 30 maintenance of carbon dioxide in the atmosphere of our planet increased on 5%.

The amount of *poor* people continues to increase in the world. In these terms step by step the state and national systems pass to the peculiar. Privatizing of water, electricity, health protection, brings educations over to the economy growing, as accuses of businessmen grow. But she also results in impoverishment of people, compelling them in general complication to spend tremendous amounts of money on that must be accessible to all and each at moderate price. When all aspects of life grow into the source of commercial profit and commodity, life is expensive, and people – poorer.

Terms *ecology* and *economy* have general roots. Both they originate from the ancient Greek word ***οἶκος*** – dwelling, house, property, designating housekeeping. While there was housekeeping in the spotlight of economy, she acknowledged and respected his close connection with natural resources and borders of ecological renewal. Her main task was to provide people all necessity within the framework of these borders. A modern economy is separated and matched against both ecological processes and base needs of people. Today destruction, elimination of nature, proves to be correct a necessity to obtain the economy growing.

Meantime, the number of poor, losing to the property of people, continues raise. Besides that it conduces to instability, it yet and unfairly in economic sense. The dominating model of economic development became unnatural actually, "antiviral". When the level of development of economy is measured only by money streams, the rich become yet richer, and poor – yet poorer. Thus the rich are rich only in sense of money. The rich are poor in wider context that means to be a man. The necessities of modern model of economy result in uniting of wars for resources, petroleum and food wars.

In the conditions of modern development of civilization distinguish three levels of violence. The first level is this violence against nature that is expressed in form ecological crisis. Second is violence against people, the finding expression in poverty, poverty and evictions. The third level is wars and conflicts, during that influential subjects aim to get to the resources being on territory of other associations and countries, to satisfy the boundless, predatory, aggressive appetite. An obsession outshone the economy growing by itself our fears concerning viability, justice and human dignity [2].

In this connection sociology, ecology and economy are called both ideological and pragmatic to unite on principles of conception of sustainable development at all levels of management and management for creation of the proper terms for good and happiness of people. It is known that in strategy "Europe - 2020" three basic factors of strengthening of economy EU are set: a 1) reasonable height: the development of economy, based on knowledge and innovations; 2) strong growth: creation of the economy, based on the expedient use of resources, ecology and competition; 3) all-embracing height: promoting to the increase of level of employment of population, achievement of social and territorial consent.

Sustainable development is conception worries positions of that minds of many people. For example, Kyoto protocol is envisaging events in relation to maintenance of ozone layer. At the same time, to go out from protocol means both the USA and Canada. To arrange self-will above a planet she sees a fit, and the inflicted damage must bear responsibility for, but not wants. Not very worry for the fate of future generations of both country "G7" and country "G20".

Well-known collections under the aegis the UNO in Stockholm (Sweden, 1972), Rio de Janeiro (Brazil, 1992), Johannesburg (South Africa, 2002), accepted resolutions, legislative acts on national levels, numerous reports, strategies, plans, programs, projects, monographs, dissertations, articles, conferences, symposiums on sustainable development during the last four decades only is the next attempt of decision of eternal problem of civilization – how to save a planet Earth and to provide the proper quality of life of everybody, from positions of unity of triad of problems: ecological, social and economic. If to conduct speech yet more scale, then, eventually, the question is about existence of planet. The question is about existence on the planet of every living creature, every living cell, all representatives of the world of flora and fauna.

An attempt to understand a mission and having special purpose reference-points of strategy of sustainable development of the state taking into account the achievements of theoretical, methodological and practical character, accumulated both in Ukraine and in a world concord, comes in this publication true. Quite a bit unsolved problems in relation to forming and realization of management mechanism by sustainable development on a vertical line: family – society – productive collective – industry – region – state – world – noosphere.

In the mechanism of management by sustainable development researchers are important to pay attention to two key constituents: organizational and economic. We will do fundamental clarifications. In respect of economic constituent, then there always is the **system of interests** in her core. In default of such system, attaining a positive result is impossible. In case of imperfection of the system of motivations and a result will be partial, incomplete. There must be a **leader** in the core of organizational mechanism, as only at this condition, as well as in a previous constituent, it is possible to count on a result. History asserts that she is created by **Personalities**. We mean those charisma personalities that send activity of people to success. The result of their activity is always better, than for predecessors, better, than at competitive parties.

The aim of realizable research consists in deepening of theoretical and methodological principles, and also formulation of practical recommendations in relation to development and realization of effective

mechanism of management by of sustainable development at all levels of world concord. Among the basic tasks of research:

- to trace progress of humanity trends and understand primary causes of distribution of scornful, careless attitude toward Nature, to Air, to Water, to Flora and Fauna, to Bowels of the earth of planet, to Justice;
- to analyze, as far as strategies and programs of sustainable development are self-weighted formed on the different levels of management for the successful decision of triad of problems: social (moral, traditions, culture, education), ecological (water, air, forests, food), economic (capabilities, labor, industry (from light industry to space), export-import, competitiveness);
- to answer a question, what from indexes is on the top of pyramid of criteria of conception of sustainable development;
- to define whether it is correct to equate between concepts it is "needed" and "necessary" in the so-called "growing necessities" of population far to the not boundless planet Earth;
- stopped for the organizational constituent of management mechanism by strategies of sustainable development;
- to offer measures on perfection of the checking system, estimation of success of realization of intentions of world concord on steady of sustainable development.

2. FACTOR OF LEADERSHIP IN DECISION OF PROBLEMS OF SUSTAINABLE DEVELOPMENT

"Sapientia gubernator navis (Lat.). – Wisdom is a captain of ship". Memory – here that allows us to analyze study, summarize, communicate and peep in the future. An origin and development of the written language (from Ancient Egypt, China and India, Phoenicia and to Babylon, Greece and Rome to Cyril and Methodius) became the special phenomenon in history of humanity. The epitaphs of Ancient Egypt became the prominent monuments of history, clay tables Schumer, sacred books of the Indian Buddhists, Chinese Confucian and Taoists, Talmud of ancient Jewries, cult books of Iranian Zoroastrian, Bible of Christians and Koran of Muslims [3].

A man is a creator of history. His lives on a planet must be inherent: justice, honesty, decency, sympathy, intelligentsia et cetera, and others like that. People, the states arrived at the bloom, when war-lords, princes, kings, tsars, emperors, checks, presidents, secretary generals, society on the whole adhered to common to all mankind principles, set norms and rules of everyday behavior. The marked is fixed in basis 10 commandments for Christians, 12 principles of code of ethics of builder of communism and others like that. In basis all philosophical and dogmas is development of Man, thrifty attitude toward Nature. Present and coming generations must adhere to the principles of development of civilization stopped up a long ago. There are common to all mankind principles in most cases; however it is regrettable, however it badly, ignored. Indeed, exceptions happen from rules.

Success, victory is provided by a leader with the command, leaning against support of collective, people. A standard can serve as is Lee Kuan Yew (Singapore). Why Lee Kuan Yew? And it is a classic example that, if there is a strategist, there is strategy, there is a result and there is success. Something about Singapore: area (692,7 apt. kilometer) in 1,3 time less territory of city of Kyiv; a population is 4,4 million persons; GDP (PPP) per capita, from data of IMF after 2010, in Singapore made 57 238 $US (3th place in the world), in Ukraine are 6 665 $US (100th place). Singapore brings in everything: water and sand for building, oil, gas, metal, wood et cetera. Phenomenally, but during the small interval of historical time from one of the least after territory and poorest in the world countries Singapore grew into one of the most solvent states, entering the cohort of countries of the so-called "gold milliard". From the "third" world the state passed to the "first". Official languages: English, Chinese, Malay, Tamil.

One of key reforms in independent Singapore touched an elucidative sphere. Teaching is in universities – in English. If at the beginning of reforms of students from Singapore directed in the best universities of the world, presently – foreigners go to study to Singapore. Lee Kuan Yew – a leader that on a little island created the large state at one time made off Cambridge with a "double difference". He got two "red diplomas" – legally and to the economy. As a result of reforms Singapore became the country of electronics and exact instrument-making, production of optical instruments and lenses, aircraft construction and boring platforms for the booty of oil and gas, computer technique and shipbuilding, metallurgy and petro chemistry [4].

Made an example we want to mark that any strategy and most "pink" intentions have chances to succeed at presence of leader. The question of leadership touches the problem of sustainable development. The main idea of sustainable development consists in that the economy growing and increase of welfare of population must not be arrived at due to future generations and society. And here we must be shortly stopped for personality of Gro Harlem Brundtland [5].

Gro Harlem Brundtland is the Norwegian public and political figure, minister of environment of Norway in 1974-1979, prime minister of Norway during three terms in the interval of 1981-1996. In 1994 Brundtland awarded with bonus the name of Carl Large for a contribution to the association of Europe. In 1983 the Secretary General of the UNO invited Gro Harlem Brundtland and led the International commission of the UNO on an environment and development. A commission engaged in development of conception of sustainable development with bringing in of wide public.

In 1987 a commission published a lecture "Our common future" or "Lecture of Brundtland". A commission participated in realization of Summit of Earth in 1992, acceptance of the program of the UNO "Order-paper on the XXI century". In May of 1998 Brundtland selects the Director General of Worldwide organization of health protection (WOH). She founded Commission on Economics and health protection that was led by J. Sax. The British newspaper "The Financial Times" named Brundtland in the number of the most influential Europeans for the last 25. On May, 1 of 2007 Secretary general of the UNO Pan Gui Mun appointed Brundtland by the Special messenger of the Secretary General on issue of change of climate.

3. AIMS AND TASKS OF SUSTAINABLE DEVELOPMENT FROM POSITIONS OF COMMON TO ALL MANKIND VALUES

"Mundus vult decipi [ergo decipiatur] ((Lat.). – The World wants to be deceived [so let will be deceived]". The world of aims of steady development is approved in 1992 on conducted by in Rio de Janeiro of world to the conference of UNO for to the problems of environment and development. Then of was ratified world program of actions of on XXI of century to the in sphere of steady development to 2030 under the name of "Agenda-21". With of 1992 by world activity leads the in sphere of sustainable development of the same name of the commission of UNO. The commission of examines the different themes of within the framework of two year cycles of activity. On annual meeting the state of realization of the aims put in "Agenda-21" ("Notice of day on XXI of century") of and of Johannesburg by a plan is analyzed. On meeting of Commission new political directions are determined on world, regional and state levels. Strategies of or programs of sustainable development are accepted practically in most countries of the world, including in Russia, USA, countries of EU, Japan, China, India.

On Junes, 20-22 of 2012 in Rio de Janeiro again the world summit of the UNO will take place on sustainable development of "Rio+20". World leaders will gather with an aim: 1) to provide proceeding in political adherence of conception of sustainable development; 2) to estimate progress and educe blanks in execution already contracted, envisaged "Agenda – 21" and Johannesburg by a plan; 3) to work out new and nascent problems. Conference of the UNO of "Rio+20" concentrated on two key themes: a 1) "Green economy" in the context of steady development and eradication of poverty; 2) institutional backgrounds of steady development.

"Rio+20" must provide possibility of acceptance of measures and revival of global partnership with participation of governments, civil society and private sector - in interests the achievement of all-embracing and permanent development for all. Among suggestions for embodiment in life of basic idea of steady development, expounded in a lecture Pan Gui Mun (A/CONF.216/PC/7), following:

a) countries that are on the different levels of development carry out national strategies and programs that answer the tasks of ecologization of economy;

b) б) the all greater number of countries tries to conduct complex perfection of the national strategies and politics in area of development, including strategies of achievement of the "green" economy growing, on principles of "green economy";

c) of their combined actions while not enough in an order to change the models of production and consumption in scales proportionate with tasks;

d) sparing of primary attention to without the "risk" of loss possibilities that bring considerable concomitant benefits in a short-term prospect, can assist a confidence-building to conception of ecologization

of economy in the context of sustainable development, eradication of poverty and increase of corresponding support;

e) ability of countries as a result of the efforts on development of "green economy" to promote welfare of population quite often depends on support and increase of level of traditional social charges on a health protection, education and grant of having a special purpose material support to the poor layers of population;

f) in order that strategies of development of "green economy" brought positive results in a social sphere extremely necessary measures on perfection of corresponding institutes;

g) passing to the ecologization of economy in the context of sustainable development and eradication of poverty assumes not only structural reorganization of public organs that regulate an economy on different levels but also realization of technological transformations;

h) after critical Conference in Rio de Janeiro (1992) scope of institutional scopes of sustainable development broadened. Absence of co-ordination and co-ordination in-process did not allow to a full degree to involve all potential. The necessity of decision of this task came to a head a long ago [6].

4. EUROPEAN UNION IS IN DEVELOPMENT OF MORE CLEAN, MORE SAFE AND MORE HEALTHY SOCIETY

"Cognatus pauperi nullus (Lat.). – Nobody not [wants to be] by my folks to the cadger". Strategy of EU in area of steady development was approved in June of 2001. It registers in her, that economic, social and ecological steady development must come true in parallel, complementing each other. Sustainable development in EU envisages in a long-term prospect forming in countries EU societies of welfare and justice. Such vision creates possibilities for development of more clean, more safe and more healthy society. In the international ecological rating presented on the World economic forum in Davis (2006), in the first ten of environmentally clean countries 7 countries-members of EU are confessed: Sweden, Finland, Czech Republic, Great Britain, Austria, Denmark and Ireland. In March of 2010 new European strategy of economic development is accepted "Europe – 2020: strategy of reasonable, steady and all-embracing height".

European Commission offered five basic directions of activity, it is necessary that to follow to the European states: employment; researches and innovations; change of climate and power engineering specialist; education; fight against poverty. In EU necessary instruments are created for a management by a new economic order. This order will be supported by means of the internal market, budget, enterprise, foreign policy, and also by forces of Economic and Currency Union. Undoubtedly, a new economic course requires the concerted actions of states-members of EU. "Europe-2020" sets three basic factors of strengthening of economy: reasonable height (development of economy with support on knowledge and innovations); strong growth (creation of economy that is based on the expedient use of resources, ecology, competition); all-embracing height (assistance to the increase of level of employment of population, achievement of social and territorial consent).

On a period to 2020 EU puts before itself next primary objectives: 75% population in age from 20 64 to must be employed; 3% GDP of EU need to be invested in R&D; achievement of aims of power politics and politics concerning the change of climate, including 30%th decline of contamination of environment; the stake of students that gave up schools must not exceed 10%, and also no less than 40% young people must get higher education; reduction of number of people that are in a danger to appear after the line of poverty, on 20 millions.

The indicated primary objectives reflect the basic idea of reasonable, steady and all-embracing height. At the same time, they are not exhaustive. EU is put before itself by the large array of certain tasks during implementation of strategy of "Europe-2020". For mushroom growth and achievement of the put aims EU considers priority following 7 directions of activity: "Innovative Union"; "Motion of young People"; "Plan of development of digital technologies is in Europe";"Expedient use of resources is in Europe"; "Industrial politics sent to globalization"; "Plan on developing new flairs and increase of working seating capacity"; "European politics against poverty".

7 basic higher brought directions over of activity are priority both for EU and for each of states-members. Political, economic and social instruments of EU, especially internal market, financial leverages, the instruments of foreign policy will assist the removal of obstacles and achievement of aims of "Europe-2020" in every way. In the cut of strengthening of management an economy is envisage important attention to turn on 2 basic supports of "Europe-2020": decision of the above-mentioned thematic tasks, combining priorities and primary purposes; a help to the members of EU is in development of own strategies of development.

During realization of the second support development of single leading principles is envisaged to every direction of activity, direction of recommending the European states, application of corresponding events of influence in case of failure to observe by the state-member of EU of the accepted rules, preparation of reports relatively preparation of reports in relation to realization of strategy of "Europe-2020", estimation of efficiency of the use of norms of "Pact about stability and prosperity" [7].

Our attention to strategy of "Europe-2020" is attracted on absolutely clear considerations. Solidity of the theoretical and practical going near the decision of important world problems on the example of EU can serve as a standard for the acceptance of corresponding events at all levels of management in Ukraine.

OF STEADY DEVELOPMENT IS IN UKRAINE

"Lucrum unius est alterius damnum (Lat.). – Profit one is a loss for other". At consideration of this point we will avail, clear, by works of colleagues, that is specialized on a problem that is the object of our attention [8]. Strategy of sustainable development of Ukraine must come forward as a position paper of long-term action that is base on international principles of coexistence of humanity and environment. Priority direction of sustainable development is optimization of vital functions of humanity in the conditions of safe natural environment and harmonious relations in society. Thus an eternal problem is remained by the factor of between's by riches and poverty taking to account that on potential all people on a planet are identically talented. The role of the state consists, first of all, in that, to create terms for opening of capabilities, talents of every citizen, to erect to the reasonable minimum stratification of society. A higher post step must have, first of all, moral, but not without restriction material advantage.

The necessity of development of strategy of sustainable development of Ukraine is explained, firstly, by the row of important decisions within the framework of the UNO, secondly, by a critical situation that was folded in the state in connection with hasty, unbalanced exploitation of natural resources. For an example it is enough to bring Chernobyl over. The consequences of such "economic activity" continue negatively to influence on an environment that results in exhaustion of resource potential, height of charges on defense of population and territories, liquidation of consequences of emergencies and recreation of equilibrium in the wild. The size of penalties for contamination of environment in Ukraine does not go to no comparing to the economic and social losses of society. We on itself feel the consequences of the Chernobyl accident, since the height of oncologic diseases. The state not properly behaves to the sources of contamination of environment. Enriched – one, suffer – all other.

Among the basic sources of harming to ecology – enterprise mining, chemical, metallurgical, machine-building, fuel, power, building, cellulose, paper and agro industrial complexes. On the level of the use of water resources for the necessities of industry, agriculture and population, and also Ukraine occupies one of the first places the level of adjusting of river flow among the European countries.

Having an about 1 percent of agricultural lands of the world, Ukraine quickly loses the landed potential in connection with the making progress worsening of quality indexes of fertility of soil. As a result of decline of culture of agriculture from 0, 6 to 1 ton of humus is annually lost from every hectare of earth. After the level of technical interference with natural ecosystems an agrarian sector is on the first place in the world.

Ukraine continues to occupy an also leading place in the world after intensity of the use and exploitation of bowels of the earth. Through closing of mines and quarries the dangerous processes of hydraulic geology purchased development are floods, changes, chemical contamination of soils, underwater and others like that. Excessive elimination of the forests resulted in substantial changes in the structure of the forests, to worsening of the state of natural complexes, degradation of vegetable cover, to exhaustion of source of raw materials of the forest. The about 27 thousand and 45 thousand the types of animals types of plants are counted in Ukraine. However natural resources the objects of animal and vegetable kingdom belong to that have a steady tendency to exhaustion.

The objective process of downstream in the conditions of socio-economic transformation resulted in considerable stratification of population after the level of the real incomes and standard of living. A disturbance is caused by the decline of the expected life-span, emigration of the most dynamic groups of labor resources. The strategic **aim** of steady development in the state is an achievement of balanced of coexistence of natural environment, state and society on the basis of democratic, pluralism and ecologically oriented socio-economic politics, open economy, providing of national safety of the state, harmonious public relations and equal in rights international cooperation, integrated in global processes.

For providing of realization of strategic directions of sustainable development **monitoring** of efficiency of the carried out events is conducted on the basis of application of the system of indicators that includes the base reference-points of sustainable development. The system of indicators of sustainable development envisages possibility of their permanent perfection and development. The indicators of sustainable development give an opportunity to estimate a situation in economic, social and ecological spheres. So, economic development status is determined by means of next indexes: GDP calculating on the soul of population; index of industrial production; index of the internal combined real demand; index of gross consumption; index of the gross piling up of the fixed assets; a stake of extractive industry is in industrial production volumes; a stake of processing industry is in industrial production volumes; volume of the combined investments in the fixed assets; coefficient of intensity of updating of capital assets; volume of R&D; volume of direct foreign investments.

6. QUALITY OF LIFE: THEORY AND REALITIES

"Rem tene, verba sequentur (Lat.). – Grasp essence and words will be (Capture an object and words will be)". We will begin with realities. The places of Ukraine practically in all world rating are known. These results do not carry positive character. From data of experts, among 10 most unhappy countries of the world on a 10-ball scale in trinity of prizewinners: Bulgaria (2, 33), Ukraine (2, 44), Russia (2, 51). One of basic indexes of the world rating is Index of development of human potential (IDHP). He, as is generally known, three types of descriptions take into account: the expected life-span, level of literacy of population of country (2 indexes), standard of living (GDP per capita). In the rating of the UNO Ukraine occupied 78 (2014) place among 187 states of the world. Ukraine was passed in rating: Belarus and Russia, Antigua and Barbuda, Trinidad-Tobago, Libya, Kazakhstan, Costa Rica, Albania, Georgia, Bosnia and Herzegovina.

We will be stopped for the constituents of IDHP of Ukraine. The expected life-span is in Ukraine - 69, 0 year. Value of this index not on much exceeds a middle world level (67, 2 years). On this index we occupy a 124th place (2014). Presently in Ukraine life-span below as compared to 1965-1966 - 71, 6 year. The greatest indexes of life-span are in Japan - 83, 2 year. Life-span 80 and higher takes place in 23 countries, between 75 and 80 for years - in 29 countries, between 70 and 75 for years - in 44 countries.

On the level of GDP (PPP) per capita Ukraine, from data of the World bank (2013) occupies a 136th place among 169 countries with an index 3500 $US. In 1990 she occupied a 51th place, exceeding a middle world level on 11%. Presently on the average in the world the index of GDP (PPP) per capita is equal to 10631 $US, that there is more than in Ukraine time in 1, 6. Higher he in nearby countries: to Russia are 15258 $US, Belarus - 12926, Poland - 17803, Slovakia - 21658, Hungary - 17472, Romania - 12844, Turkey are 13359 $US. For period of 1990-2008 the index of world GDP grew on 190, 7%. In Ukraine he fell down to 74, 1%. World financial crisis of 2008-2009 did not result in considerable reduction of world GDP. In Ukraine he went down for a year on a record 15, 1% - to 62, 9% to 1990. In 2008 GDP of Ukraine was equal to 74, 1%, in 2009 - 62, 9% from the indexes of 1990. World GDP during 1990-2009 grew on 86, 7% [9].

For past two decades of independence practically all efforts of government and state were directed, first of all, on becoming and development of institutes of market economy. It came true in harm development of quality terms of life of population. Took place complete change of ideology in political life. The socially oriented priorities gave place to the pragmatic aspiring to the receipt of maximal profit. From positions of good sense upgrading of life must be examined as major priority of all levels of power, as common to all mankind idea. Certain everybody, every certain family, must priority become in society and state. The state must bear the responsibility both after family with high accosts and after family that does not live, and vegetates. Necessary purposeful operating under the increase of level of welfare of population, support of family, maternity and childhood, strengthening of health of population, his level of form, revival of morality and spirituality. Upgrading of life of population comes forward the integral index of success of such course.

Quality of life is investigation of affecting man of totality of factors: economic development; scientific and technical progress (foremost, in area of medicine); height of hygienically culture of population and educational level in general; removal of class and another a priori, uneconomic inequality. The height of life-span comes forward a necessary condition: increase of the productivity, efficiency of labor, and, on the whole, economic progress; height of level of education, advance of science in wide sense of word (capacity for educating, steady connections between generations, accumulation and processing of knowledge); social and gender equality; real right for a choice.

In scientific literature does not exist and cannot exist once for all the generally accepted determination of concept "Quality of life". At the same time, in the structure of great number of determinations it is possible to distinguish rich in **conten**t and **operational** to part [10]. Sense of concept opens up in rich in content part, and the method of the quantitative measuring of level of quality of life is specified in operation part. In rich in content part to all determinations speech goes about the measure of satisfaction of material, cultural and spiritual necessities of man. In detail to talk about the measure of satisfaction of any necessities, firstly, these necessities must exist; secondly, must be well-known base level of satisfaction of necessities; thirdly, there must be procedure of comparison of actual level of satisfaction of necessities with base in corresponding units. Procedures of comparison of actual level of satisfaction are specified in operation part of determination of concept "Quality of life" that are based on a subjective self-appraisal; 2) that are based on an external objective estimation.

We will consider determination of quality of life that is base on self-appraisal. So, WOH determines quality of life as perception by the people of the position in life depending on cultural features and system of values and in connection with their aims, expectations, standards, caring. WOH suggests to estimate quality of life on parameters: physical (tiredness, physical discomfort, dream and rest); psychological (self-appraisal, concentration, positive emotions, negative experiencing, thinking); degree of independence (everyday activity, capacity, dependence on medications and treatment); life is in society (everyday activity, social connections, friendly connections, public meaningfulness, professionalism); environment (accommodation and way of life, safety, leisure, availability of information); ecology (climate, muddiness, densely populated); spirituality and personal persuasions. The standard of living here is in a great deal determined by expectations of certain everybody, and also from the standards accepted in a microenvironment.

At determination of quality of life that is based on an external estimation, this phenomenon represents the measure of satisfaction of material, cultural and spiritual necessities of man, measureable competent and informed specialists on the set of objective indexes. Complex determination of quality of life includes both rich in content and operating-room of part. Clear that a concept "Quality of life" must to accord with a well-known slogan: "From each to abilities - each on necessities". We consider that in a concept "Quality of life" necessarily satisfaction of requirements must be taken into account in work, in development of personality and self-realization of the capabilities, but not only with "consumer" moods.

At consideration of one or other phenomena it is necessary to estimate them with the use of quality and quantitative criteria. It is expedient to use integral measuring devices also. For the quantitative comparative estimation of quality of life corresponding methodologies and measuring instruments are needed. Their use must open possibility to estimate both the level of subjective satisfaction quality by life and to have an objective picture on the row of indexes. The comparableness in space is needed, that it was possible correctly to compare the estimations carried out on this methodology in different countries and regions, and the comparableness is in time - for the study of dynamics of quality of life on the whole and in a cut on these countries and regions.

Methodology of estimation of quality of life on an integral index expects opening. Such universal methodology must satisfy to the next basic requirements: self-weighted in a theoretical ground; to own necessary legal status; availability for the practical use; to have the developed financial, organizational, informative organizational, informative, technological and technical providing; to lean in support the customers interested in her use at all levels of management and ménage. In respect of separate indexes of estimation of quality of life, then they are full enough expounded in original sources [11].

Totality of all well-known criteria of estimation of quality of life must lean against basic principles of conception of sustainable development, namely: firstly, humanity must give to development permanent and of long duration character taking into account the necessities of future generations; secondly, limitation in relation to exploitation of natural resources the techniques related to the modern level, to social organization, by the capacity of biosphere for updating; thirdly, it is necessary to create terms for satisfaction of elementary necessities (food, accommodation and others like that) of man, to give possibility to realize the talent, hopes each on happy, safe life; fourthly, it is necessary to put right the levers of inhibition of the relatively excessive use of currency-financial, material and power facilities taking into account ecological possibilities of planet; fifthly, sizes and growth of population rates must be subject to adjusting [12].

7. BASIC FACTORS OF UPGRADING OF LIFE

"Bene vertat quod agis! (Lat.) - Let it will be good that you do! (We wish successes with work!)".

7.1. Clean water. Water of bad quality is one of reasons of origin of gastric, cholecystitiss, illnesses of organs of breathing, stenocardia, heart attacks of myocardium and other illnesses ulcer. Clean water provides the resiliency of skin, normal metabolism, slender figure, irreproachable cerebration. For the normal vital functions of organism 30 malls of water are needed on 1 kg of body weight. During life a man drinks (and distinguishes) an approximately 75 ton of water on the average. Without a meal a man can live 2 months. Waterless he will not live 5 days.

Ukraine in quality of drinkable sources occupies a 95th place (from 122). In the first five, from data of UNESCO, is Finland, New Zeeland, Canada, Great Britain and Japan. 1 milliard of habitants of planet in general is not had access to safe water. In Ukraine water is a bit better, than in Haiti and Ethiopia. 80%% waters Ukrainians consume from superficial sources (from Dnepr and drink Dniester water 35 million persons), and 20% from underground. The huge amount of unrefined effluents, domestic and industrial wastes is thrown down in the rivers, pesticides, nitrates, nitrites, salts of heavy metals, are washed off by a rain etc. Almost in the 18 thousand settlements of Ukraine does not have an access to the quality drinking-water. Requirements to the drinking-water in countries EU in 28 times higher, than in Ukraine and it negatively influences on her quality. For the improvement of quality of drinking-water in Ukraine it is necessary to enter water scope Directive of EU and pass an act about complete abandonment from cleansers on the basis of phosphates.

7.2. Clean air. From data of WOH, every year over 2 million persons perish by reason of muddiness of air. A statistical analysis clearly set dependence between the level of contamination of air and diseases of overhead organs of breathing, heart failure, bronchitis, asthma, pneumonia. Swift development of industry and transport sphere results in that the substances thrown out in an atmosphere cannot anymore disperse, consequently, their concentration rises. Annually dirty air kills about 500 Ukrainians on every 1000 square kilometers, т. of e. 301 thousand persons all for a year Ukraine loses about 700 thousand habitants. The map of contaminations, first worked out by the National management on aeronautics and research of space the USA (NASA), testifies to it. A bad situation on the cleanness of air is folded also in China, India and Japan. In Russia an unsatisfactory ecological situation is in megalopolises, but she is much better, than for us on the whole. The cleanest places on a planet are Australia, Canada, Brazil and Greenland.

The dynamics of contamination of environment in Ukraine gets worse from year to year. From data of Government service of statistics, in 2011 the extras of harmful substances in an atmosphere made about 6, 8 million tons. 4, 4 million tons acted from the stationary sources of contamination, that there is a more index of 2010 on 5, 9%. Leadership on contamination is retained by Donetsk, Dnepropetrovsk and Luhansk to the area. The basic movable source of contamination of air in Ukraine is a motor transport (90% general volume of extras), less harm is brought by a productive technique (6, 8%), railway transport (2, 0%), aviation (0, 6%) and water-carriage (0, 3%).

On every habitant of country in 2011 there was a 4, 4 ton of extras of dioxide of carbon and 95, 7 kg of other harmful extras. A 335, 0 ton of dioxide of carbon and 7, 2 ton of other substances dropped on every square meter of territory of Ukraine. In the Donetsk area volumes of extras calculating on 1 apt. a kilometer was more in 7, 9 times, what on the average on a country. During 1992-2012 the very high and high level of contamination of atmospheric air was observed more than in 20 cities of Ukraine. For 20 Kyiv was moved to the last, 30th, step of rating of ecofriendlyness among the European capitals. The residents of Kiev force to breathe in more than 20 types of insalubrious admixtures (dioxide of sculpture, oxide of carbon, dioxide of nitrogen). Enterprises of Kyiv are in 2011 thrown out a 38, 8 ton of contaminants on 1 apt. kilometer that exceeded a middle index on a country in 5, 5 times. On the stake of large enterprises there are only 10% harmful extras in the capital, and almost 90% bring in cars that ride on low octane petrol.

7.3. Clean food. Over 70% all contaminations enter organism of man with foodstuffs. From 12 to 15% suckling products, fish and fish cookery, from 7 to 12% meat products do not answer the requirements of standards. From 1, 5 to 10% tests of food products contain heavy metals (Mercury, lead, cadmium, copper, zinc) in concentrations that exceed maximum possible. Principal reasons of unsatisfactory quality of the food products realized to the population in Ukraine it is been: demonopolization of food industry, increase of volumes of import, out-of-date material and technical base of enterprises of food industry and trade; low level of sanitary and productive culture; use of off-grade raw material and components; sharp weakening of control of quality of products.

Ukraine occupies 44th position among 105 countries in rating of The Economist Intelligence Unit after availability for a population and quality of food products (2012), getting 58, 4 point from 100. The basic indexes of Index of "confidence in a meal" were become: availability (charges of family on the consumption of food by comparison to other charges), presence (sufficient suggestion, consumption of food on the average on a day), quality and safety of products (observance of food standards). The greatest indexes are fixed in the USA (89, 5), Denmark (88, 1), Norway (88, 0), France (86, 8), Netherlands (86, 7). In ten of front-rank countries on this index entered are Austria, Switzerland, Canada, Finland and Germany.

7.4. Employment. Unemployment rate in Ukraine on the state on 01.01.2013 7, 4% made. In Ukraine on the state on 01.06.2013, from data of Government service of statistics, 501 thousand unemployed persons are officially registered. A most vacancy is in processing industries is about 13 thousand It testifies to development of sphere of material production status, about the state of industrial potential in the state. As a strategic reference-point of Ukraine is proclaim entering into EU, it is needed to remind that in European Union an unemployment rate remained at former level 10,9% - 26,4 million persons from that 19, 2 millions are in the countries of euro zone. On the whole world unemployment rate on prognoses WOL in 2013 can grow from 197 million to 225 million (from 6, 0% to 6, 9%). And unemployment to anything good in does not conduct the world.

7.5. Terms of residence. Middle salary of Ukrainian on 01.01.2014 made 304 euro. Stake of salary in the prime price of the Ukrainian commodities is at the level of 6%. In countries EU she arrives at 45%. The o'clock of work in countries EU costs 23 euro on the average. It in 16 times higher, than the Ukrainian worker earns. To purchase an apartment by an area in 75 sq. m the habitant of Kyiv is necessary to work 20 about, not carrying out other charges here. A foreign passport has approximately 30% population. 2/3 Ukrainians are compared the standard of living with the habitant of EU only through mass medias. It is known that better than one times to see the world, what 100 times to hear from someone. Analysis testifies to the presence to the permanent tendency to reduction: general volumes of passenger transportations (2009 to the level of 1995 - 75, 8%).

8. CONCLUSIONS

"Feci quod potui, [faciant meliora potentes] (Lat.). - I did [all], that able, [let those, who can, do better]". Conception of sustainable development needs to be examined both from positions of contemporaneity, corresponding decisions at the level of the UNO for the last decades (from Stockholm, 1972 to Rio de Janeiro, 2012) and taking into account the evolution of looks of philosophers, sages on development of civilization. A presence of leader is fundamental principle of development world, national and other level of strategies or programs of sustainable development. There is a necessity of perfection of organizational mechanism of management by sustainable development in a chain let: family - society - productive collective – industry - region - state - a world concord - noosphere.

The problem of steady development closely interlaces with a structure and maintenance of concept "Quality of life". A primary role in the estimation of the state and dynamics of sustainable development must be taken to Index of development of human potential (IDHP), first of all, - to the expected life-span of man.

The special attention is deserved by a management problem by the process of sustainable development from permanent clarification of the system of aims to control and responsibility after their achievement. Coming from the pointed analysis of practical realization of conception of steady development, we suggest to enter except a passport a citizen one or another from 194 independent countries (within the framework of the UNO) yet and passport of habitant of planet Earth. In a passport it is expedient to bring in all "just" businesses and perfect "sins", that it was possible to estimate a contribution to steady development all and personally each on our planet. It is impossible to be glad to the permanent increase of number of millionaires and multimillionaires due to the increase of number poor, hungry and homeless, due to thoughtless elimination all living and lifeless on our planet.

REFERENCES

Report of the World Commission on Environment and Development: Our Common Future.
URL: http://www.un-documents.net/our-common-future. pdf.

Shiva, V., As an economy growing destroys life ("The Guardian", Great Britain): http: //unichtozhaet- zhizn-the-guardian-velikobritaniya.htm

Baliazin, V., (2006), *Wisdom of millenniums. Encyclopaedia,* Moscow: "Krasnij proletarij.

From the third world in the first. Singaporean history: 1965-2000. Memoirs of Lee Kuan Yew, Tom 2, (2011), Kyiv: publishing House of Oleksij Kapusty.

Harlem Brundtland, Gro: http://ru.wikipedia.org/ wiki/

Lecture Pan Gui Mun 22.12.2010 (A/CONF.216/PC/7): http://www.unepcom.ru/development/rio20m.html.

New European strategy "Europe–2020": http: //eulaw.ru/content/307

Strategy of sustainable development of Ukraine (Project):http://ecolabel. org.ua/index.php?id=253

Ukraine and top-20: http://fpsuorg.ua/index.php?option=article&id=5669&Itemid=uk

Tkachev, A.N., (2009). Quality of life of population as integral criterion of estimation to efficiency of activity of regional administration, *Stavropol: Kuban state agrarian university.*

Ajvazian, S.A., (2001), Analysis of integral categories of quality of life population, *Moscow: CEMI.*

Sustainable development. Material is from Wikipedia: http://uk.wikipedia.org/wiki/

4th International Symposium on Natural Resources Management
"Sustainable Development and Green Economy in Transition Countries"
31st May -1st June, 2014, Faculty of Management Zajecar, Republic of Serbia
www.fmz.edu.rs

СЪСТОЯНИЕ НА ПРИРОДНАТА СРЕДА В РАЙОНИТЕ НА ЛИКВИДИРАНИ ПОДЗЕМНИ РУДНИЦИ

проф. д-р инж. Венцислав Иванов[1]

[1]Чуждестранен член на АИН на Сърбия, МГУ „Св. Иван Рилски", София, България; ivanoven20@gmail.com

РЕЗЮМЕ

В статията са описани основните геомеханични фактори и методология за определянето им и оценка на въздействието им върху качеството на природната среда в районите на подземна експлоатация на находища на минерални суровини. Специално внимание е отделено на състоянието на системата Вместващ масив/Добивни участъци, след ликвидацията на подземния рудник. Показани са примери за практическо приложение на методологията в разнообразни условия.

1. УВОД

В публичното пространство, в последно време, тече дискусия относно последиците от транспонирането на евродирективите , регулиращи въздействието на минната промишленост върху околната среда, в законодателството на България.

В контекста на дискусията, в сянка остава един проблем от съществена важност. Това е проблема за състоянието на природната среда в районите на ликвидираните подземни рудници.

В периода 1978 – 2002 г. в България са ликвидирани 129 подземни рудници. Ликвидацията им е на база изчерпване на запаси или по обобщени геоложки и/или икономически критерии. Самата ликвидация е правена въз основа на инструкции (Инструкция за техническа ликвидация, консервация, рекултивация, пречистване на води и мониторинг на минни обекти, съгласно ПМС 140/1992 г. и последвалите го изменения и допълнения; Инструкция за техническа ликвидация, консеврация и отстраняване на вредните последствия върху околната среда във въгледобива, 2001; Инструкция за опазване на съоръженията и обектите от вредното влияние на подземните минни работи за условията на рудните находища, 1989.), съдържащи указания за нейното техническо изпълнение. В инструкциите няма изисквания за предхождаща геомеханична оценка на състоянието на масива и устойчивостта на системата Вместващ Масив/Иззети Пространства (ВМ/ИП). Указанията, съдържащи се в инструкциите, се изразяват главно в начини за ликвидиране възможностите за достъп до добивните пространства.

Важно е да се отбележи, че често минната промишленост засяга райони с гъсто население, урбанизация и/или курортни и туристически зони. За оценка на вредните въздействия на минната промишленост обикновено се дават данни за размерите на нарушените терени и моментни характеристики на екологически рискови фактори, като санитарни данни застрашаващи човешкото здраве, биологичното разнообразие и замърсяване на водите, почвите или растителността.

Към началото на новия век, нарушените от минно-добивния отрасъл терени се оценяват на 25000 ha от територията на страната. Съществена част от площта на тези увреждания идва от ликвидираните рудници за подземен добив на полезни изкопаеми (Инструкция за опазване на съоръженията и обектите от вредното влияние на подземните минни работи за условията на рудните находища, 1989.).

2. ВЪВЕДЕНИЕ В ПРОБЛЕМА

Един най-общ анализ на практиката на подземния добив показва, че за изкопаването на 1000 t руда, в скалния масив се прокарват 120 m^3 подготвителни и капитални изработки; 100 m^3 добивни пространства и 350 m^3 се разуплътняват, движат и обрушават около добивните пространства.

Територията на страната е в активна орогенна зона, геоложката й среда е със сложен тектонски строеж и съдържа зони на сеизмична активност и има разчленен релеф. Тези дадености, при експлоатацията на минерални суровини резултират в сложни минно-технически условия.

Иззетите пространства, наред с останалите технологични операции, нарушават равновесието на естественото напрегнато състояние на вместващия масив.

В него се развиват процеси на преразпределение на напреженията и възниква индуцирано от минните работи поле. Около контурите на иззетите пространства възникват локални концентрации или разтоварвания. Системата ВМ/ИП губи равновесие и в зоните на концентрация и/или разтоварване настъпват разрушения от превишаване на якост или от придвижвания на разуплътнени блокове. Отначало сработват участъците, съдържащи нарушения от нисък и среден ранг, впоследствие в процеса се въвличат нарастващи обеми повлиян масив, зоните на загуба на устойчивост се развиват и вместващите скали се преместват и движат към иззетите пространства. Видът и интензитетът на тези процеси е в пряка зависимост от параметрите на индуцираното поле; строежа , свойствата и нарушенията на масива; размерите, конфигурацията и дълбочината на разположение на иззетите пространства и времето им на формиране. В редица случаи, горните процеси се развиват до повърхността, под формата на мулди, разкъсвания и пропадания, като показаните на фиг.1.

Фиг. 1. Нарушени зони от земния релеф над ликвидирани подземни рудници, описани в текста. Вляво – до международен път, в дясно – до Черноморското крайбрежие.

При ликвидация и изоставянето на подземния рудник, описаните геомеханични явления не се прекратяват. И ако, в периода на експлоатацията на рудника, е било възможно прилагане на инженерни методи за предотвратяване или минимизиране на развитието на опасни геомеханични процеси, застрашаващи равновесието на системата ВМ/ИП, то след ликвидацията това е невъзможно.

Върху съществуващото при ликвидацията напрегнато-деформирано състояние (НДС) на системата се наслагват още влиянията на: темповете и начините на техническата ликвидация и последиците им във времето (липсва водоотлив и поддържане на изработките); нарушеният режим на плитко- и дълбоко циркулиращите подземни води, които се дренират и акумулират в празните пространства и силно снижават тангенциалната якост, на съдържащия нарушения масив. Планетарни явления като сеизмичност, тектонски процеси и климатични явления, също оказват своето влияние.

Изложеното означава, че ако, през времето на действие на рудника той може да бъде разглеждан като сложна геоинженерна система (Турчанинов, 1989.), то след изоставянето му се превръща в природно-техногенна такава.

Във всички случаи, ширещата се практика влиянието на подземния добив върху околната среда да се оценява и отъждествява, преимуществено с размерите и състоянието на увредения терен, от гледна точка на геомеханиката е непълно и непрофесионално.

Последствията от подземния добив, мащабите му на въздействие върху екосистемите, прогнозирането на опасността от техногенни или екологични инциденти и / или катастрофи е невъзможно, без да бъде оценено геомеханичното състояние на системата ВМ/ИП. Максимално ефективният и надежден метод на техническа рекултивация на района, над ликвидиран подземен рудник, може да бъде обоснован единствено на база на геомеханичната оценка на същата тази система.

Всичко изложено означава, че проблемът за последиците от подземното минно производство преди да стане екологичен, икономически, социален, или какъвто и да е друг, е фундаментално геомеханичен.

3. ИЗХОДНА ПОСТАНОВКА

Целта на публикацията е да представи една методология за оценка на геомеханичното състояние на системата ВМ/ИП вследствие експлоатацията и след ликвидация на подземния рудник. Да се покажат възможностите на методологията, за логистика на инженерни решения за съхраняване и/или подобряване качеството на природната среда, по време и след прекратяването на добивната дейност.

НДС на системата ВМ/ИП по принцип се обуславя от взаимодействието на три групи фактори:

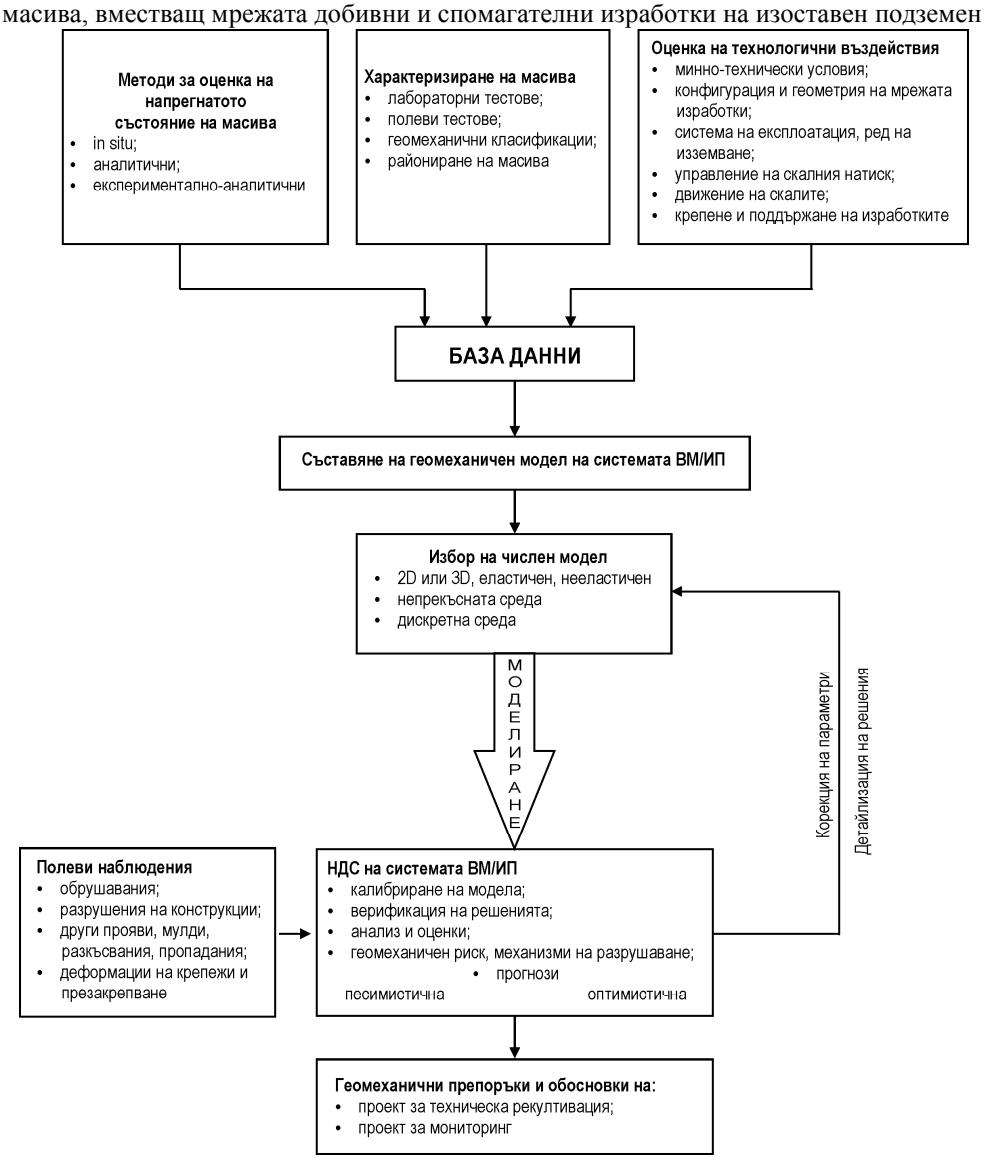
- Естественото и индуцираното от експлоатацията напрегнато състояние на масива;
- Строежа и свойствата на изграждащите го скали и съдържащите се в тях нарушения;
- Ефектите от технологичните процеси и мрежата подземни изработки с геометричните си и пространствени характеристики, нарушаващи масива.

НДС на системата ВМ/ИП на изоставен подземен рудник може да се характеризира със следните особености:

- Напрегнато деформираното състояние на системата и развиващите се в нея процеси се определят от неконтролируеми и неуправляеми вътрешни и външни за нея фактори;
- Изучаваната система е недостъпна за инструментални изследвания, чрез които да се получи актуална информация за фактическото й състояние;
- Реализирани са безспорни явления, изразяващи се в различни увреждания на терена – мулди, разкъсвания, обрушовки и пропадания на части от него;
- Наличие на геоложка, хидрогеоложка, маркшайдерска и технологична документация, с различни нива на информативност и актуалност за състоянието на рудника, по време на експлоатацията му;
- Несистемни и недостатъчни по обем данни от лабораторни изследвания на физико-механическите свойства на скалите и структурните характеристики на вместващия масив;
- Отсъствие или незначителни обеми in situ резултати, за измервания на напрегнатото състояние или измерване на процесите на деформиране и движение на скалите, съпътстващи добивните операции.

Очертаната специфика, предпоставя като най-подходящи за изследване и оценка на геомеханичното състояние на системата ВМ/ИП, след закриване на подземния рудник, методите на моделиране (Трубецкой, 1997.) и специално (Board, 2001.) методите за числено моделиране.

При прилагане на числен метод за изследване, оценка и прогнозиране развитието на геомеханичното състояние на горната система се налага численото изследване да се съчетае с други, добре развити в механиката на скалите, методи за характеризиране състоянието на масива. На фиг. 2 е показана блок-схема на набор от методи и тяхната последователност на използване при изследване на НДС на масива, вместващ мрежата добивни и спомагателни изработки на изоставен подземен рудник.



Фиг.2. Методология на геомеханична оценка на системата ВМ/ИП на ликвидиран подземен рудник

4. ОПИСАНИЕ НА МЕТОДОЛОГИЯТА

Оценка на напрегнато състояние: Характеристиките на естественото поле на напрежения са ключов фактор при определянето на НДС на масива. Численото моделиране също изисква предварително познаване на природното напрегнато състояние на вместващия масив. Магнитудите и ориентацията,

както и генотипа на полетата на напрежения може да се определят чрез инструментални измервания, по аналитичен път или чрез комбинация от тях. (Board, 2001.; Марков, 1987.). Най-перспективни (но и трудопоглъщащи и скъпи) са методите за in situ измервания (Марков, 1987.). В зависимост от механичните характеристики на масива се прилагат методите от клас деформационни* (разтоварване, разлика в наляганията, фотоеластициметри), или клас структурни (метод на хидроразкъсване), или клас геофизични (сеизмоакустични, сеизмологични).

При отсъствие на in situ измервания за оценка на параметрите на естественото поле, могат с успех да се ползват комбинация от експертно-аналитични подходи (реконструкции по тектонофизични, геоложки и сеизмологични данни, ядкови изследвания, (Core logging; Bienjavski, 1989.), изклиняване на проучвателни сондажи, движения на земната кора и др. (Марков, 1987.).

Характеризация на скалния масив: НДС и механичните процеси в модела се описват с параметри на състоянието. От тях, с първостепенна важност са физикомеханическите свойства (ФМС) на изграждащите масива скали. Използват се две групи параметри. Първите са ФМС на ненарушените скали, определени при едноосови и триосови лабораторни тестове (The complete ISRM, 2007.). Вторите се получават при изпитвания в естествени условия (Турчанинов, 1978.; The complete ISRM, 2007.) или чрез използването на многопараметровите геомеханични класификации за характеризиране на структурните свойства на масива (Hoek, 2001.). За получаване на интегралните характеристики на реалните свойства на масива, съдържащ нарушения, е натрупан голям практически опит от прилагане на класификациите на Barton (1980.) и Bienjawski (1989). Установено е, че чрез RMR и Q, както и производните системи MRMR, MBR, RSR (Hoek, 2001.) се получават достатъчно пълни и надеждни оценки на качеството и геомеханичния статус на вместващия масив и полезното изкопаемо.

На тази основа могат да се построят опростени карти по изменчивост на свойствата и "качеството" на масива, както и да се извърши районирането му по различни признаци (опасност, устойчивост, геомеханичен риск (Board, 2001.) и др. От тези изследвания се определя и критерият на разрушаване, и се идентифицират механизмите на разрушаване, с което числеият модел да бъде захранен с адекватни входни параметри.

Ефекти от технологичните въздействия: Нарушаването на естественото напрегнато състояние и възникването на индуцирано поле на напрежения на масива зависят от прилаганата технология, мащаба на добивните работи и мрежата добивни и спомагателни изработки. Разпределението на допълнителното поле в най-голяма степен зависи от размерите, конфигурацията и пространственото разположение на мрежата, както и ориентацията й спрямо компонентите на естественото поле на напрежения. Редът на изземване, последователността на развитие на мрежата, степента на извличане, начина на управление на скалния натиск са базова информация за успешното моделиране на технологичните въздействия при установените дадености и ограничения, маркирани по-горе, за анализа на НДС на системата ВМ/ИП.

База данни: Информационното осигуряване на численото изследване изисква структурирането на многомерна база данни (БД) от различен формат. Базата данни трябва да съдържа:

- Данни за якостно-деформационни свойства на представените литоложки разновидности от лабораторни изпитвания;
- Обобщени характеристики (RQD, RMR, Q, GSI, хидравлични радиуси и т. н.) за всички основни видове скали, изграждащи масива;
- Резултати от in situ измервания (напрежения, деформации, движения) на скалите;
- Размери, време и последователност на формиране и разположение на мрежата изработки;
- Минно-технически характеристики, хидрогеоложки условия, главни тектонски нарушения и нарушеност на масива с техните характеристики, коефициент на извличане, отнесен към геометрията на иззетите пространства и др.;
- Информация, която не може да се квантифицира, но е изключително полезна при анализите и калибрирането на модела като: обрушаване, разрушаване на целици, крепене, запълване, вид на залежа, химически състав на подземните води, характерни случаи на загуба на устойчивост, визуални наблюдения, дискувания, отслоявания, люспене, подуване и т.н.

Числено моделиране: Съществуват и са достъпни добре разработени числени модели за 2D и 3D анализ на НДС на вместващия масив и взаимодействащите с него подземни конструкции. Най-общо

* В статията е възприета класификацията на методите, дадена в (Турчанинов, 1989.)

те се делят на две базови групи (Board, 2001.). Първите приемат масива за еластичен (разрушаващите товари не са лимитирани) и концентрациите на напрежения зависят от коефициента на извличане и геометрията на добивните изработки. Втората група числени модели са базирани на възможността на скалите да се разрушават и товарът да се пренесе на околния масив. Изборът на модела зависи от целите на изследването, като симулирането на етапите и реда на изземване може да се извърши в еластична или нееластична, непрекъсната или дискретна среда.

В случая, при оценка на изоставени рудници, детайлните анализи по понятни причини са неосъществими. Това предпоставя успешното прилагане на еластични модели (МКЕ, МГЕ, МГИУ) за едно приблизително хронологично моделиране на технологичните въздействия.

Верификацията и калибрирането на модела се прави чрез сравняване на получените решения с резултати от наблюдения на характерни случаи на разрушения от БД, като се използват елементи на обратния анализ (Board, 2001.). Същият подход се използва при калибрирането на модела, за корекция или стесняване диапазона на входните данни, захранващи модела. Когато се достигне ситуация, чрез моделирането да се разграничават участъците с по-интензивен добив и се прогнозира загуба на устойчивост и разрушения, които съвпадат с реализирани събития се приема, че необходимата адекватност и достоверност на числения модел е достигната (Board, 2001.; Board et al., 2005.). Проверката на адекватност може да наложи детайлизация на отделни решения или смяна на модела.

Решенията позволяват обща оценка на влиянието на добивните операции, при установените характеристики на напрегнатото състояние и свойствата на масива. Това е достатъчно за да се определят реакциите на масива, да се изявят рисковите геомеханични фактори и да се прогнозира тяхното развитие при оценката на НДС на системата ВМ/ИП.

След анализ на резултатите от моделирането, оценката на НДС на системата ВМ/ИП след ликвидацията, се съставя прогноза за вероятното развитие на геомеханичната обстановка в района на рудника. Прогнозата е в диапазон оптимистична/песимистична (максимален/минимален геомеханичен риск) и се оценява нивото на устойчивост. За анализа могат да се приложат подходящи за целта критерии (по напрежение, по индекс на опасност от обрушаване, по сеизмичност или по натрупана деформационна енергия). Получената прогноза служи за геомеханичната обосновка на инженерния проект за техническа рекултивация и на проекта за мониторинг, след изпълнението й.

5. ПРАКТИЧЕСКИ ПРИЛОЖЕНИЯ

Описаните методологични подходи, както и отделните им елементи за оценка на НДС на системата ВМ/ИП са прилагани за геомеханични анализи на състоянието на масива при закрити рудници в България.

Изследвана е геомеханичната обстановка в находища I, II и III (Сеславци) на Буховското рудно поле. Избрана е комбинация от методи и са установени основните рискови фактори, определящи загубата на устойчивост на системата (Ivanov, 1996). Прогнозирано е развитие на разкъсванията на терена и над руднични полета I и II с локализация на местата на вероятните им прояви (Иванов, 2007). Препоръчани са мерки за обезопасяване на рисковите зони. Впоследствие прогнозата е верифицирана и потвърдена, след което е изготвен проект с геомеханични решения за възстановяване на естетическия вид на терените в района (Иванов, 2007.).

Методологията е приложена за геомеханична оценка на влиянието на подземните минни работи върху земния релеф (Ivanov, 2001.) след което е извършено параметрично изследване чрез числено моделиране (Vassilev, Ivanov, 2001.). Изготвен е проект за геомониторинг чрез подземни и надземни измервателни станции (Иванов , Василев, 1996.).

През 2005 г. е извършена геомеханична оценка на състоянието на масива в района на закрития рудник “Росен” (Бургаски медни мини” ЕАД) (Иванов, 1996.). Оценено е НДС на масива, идентифицирани са механизмите на разрушаване, определено е влиянието на тектонските компоненти на полето на напрежение и е прогнозирано нивото на устойчивост на системата ВМ/ИП. Дадена е обосновка на адекватен на геомеханичната обстановка метод за техническа рекултивация и са определени изискванията към проекта за мониторинг.

Над добивните участъци на закрит подземен рудник „Пропада“ на Малкотърновското рудно поле са възникнали мощни разкъсвания на терена в близост до които преминава трасето на международен път за Истанбул. Методиката е приложена в пълния си обем, определени са основни рискови фактори, оценено е влиянието им върху геомеханичната устойчивост и са дадени решения за ограничаване развитието на пропаданията и минимизиране на влиянието им върху строящия се път (Иванов, 2008).

В периода 2007 – 2009 г. в някои от ликвидираните рудници на Маданското рудно поле е планирано допълнително изземване на запаси руда, неиззети до ликвидацията. В случаят са решавани два вида проблеми. За изземването на запасите в околошахтовия целик на рудник „Димов дол“, след проведени изследвания по описаната методология е съставен проект за разработването им чрез система с втвърдяващо се запълнение (Иванов, 2008). Във вторият случаи методологията е приложена в условията на рудници с висок рисков потенциал за скални удари (Szwedsky, 2008.). Резултатите от изследванията на основните рискови фактори за индуцирана от минни работи сеизмичност и определението на потенциала на системата ВМ/ИП към внезапни, неконтролируеми разрушавания на масива. Дадени са технологични решения за превенция и/или минимизирането на технологични инциденти в зависимост от интензивността на експлоатация по метода Stress path (Hoek, 2001.; (Szwedsky, 2008.).

Последно приложение на описаната методология е за оценка на състоянието на нарушени терени над участъците Ленко 1 и 2, Надежда и Труд от рудник Върли бряг във връзка с разширение на промишлена зона около град Бургас. Резултатите от изследванията на системите ВМ/ИП са послужили за проект за техническа рекултивация на увредените терени (Иванов, 2011).

6. ЗАКЛЮЧЕНИЕ

Предложен е и описано приложението на подход за специфично използване на възможностите на методите на приложната геомеханика за оценка на НДС на скалния масив, вместващ добивните участъци след ликвидация на един подземен рудник.

Въз основа на проучен чужд и собствен опит е създадена оптимална комбинация от лабораторни и in situ методи за определяне на свойствата, напрегнатото състояние и ефектите от технологичните въздействия върху масива, вследствие експлоатацията. Описаните методи дават възможност за избор,захранване с входни данни и впоследствие използване на съвременни числени модели за анализ и прогнозиране н а геомеханичните явления и процеси, развиващи се в скалния масив след ликвидацията на рудника. Тази методология, освен че е единствено възможна, притежава предимството, че е отворена т. е., успешно може да бъде съчетавана с методи, даващи нови възможности за повишаване на надеждността и адекватността на численото изследване. Описаната методология като цяло, както и отделните подходи за оценка на напрегнатото състояние, характеризацията на масива и симулирането на технологичните въздействия; както и верификацията на оценките, е прилагана успешно за анализ на геомеханичната обстановка в района на закрити подземни рудници. Има още едно обстоятелство, което е много важно. Числените модели на пазара стават все по-добри и достъпни, а развитието на база данни от описания по-горе тип, почти липсва в нашите минни предприятия. Това е сериозен проблем, преодолим в известна степен, с методите на приложната геомеханика, дадени по-горе. Актуалността на проблема за страната е несъмнена, при множеството ликвидирани, след преструктурирането на отрасъла, подземни рудници.

ЛИТЕРАТУРА

Инструкция за техническа ликвидация, консервация, рекултивация, пречистване на води и мониторинг на минни обекти, съгласно ПМС 140/1992 г. и последвалите го изменения и допълнения. София, март 2004 г.

Инструкция за техническа ликвидация, консеврация и отстраняване на вредните последствия върху околната среда във въгледобива. 2001.

Инструкция за опазване на съоръженията и обектите от вредното влияние на подземните минни работи за условията на рудните находища. 1989.

Турчанинов И. А., 1989. Основы механики горных пород, Недра.

Трубецкой К. Н., 1997. Горные науки освоение и сохранение недр земли.

Board, M et al., 2001. Use of numerical modeling for mine design and evaluation. Processing 16th Quebec Mining Collogue in Underground mining, Quebec.

Марков Г. А., 1987. Тектонические напряжении и горное давление в рудниках Хибинского масива, Л., Наука.

Herget G., 1982. Stresses in Rock. A A Balkema.

Турчанинов И. А., 1978. Тектонические напряжении в земной коре и устойчивость горных выработок. Л., Наука.

The complete ISRM, 2007. Suggested methods for Rock characterization, testing and monitoring: 1974-2006, Ankara, Turkey.

Hoek E., 2001. Rock Engineering.

Bienjavski Z. T., 1989. Engineering Rock mass classifications. NY Wiley.

Barton et al., 1980. Aplication of the Q-sistem in design decisions. NY Pergamon.

Board, M et al., 2005. Use of numerical modeling for safe and cost-effective mine design, stability assessment and support dimensioning. *Processings of the International seminar ECOMINING – EUROPE IN 21ST CENTURY*.

Ivanov V., 2006. Geomechanical assessment of the stability and failure Processes of Rock massif during underground mining. *Processings, IV International Symposium in the field of Mining*, Ohrid, FYROM.

Ivanov V., 1996. Geomechanical prognosis of the state of the massif in an abandoned underground mine from Enviromental Protection point of view. *International Conference Mining and Enviromental Engineering, Proceedings*, Beograd.

Иванов В., 2007. Геомеханична оценка на устойчивостта на масива в района на ликвидиран подземен рудник „Сеславци“ на Буховското рудно поле. *Годишник на МГУ „Св. Иван Рилски“*, т.50, ч. II.

Ivanov V., V. Vassilev., 2001. Influence of underground mining activity on the earth rebill. *Proc. MEP`01*, Belgrade.

Vassilev V., V. Ivanov, 2001. Numerical modeling of the stress state and the stability of the system host rock mass / extraction workings of the underground Chelopech cooper mine, RINT, Priedor, SRB.

Иванов В., В. Василев, 1996. Анализ на НДС и устойчивостта на масива. НИ отчет, договор № 6/1996, архив СД Геомарк, София.

Иванов В., 2006. Геомеханична оценка на масива след закриване на рудник “Росен”, Бургаски медни мини. *Годишник МГУ “Св. Иван Рилски*”, т. 49.

Иванов В., 2008. Геомеханична оценка на участък „Пропада“, рудник Малко Търново, Бургаски медни мини ЕАД. *Годишник на МГУ*, т.51, ч. II.

Szwedsky T., 2008. Precursors to Rock Mass Failure in Underground Mines. *Austr. Min Sci*, Vol. 53, 2008.

Иванов В., 2011. Геомеханична оценка на увредени от експлоатация участъци от масива в района на рудник Върли бряг. *Годишник на МГУ “Св. Иван Рилски”*, т. 54, ч. II.

4th International Symposium on Natural Resources Management
"Sustainable Development and Green Economy in Transition Countries"
31st May -1st June, 2014, Faculty of Management Zajecar, Republic of Serbia
www.fmz.edu.rs

LIFELONG LEARNING FOR SUSTAINABLE DEVELOPMENT IN SERBIA

Violeta Jovanović[1],
Jane Paunković[1]

[1]*Faculty of Management Zajecar, violeta.jovanovic@fmz.edu.rs*

ABSTRACT

Modern society is characterized by a range of economic, technological, social and environmental changes. All these changes require a rapid transition of society to "Knowledge society". Also, business requirements in modern society include education for new professions, new skills. Social development conditions the emergence of the concept of "lifelong learning" in which the learning activity takes place throughout whole life. Lifelong learning as a basic educational principle and " the key to 21st century ", should respond to the challenges of the modern world that is changing in order to facilitate individual's recognition and acceptance of the changes taking place in modern society. In Serbia very little attention is paid to the concept of lifelong learning, and the beginnings of this concept are mainly related to universities and colleges. The paper will point to the importance of life-long education and analysis of the development of this concept.

KEYWORDS

Lifelong learning, sustainable development, knowledge-based society

1. INTRODUCTION

The concepts of sustainable development and lifelong learning are now global, universally accepted framework of various theoretical approaches and research activities. They are also embedded in the political systems of the countries, making the foundation of declarations and agreements within the international community. Through his framework, a holistic view of the world is experiencing a renaissance once again, thus making theorists, policy makers and practitioners look back at the primal theory of the inseparability of man from his social and natural environment, as well as at the necessary observation of the integrity of these interrelationships for understanding the world and facing the future.
Learning is an ongoing process, since changes and needs are continuous. It is a multi-dimensional process, as the systems and their relationships are complex, and also made up of a lot of delicate filaments. The ancient wisdom that people need to learn and develop all their lives is gaining strength again through the revival and conceptualization of the idea of lifelong learning.

In the history of mankind, there is no recipe for solving modern problems. They are unique and require flexibility, innovation, readiness to accepte mistakes and learning from them. Learning and sharing knowledge are gaining an important role in this process, and mastering patterns of sustainable behavior seems to be one of the most important domains in which we should develop and improve the competence of adults today. This approach is also promoted by the United Nations through their campaigns and their efforts to enhance the chances for a better education status and awakening the public. "Education for All" A Literacy Decade (2002-2012), Millennium Development Goals – they all promote education, mostly, however, at the level of gaining literacy and achieving gender equality, while only the Decade of Education for Sustainable Development (2005-2014) clearly recognizes the important role of adult education (UNESCO , 2009). The concept of sustainable development and lifelong learning are therefore an ideal foundation for the development of education, which refers to life in all its segments and for all generations. In practice, however, in most countries, as well as in Serbia, it is still not the case.

2. SUSTAINABLE DEVELOPMENT – CONCEPT AND PRINCIPLES

The most popular definition of sustainable development was first acknowledged in the report "Our Common Future" of Brutland Commission as development which meets the needs of the present without compromising the opportunity of future generations to meet their own needs (WCED, 1987). In order to make a significant step towards sustainable development we have to make drastic demands for a change in almost all areas of life. Not only will the consumers' habits have to change, which in itself is already difficult enough, but there must be a change of consciousness in the fields of economy, society and politics. The concept of sustainable development is an alternative to the quest for the "unhindered development". Conventional approaches observed the development in the context of the modernization process in which a society is assumed to be technically and technologically sophisticated, urbanized with a developed market economy. Sustainable development is a dynamic concept describing the process which should take you to the ultimate goal of sustainability. The concept of sustainability is based on the relationship between economic development, environmental quality and social equity. Brundtland report presents a normative framework that joins together the three components which also constitute the very basis of sustainable development:
1. Economic sustainability – maximization of income while maintaining or increasing the stock of natural capital 2. Social Sustainability - preserving the stability of the social and cultural systems and
3. Environmental sustainability - maintaining flexibility and balance of biological and physical systems.
Connectivity and interdependence of these components require making integrated decisions which would achieve a balance of economic and social needs of people while preserving the regenerative capacities of the environment. Essentially, sustainable development can be observed as an "umbrella concept" that integrates and systematically shapes a number of different ideas but the document known as "Earth Charter" (http://www.earthcharterinaction.org/content/pages/Read-the-Charter.html) summarizes basic principals:
I RESPECT AND CARE FOR THE COMMUNITY OF LIFE
II ECOLOGICAL INTEGRITY
III SOCIAL AND ECONOMIC JUSTICE
IV. DEMOCRACY, NONVIOLENCE, AND PEACE

The United Nations Conference on Environment and Development (UNCED) organized the "Rio+20 Conference" in June 2012 in Rio de Janeiro, to mark the 20th anniversary of the 1992, and the 10th anniversary of the 2002 World Summit on Sustainable Development (WSSD) in Johannesburg. The outcome of the Conference, "The future we want "declares:"… Heads of State and Government and high-level representatives, having met at Rio de Janeiro, Brazil, from 20 to 22 June 2012, with the full participation of civil society, renew our commitment to sustainable development and to ensuring the promotion of an economically, socially and environmentally sustainable future for our planet and for present and future generations". Nevertheless, the supporting documents for the conference ("A Pocket Guide to Sustainable Development Governance") once again state clearly that the despite the growing number of institutions, instruments and processes addressing sustainable development, environmental problems have intensified globally. It also outlines that continued degradation of the global environment has not been caused solely by governance weaknesses, but rather by a multitude of drivers, including prevailing economic models and patterns of consumption and production.

As the concept of sustainable development has been gaining in significance, ranging from political idealism and academic debate to what makes economic and political reality, there have been different ideas on how to make this concept operational and allow its implementation in practice. It necessarily requires more concrete and explicit definition making more precise roles of individuals and institutions in ensuring sustainability of the economy, society in general and the environment.

3. LIFELONG LEARNING

The statement that people learn all their lives is a factual situation. We learn every day, more or less intensely. Sometimes we do it on purpose, while sometimes the learning processes are unplanned; very often they are inevitable. A life without continuous learning is almost impossible. Even organizing our daily activities involves constant learning. In fact, we are learning more and more often than we know. The assumption that lifelong learning can be enhanced or otherwise organized is less obvious, which is the thesis

often implicit in support of lifelong learning as a promising idea in education policy and educational approaches.

Lifelong learning implies the opportunity for people to learn at all ages and in numerous contexts: at work, at home and through the activities during free time, and not just in the usual way at schools and universities.

Lifelong learning covers many fields, from general education to vocational training, the youth needs to the needs of the elderly and the needs of the employees and the unemployed. Lifelong learning involves different levels of learning (formal, non-formal and informal) and is engaged in a number of areas: training of trainers, basic skills, integration of information and communication technology, the efficiency of investment, foreign language learning, Lifelong guidance, the flexibility of the system in order to make learning accessible to all, mobility, civic education, and so on. (Polić at al, 2012)

Education as a basic capital of modern society has become a key factor in economic development. In addition to formal education in educational institutions such as schools and colleges, which in the last century guaranteed employment, today it does not guarantee a safe workplace, and all the more attention is paid to non-formal education through additional training courses, seminars and informal education which an individual acquires through his personal work, communication, reading and developing skills, experience and knowledge. All of the above methods of education can be included in the concept of lifelong learning.

The concept of the learning society prevailed after the 80s, and the idea was to educate people through total social structure. The century of knowledge in which the modern world took a step, as well as the processes of globalization, new scientific discoveries, new technologies and forms of communication, while overlapping, diverse and variable values have an impact on the education system.

Lifelong learning is becoming a guiding principle for providing and participating in education in different learning environments. This is a policy which defines lifelong learning as a complete cycle of learning from childhood, formal education at all levels to independent adult learning, including distance learning, with credits, certificates and diplomas, or without them. The concept of lifelong learning includes the ability to search for information as well as active and independent learning. Therefore, the classroom and the traditional textbook have to be replaced by gyms, libraries and institutions which offer a wide variety of different media and professional education on techniques of education.

Education is one of the most important factors responsible for the development of the society, so its adaptability to changes which today's information age is bringing is significant. Therefore, in terms of the knowledge economy the identity of education is changing, from the process which is tied to a particular period of life to a process which is less centralized (and institutionalized), available to citizens of all ages and tailored to individual needs.

Education is not a closed process, once started and then finished, with the purpose to occupy a position in society. It is a continuous process which is going on throughout life. Highly specialized individuals must accept that their specialty has a shelf life. Changes occur and lead to the development needs of specific knowledge and skills. (Green, 2002)

The role of government in the implementation of the concept of lifelong learning is great. The State has to assist in the development of the concept of lifelong learning by providing a technical support and a framework for the recognition of the acquired skills and knowledge. Typically, such support is given only in times of crisis, in situations where an industry is in crisis, and when the retraining programs are offered. Instead, it is necessary to provide an enabling environment which will encourage the employees to constantly seek new knowledge and skills. Retraining opportunities should be available to everyone at any time and in doing so they should not even be considered as retraining, but as the process of gaining and consolidating knowledge. The concept of lifelong learning must be available to all. In doing so, this does not refer to the curriculum, because it can not be diluted, but to the availability of different levels and types of education. (Mrnjaus, 2008)

Lifelong learning has become essential for all citizens. It is necessary to develop the knowledge and skills throughout life, not just for personal pleasure, but also to develop the ability to achieve success in the business world full of changes. The ways in which we access information and services is constantly changing. It is necessary to develop new skills to master a whole new digital world, not only by the adoption of technical skills, but also through a better understanding of the opportunities, challenges and clear ethical demands posed by new technologies.

4. EDUCATION FOR SUSTAINABLE DEVELOPMENT

For many years, governments and civil society emphasize education as a key policy instrument for bringing about transition towards sustainable behavior. Education in terms of life long process of learning, action and critical reflection involving all citizens. UNESCO declares that: Education for Sustainable Development (ESD) allows every human being to acquire the knowledge, skills, attitudes and values necessary to shape a sustainable future. It defines ESD as not a particular program or project, but rather an umbrella for many forms of education that already exist, and new ones that remain to be created. These essential characteristics of ESD can be implemented in myriad ways, so that ESD programs reflect the unique environmental, social, cultural and economic conditions of each locality. Furthermore, ESD increases civil capacity by enhancing and improving society, through a combination of formal, non-formal and informal education. In December 2002, the United Nations General Assembly proclaimed the UN Decade of Education for Sustainable Development, 2005- 2014, (DESD)emphasizing that education is an indispensable element for achieving sustainable development. Since the launch of the DESD in 2005, many sustainability issues have been included in education: peace education, global education, development education, HIV & AIDS education, citizenship education, intercultural education and holistic education, along with established environmental education and health education.

Education for sustainable development reflects a concern for the high quality education which is:

• Interdisciplinary and holistic: learning for sustainable development embedded in all programs of study
• Guided by values: sharing the values and principles which are supporting sustainable development;
• Critical thinking and problem solving: leading to reliable solutions of dilemmas and challenges
• Multi-methodological: word, art, drama, debate, experience,
• "participation" decision making: Students participate in making decisions about how they learn;
• Locally relevant: it takes into account both local and global issues and the use of the language(s) which students use most frequently. (Petrović, & Milićević, 2006)

Education for sustainable development is learning how to:

• respect, evaluate and preserve the achievements of the past;
• appreciate all living creatures and the humans on Earth;
• live in the world where people have enough food for a healthy and productive life;
• concern about the state of our planet and its renewal;
• create and enjoy a better, safer and more just world;
• respect one's own rights and fulfill responsibilities locally, nationally and globally.

Education for sustainable development has four priorities:

- Improvement of primary education
- Diverting the existing educational programs at all levels in order to achieve sustainable development
- Development of public awareness and understanding of sustainability
  Providing training. (Mrnjaus, 2008)

5. EDUCATION FOR SUSTAINABLE DEVELOPMENT IN SERBIA

National Strategy Sustainable Development of Serbia (NSOR) (*Nacionalna strategija održivog razvoja Republike Srbije, 2008)* , has been presented and adopted at government level in 2008. NSOR defined major national priorities for achieving sustainable development in Serbia for next 10 years, including education and life-long learning , as an important component, that will provide a qualified and skilled work force for knowledge based economy, in accordance with EU Lisbon Strategy .

In that context, NSOR discusses the current situation in Serbian educational system and emphasize that knowledge based economy could not be founded on "factographic", rigid, scholarly, or textbook knowledge, but on array of skills, competencies and interests that create innovation, problem solving and cooperation for social advancement. Learning process should not be based on answers to questions on "what" and "who", but also on "why" and "how". The National Strategy concludes that educational system in Serbia is generally unsustainable, not adequately efficient or effective, does not include all categories of children, and does not have quality outcome at any level. Consequently, education for sustainability in Serbia does not imply simple program adjustment, but a new educational approach is essential for knowledge based economy. NSOR also

recognizes that education about sustainable development principles is fundamental for good governance, decision making and capacity building at all levels.

Education in Serbia should be a guide to effective integration of Serbia into the EU, and it is necessary to be guided by the principle of the free flow of knowledge. In order to achieve competitive knowledge of the citizens of the Republic of Serbia in the European market, the reform must be based on the requirements of sustainable development, i.e. on respect for the standards that are prevalent in the education systems of developed European countries. In this regard, in the Strategy, the term education for sustainable development is not only introducing the content of sustainable development in the education system (education for sustainable development), but also a new education system which supports knowledge-based economy and represents a necessary prerequisite for sustainable development of economy and society in general.

The concept of sustainable development, in line with the National Strategy of Sustainable Development, implies that knowledge is the basis of any progress and that education for sustainable development has a direct impact on good governance, decision-making and promotion of democracy, strengthening the capacity of individuals, groups, communities, associations, and the state, in evaluating and making choices in favor of sustainable development. In order to have the current system of education adjusted to education for sustainable development, it must integrate the knowledge of all relevant sectors (environment, economy, society), with special emphasis on the actual implementation of the acquired knowledge in providing a better quality of life. Creating and increasing the level of knowledge is the key which can be adapted to the changed structure of the labor market, but also to make education available to everyone, improve early childhood education, and develop a system of continuing education for preserving the environment while creating educated staff which is capable of acting in accordance with the requirements of changes in technology and economic environment.

A new concept of education should integrate the knowledge and the way of finding the best techniques and methods in all spheres of human life, to provide the conditions necessary for applying the concept of interdisciplinary education for sustainable development and a greater participation of civil society. To achieve this, it has to ensure the participation and cooperation of all stakeholders (schools, businesses, policy makers, civil society, etc.) and intensively strengthen international cooperation with relevant scientific and educational institutions. The initial conditions necessary for the establishment of a sustainable system of education are primarily important in directing public funds into investment in education, in order to increase the overall literacy of the population, reduce the proportion of people without jobs and adjust the education system to the needs of the labor market and reforms. In order to achieve a sustainable education system it must be structured to include the possibility of changes in the needs of future generations, i.e. to have the ability to adapt to constant technological innovations and new communication systems. (Babić at al, 2013)

Accordingly, the direct assignments in the Strategy relate to the change in the system of funding, equating the private and public systems of education, modernization of curricula, the introduction of a quality assurance system, creating modern state employees who will work in the processes of education and implementation of licensing, certification and accreditation. The assignments will also be relevant to the promotion of the concept and practice of sustainable development through formal and informal education, teacher training for all levels of education for sustainable development, systematic development of research in the field of education for sustainable development, as well as continuous improvement of cooperation in education reform at the national and international level.

In the past years, despite current crisis , there have been some efforts to implement the started activities . The big challenge was to introduce the concept of sustainable development into the curricula at all education levels. The introduction of the elements of environmental protection in the curricula was first achieved through the reform of pre-school and primary school education. The main objectives of the educational program for preschool children are acquiring the knowledge of how man affects the environment and the consequences of those impacts, learning that a man pollutes the air, water and soil, as well as the ways how such pollution can be prevented. The reform of elementary education has resulted in the introduction of courses with the elements of environmental protection in the lower grades. (Mihajlov & Aleksić, 2013)

The initiated reform of secondary education has made little progress toward understanding the importance of education for sustainable development. The content that is taken in consideration regarding sustainable development has been introduced through the curricula of certain subjects in a number of educational profiles in secondary schools: forestry and woodworking, metalworking and mechanical engineering, electrical engineering, geodesy and construction, as well as grammar schools in science subjects. As a separate subject

Education for sustainable development has been introduced into the curriculum of the experimental educational profile of the technician for recycling in the field of metallurgy. Also, the experimental profile architectural technician successfully implemented the curriculum in subjects Sustainable Construction. On the other hand, the three-year educational profiles in almost all education fields study the contents of the environment, and as a separate subject there is Ecology and environmental protection. This initial experience should contribute to the progress in understanding the differences between the concepts of ecology, environmental protection and the concept of sustainable development, and to better understand the importance and necessity of the reform of the education system, not only in the direction of education for sustainable development, but also as a radical reform in order to meet the standards of education for sustainable development. To successfully implement the already adopted plans and programs related to sustainable development and to successfully continue with reforms towards education for sustainable development a continuous improvement of the teaching staff is necessary. For this purpose, an expert seminar on sustainable development and energy efficiency for secondary vocational schools has been accredited.

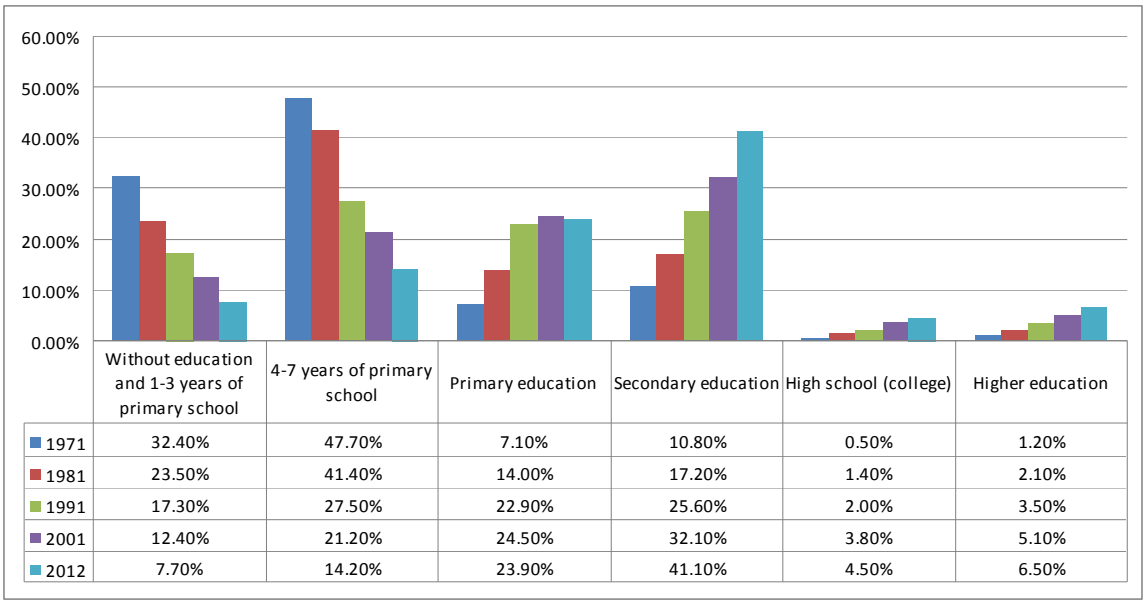
At university level, a number of faculties and departments, majors or study groups in the field of environmental protection have been established in recent years, both for undergraduate and for postgraduate and doctoral studies. The curricula based on sustainable development are applied mostly on technical colleges, although there is a growing interest in social studies. The course to sustainable development requires education and knowledge which will form the people who think critically and creatively and are able to keep up with all the fast development of new technologies and information - communication society.

One of the conclusions indicate that it is necessary to increase the number of people with higher education levels in Serbai The first report on progress in implementing the Strategy indicates that despite the difficulties caused by the economic crisis in 2009, a percentage of the population with a university degree, considering the total population, has increased compared to 2008 (11.9% , 11.0 % , respectively). However, the data for 2010 show a decline of 1.3 percent of the points, i.e. 9.6 %, which further reduces the already low level of the educational structure of the population and the capacity of societies for transition to a knowledge-based economy and to sustainable development. (*http://www.stat.gov.rs/)*

In Serbia, only 3.4 % of the GDP is allocated to education, and only 0.25% for the research and development activities. Bearing in mind the aspirations of the state aimed at joining the European integration process, it is necessary to catch up and take action on the development of an adequate institutional framework for lifelong learning, harmonized with the corresponding policies of the European Union, as well as to define the strategy for the development of lifelong learning in Serbia. (Milić, 2010)

The analysis of the Serbian education system shows that the situation is not satisfactory, especially if the analysis uses the indicators which have been long used in the EU. In Serbia, it is difficult to find valid information, and therefore it is difficult to assess the effectiveness of different levels of education which are based on international and European indicators used for performance evaluation of all the scientific - research activities, professional education and training.

In The National Economic Development Strategy of the Republic of Serbia since 2006 till 2012 it was defined that the development of Serbia will be based on knowledge as core capital. Serbian economy is in intensive transition and its innovation potential is very low, which is necessary to be changed. (*Nacionalna strategija privrednog razvoja Republike Srbije*, 2005)



	Without education and 1-3 years of primary school	4-7 years of primary school	Primary education	Secondary education	High school (college)	Higher education
1971	32.40%	47.70%	7.10%	10.80%	0.50%	1.20%
1981	23.50%	41.40%	14.00%	17.20%	1.40%	2.10%
1991	17.30%	27.50%	22.90%	25.60%	2.00%	3.50%
2001	12.40%	21.20%	24.50%	32.10%	3.80%	5.10%
2012	7.70%	14.20%	23.90%	41.10%	4.50%	6.50%

Figure 1.Movement of educational composition of the population of Serbia in the period 1971 -2012 (in%) (*http://www.stat.gov.rs/)*

Technological development has been achieved primarily by purchasing foreign technology and equipment. Scientific research and development in the Republic of Serbia, which are implemented in the existing scientific and development institutions, which are primarily funded by the state, are not a good enough generator of knowledge, which can be a serious factor in the development of new - globally competitive industrial production .

6. REFORM OF UNIVERSITY EDUCATION AND LIFELONG LEARNING FOR SUSTAINABLE DEVELOPMENT

Creating a sustainable and fruitful partnership between universities and enterprises involves redefining modes, improved knowledge transfer, promotion of entrepreneurship and lifelong learning. The system of lifelong learning is aimed at creating long-term relationships between companies and universities through exchange of information on skills and the level of qualifications required to continually increase productivity and efficiency. These links imply a change in the management of universities, through the development of entrepreneurial activities, knowledge transfer, promotion of innovation, and the necessary changes in the organization of the traditional forms of teaching through training and development of teachers.

The Law on Higher Education, which was adopted in 2005, explicitly emphasizes the importance of lifelong learning and the role that universities must take in this respect. It says that universities and non-formal education, not only in Serbia, but also the European Union, which will contribute to the establishment of awareness among citizens, are an integral part of European society and the system of values. (Babić at al, 2013)

The role of universities in lifelong learning is following: the acquisition of knowledge and skills that can be applied in practice, the openness of the university through flexible access to study and contribution to regional development and knowledge transfer. Applying the Bologna Process at the University contributes to lifelong learning only if it enables a flexible enough access to different levels of study at different ages. It is necessary to define and strengthen the relationship between higher education institutions, companies and various employment programs. In this respect, the role of lifelong learning is becoming prominent The system of lifelong learning must be defined as a part of the reform of the education system so that it results in a constant raising of qualifications and skills as a prerequisite for stimulating entrepreneurship, innovation and knowledge transfer. To achieve these goals, the universities must be open to all classes of society:

motivated and talented people who have not completed some form of formal education, adults who want to innovate knowledge in certain areas, individuals who want help with career planning, etc. Along with it all, an open, free access to educational material through the organization of distance learning and e-learning options should open a possibility to marginalized groups to have an equal opportunity of access to knowledge and education.

Knowledge and education are prerequisites for economic development and sustainable development of the society, in general. Researching the key factors of growth of the most developed countries already in the second half of the twentieth century, convincingly demonstrated that their structure had gone through a fundamental change, so that the classical basic factors such as labor and capital had reduced participation in the value of the involved factors, not because of poverty, but due to the fact that intangible factors such as knowledge, scientific research, information, and so on, gave a far greater contribution to economic growth and development. (Mihajlov & Aleksić, 2013)

The beginnings of the concept of lifelong learning in Serbia are mainly related to universities and colleges.A Tempus Project "Development of lifelong learning in Serbia" (Development of Lifelong Learning Framework in Serbia), carried out by the University of Kragujevac, is classified in one of three projects of national importance in the Tempus IV granted to the Republic of Serbia. The main objective of the project, which lasts three years (2012 and 2015) , is the establishment of a system of lifelong learning (LLL) in Serbia. The main partner in the project is the University of Aarhus in Denmark, the Faculty of Education in Copenhagen, which is responsible for the transfer of knowledge, expertise and experience in order to develop a system of lifelong education in Serbia (LLL). Besides Denmark, EU partners are also the University of Bydgoszcz, Poland and Craiova, Romania, as well as non-governmental organization SPARK from the Netherlands. The University of Kragujevac is the head of the project, while the partners from the Republic of Serbia is Ministry of Education and the State University of Novi Sad, Belgrade , Nis and Novi Pazar, as well as the National Council for Higher Education, the National Employment Agency, the City of Kragujevac, Union of Employers, scientific - technological park "Belgrade information techno ". (Babić at al, 2013)

For the successful implementation of these activities, besides involving the following partners in the project: the University, Ministry of Education, the NEA, the Union of Employers, it is necessary to provide broad support of all local authorities, all stakeholders, to create a culture of lifelong learning in accordance with the requirements of the Lisbon process.

Although strategies of sustainable development have been presented at government level, there is a lack of professional and organizational knowledge of internationally recognized campaigns for the sustainable development of cities and towns in local communities. There is also inadequate coordination among possible implementing subjects including general public, municipal officers, NGOs, professional association and, more importantly, among legislators and key-decision makers in local communities.

At the Faculty for Management Zajecar, the program “Strategic Leadership For Sustainable Societies” was designed with the aim to assist local communities in East Serbia in their attempt to adopt sustainability. Faculty for Management Zajecar (FMZ), located in East Serbia, a part of Megatrend University, Belgrade, introduced courses on Sustainable development at undergraduate and graduate level, including International research doctorate studies, in 2007. Faculty for Management Zajecar was the first business school in the Region to include sustainability in the accredited curriculum. Until now, several hundred students with the comprehension and skills in management and sustainability, graduated from this faculty. It is a considerable contribution from the Faculty for Management Zajecar and significant foundation for the advancement of this less developed Region in Serbia.

The goal of the program Strategic Leadership for Sustainable Societies” was to educate policy makers, municipal officers and elected officials, as well as NGO staff who are, or should be, directly responsible for local sustainable development planning and implementation. Furthermore, number of organizations in industry, tourism, agro business, education, health, communications, press, entrepreneurs, etc., are also expected to benefit from the implementation of this highly structured and practical management system, with defined methodology for sustainable development interventions.

The desired outcome of the program for each participant is to have an understanding of the framework for sustainable development, and be able to apply the framework in a range of situations, for an analysis of problems as well as creation of solutions. For a selected group of participants of this course (“trainers”), there is additional education in organizational and personal learning, as well as, improved presentation, facilitation and coaching skills. Authors have reported results of their work in details previously (Paunkovic J et al, 2007; Miladinovic, Paunkovic, 2012). Some aspects of this program have also been published as part of

Global Sustainability Communities review edited by a Nobel Prize Winner Dr Woodrow Clark II (Clark, 2014).

7. CONCLUSION

Education for sustainable development is a key tool for building a global force for effective action in order to achieve sustainability. The goal is to develop the knowledge, skills and values that will empower people of all ages, at all levels, to take responsibility for building a secure and sustainable future. Creating a curriculum of education for sustainable development will require current knowledge and prediction of the future. While the resulting programs of education for sustainable development will be good or bad, the consequences of not acting are unacceptably high. Therefore, the creation of a program of education for sustainable development is imperative.

Educational communities will need to identify the knowledge, issues, attitudes, skills and values essential to sustainable development in each of the three components - the natural environment, economy and society to create a curriculum of education for sustainable development, One of the great challenges of acceptance of education for sustainable development will be to redirect the current curriculum in order to achieve sustainability.

The Republic of Serbia has not yet developed a system in which the training is aimed at sustainable economic and social development. Therefore, a deficit or surplus of certain occupations often occurs on labor markets of the region. The priority of education in Serbia in the future is to create educational programs for sustainable development and the application of the concept of lifelong learning.

REFERENCES

Babić, V. Et al. 2013. *Razvoj sistema doživotnog učenja u Srbiji,* Kragujevac: Univerzitet u Kragujevcu, InterPrint.

Ćućilović M. 2006. Znanje kao privredni resurs, *Tehničko (tehnološko) obrazovanje u Srbiji,* 13-16, april, Čačak

Green A. 2002. The Many Faces of Lifelong Learning: Recent Education Policy Trends in Europe, *Journal of Education Policy,* Vol. 17, Issue 6, str. 611-626, 2002.

Mihajlov, A., Aleksić, D. 2013. *Obrazovanje za zaštitu životne sredine - postojeći profili: stanje i otvorena pitanja*, Beograd: Istraživanja za potrebe Odbora za životnu sredinu i održivi razvoj PKS.

Milić LJ., 2010. Educatiional composition of Serbia, *Technics and informatics in education*, 3rd International Conference, Technical Faculty Čačak, 7−9th May 2010.

Mrnjaus K. 2008. Education for sustainable development, Lifelong learning for sustainable development, University of Rijeka, Faculty of teacher education in Rijeka

Nadić D. 2001. Obrazovanje za održivi razvoj i principi održivog razvoja, Univerzitet i održivi razvoj, Fakultet političkih nauka Univerziteta u Beogradu, Centar za ekološku politiku i održivi razvoj, Beograd

Nacionalna strategija održivog razvoja, 2008. Vlada Republike Srbije, Beograd („Službeni glasnik RS“, br. 57/08).

Paunkovic J, Paunkovic N., Milutinovic S., Zikic S. 2007. Education for sustainable development, *Annual of the University of Mining and Geology "St. Ivan Rilski",* volume 50.

Paunković J. 2014. Educational Programs for Sustainable Societies Using Cross-Cultural Management Method, Chapter 16, in: Clark W: *Global Sustainable Communities Handbook* © 2014 Elsevier Inc.

Miladinovic V, Paunkovic, Dz,, 2012. "Odrzivi razvoj u lokalnim samoupravama", *Ecologica* br.66.

Polić M. At al. 2012., Lifelong learning as a cocncept ofmodern education*, Technics and informatics in education,* 4th International Conference, Technical Faculty Čačak, 1−3rd June 2012.

http://www.desd.org/

http://www.dfes.gov.uk/sd/action.shtml

http://www.earthsummit2012.org/resources/useful-resources/1157-the-future-we-want-rio20-outcome-document

http://www.uncsd2012.org/content/documents/814UNCSD%20REPORT%20final%20revs.pdf

http://www.stat.gov.rs/

http://www.unesco.org/new/en/education/themes/leading-the-international-agenda/education-for-sustainable-development/

http://www.un-documents.net/wced-ocf.htm

4th International Symposium on Natural Resources Management
"Sustainable Development and Green Economy in Transition Countries"
31st May -1st June, 2014, Faculty of Management Zajecar, Republic of Serbia
www.fmz.edu.rs

THE "SOUTH STREAM" AS AN INVESTMENT IN THE ENERGY SECTOR OF SERBIA

Dragan Mihajlović, PhD[1]

[1]*Faculty of Management Zaječar, Park šuma Kraljevica bb, 19000 Zaječar, dragan.mihajlovic@fmz.edu.rs*

ABSTRACT

Natural gas is an energy source with strong technical and environmental advantages over other conventional fuels. In that sense, it should provide a significant contribution to a more efficient and environmentally friendly energy use. However, natural gas is a predominantly imported energy source and its price is linked to change in oil price on the global market. The project "South Stream" is of a great importance not only for the economic development of Serbia, but for the region as well. The importance of the project lies not only in gas supply for Serbia, but also in the security of the supply, favourable transport, gas price, development opportunities, interconnection to the Republika Srpska, Croatia, Romania and Bulgaria.

KEYWORDS

Natural gas, gas pipeline, South Stream, Serbia

1. INTRODUCTION

Serbia produces oil and natural gas, but not enough for its needs. In 2010, planned oil production was 1Mtoe and 0.495 Mtoe of natural gas. In the same year, planned import was 3.3 Mtoe of oil and 3 Mtoe of gas. So, Serbia imports about 77% of needed oil and 86% of needed gas.

"The South Stream" is a gas pipeline under construction that should transport natural gas from Russia to the EU countries. The pipeline goes from the southern part of Russia to the city of Anapa in Krasnodar area under the Black Sea, through Turkish territorial waters to Vana in Bulgaria, and from Bulgaria it splits into two branches. One branch should go from Bulgaria to Greece and underwater to Italy, while the other one would go through Serbia and Hungary to Austria.

The pipeline enters Serbia near Zajecar, passes near Belgrade and goes to Backi Breg (originally announced Subotica) where it enters Hungary. A pipeline hub is planned in Centa from where a branch would lead to the Republika Srpska. This project will also include a gas storage facility in Banatski Dvor which has already been in operational use. Another storage facility has been planned in Itebej, and the contract includes the construction of several gas plants.

There is no doubt that the pan European gas pipeline "South Stream" will have a huge economic and strategic energy importance for Serbia and other countries somehow included in the project. The benefits that Serbia and other countries involved in the project could have from the "South Stream" are the transport tariffs. Creation of jobs in connection to the pipeline construction, work and maintenance, favourable price for businesses and citizens, as well as energy security which arises from long-term secured reliable energy supply, generate good preconditions. The listed items have an effect on the beneficiary countries and the countries that profit from the transport. When it comes to gas exporters, i.e. Russia and the countries of

Central Asia which also supply the Russian gas pipeline system, they get an even better position on the European market.

2. GENERAL CHARACTERISTICS OF NATURAL GAS

Natural gas is a natural gaseous fossil fuel with a high proportion of methane. It can occur independently (dry natural gas), or with oil, usually in a gas cap above oil (wet natural gas). Thanks to its main ingredient methane, in comparison to other fossil fuels, it has the lowest carbon emission quotient per unit of released energy. Therefore natural gas is considered an environmentally friendly fuel.

Figure 1 Natural source of natural gas in the Romanian Carpathians
Source: http://sr.wikipedia.org/sr/Zemni_gas

The composition of natural gas greatly varies depending on where it occurs. If it occurs along with oil, there is usually a higher proportion of gases with more carbon atoms (wet natural gas) and vice versa, when the share of methane is around 98%, and up to nearly 100%. (Figure 1 shows the usual values of the natural gas components share and, as an example, the values in the Yugoslavian gas pipeline, hub Pancevo, for January 1991).

Table1 Share of natural gas components – hub Pančevo (January 1991)

Gas	**Common share**	**Pancevo**
Gaseous hydrocarbons		
Volume of methane (CH_4)	50-98%	92,599 %
Volume of ethan (C_2H_6)	< 10 %	2, 784 %
Volume of propane (C_3H_8)	< 7 %	0,413 %
Volume of butane (C_4H_{10})	< 7 %	0,56 %
Admixture		
Volume of hydrogen (H_2)		?
Volume of carbon monoxide (CO)		?
Volume of carbon dioxide (CO_2)	< 30 %	2,416%
Volume of oxygen (O_2)	< 12 %	?
Volume of nitrogen (N_2)	< 28 %	1,727 %
Volume of sulfur compounds (H_2S, ...)	<2 %	?

Source: http://sr.wikipedia.org/sr/Zemni_gas

Natural gas includes hydrocarbons, such as methane, ethane, propane, n-butane, iso-butane, and also pentane (n-pentane and iso-pentane). Apart from hydrocarbons, natural gas contains admixtures: combustible, such as hydrogen, and to some extent carbon monoxide, and non-combustible (carbon dioxide, oxygen, nitrogen), and some of them contain sulfur compounds, for example hydrogen sulfide which is toxic, corrosive and highly undesirable, so it is removed before transportation. With composition, the calorific value also changes: the larger the share of the gaseous hydrocarbons with a higher number of carbon atoms, the larger the calorific value. The calorific value of the dry gases is approximately 36MJ/m^3, and of the wet

ones about 38 MJ/m^3, and it can go up to 41 MJ/m^3. Figure 2 lists the upper calorific values of certain producing countries (in the descending order).

Table 2 Upper calorific power of gas for gas producing countries

The origin of gas	**Calorific power (MJ/m^3)**
Alzir	42
Indonesia	40,6
Norway	39,88
Great Britain	39,71
USA	38,42
Russia	38,23
Canada	38, 2
Saudi Arabia	38
Uzbekistan	37,89
Netherlands	33,32

Source: http://sr.wikipedia.org/sr/Zemni_gas

The calorific value of natural gas in the Serbian, ex Yugoslav gas pipeline, hub Pancevo was recorded in the range of 31,1 ÷ 33,6 MJ/m^3 (monthly mean values in 1991). In general, the use of natural gas can be divided into its use as a fuel (for heating or ignition of ICE) and its application in the chemical industry (as a source of hydrogen in nitrogen fertilizers production, and potentially for fuel cells). It is used in households, as a fuel for heating or cooking. Households are supplied by gas distribution. It is used in industry as a heating fuel. Lately, it has increasingly been used in vehicles as an alternative fuel, primarily to gasoline, but also to diesel fuel in the compressed form, as compressed natural gas, and possibly as liquefied natural gas. (For the use of natural gas in vehicles, see CNG). Natural gas is one of the most promising alternative fuels.

3. OIL AND NATURAL GAS RESOURCES

Known world oil reserves are around 160x109 t, while the annual production and consumption are around 4x109 t. These reserves would be spent over the next 40 years, which is quick and worrisome.
Serbia produces oil and natural gas, but not enough for its needs. In 2012, planned oil production was 1Mtoe and 0.495 Mtoe of natural gas. In the same year, planned import was 3.3 Mtoe of oil and 3 Mtoe of gas. So, Serbia imports about 77% of needed oil and 86% of needed gas.

All the areas with specific oil and geological preconditions have been explored. Minable reserves were discovered in Vojvodina and Stig.

About 99% of oil production and total gas production come from oil and gas fields in Vojvodina.

Certain occurrences of oil and gas have been registered in some parts of Central Serbia, but there are no significant results or expectations.

Below is the text about oil and gas resources in the Republic of Serbia, which was taken from the National Strategy on sustainable use of natural resources.

Significant deposits of oil and gas were discovered in AP Vojvodina. NIS-AD Novi Sad, as the sole holder of oil and gas production in the Republic of Serbia, produces oil from around 800 oil wells, and gas from about 110 wells. Around 15% of oil wells use eruptive method, 70% is in the depth pumping and the remaining 15% has a system of gas-lift method.

In Vojvodina, as the main bearer of oil and gas production, 222 hydrocarbon deposits were discovered in 88 fields with squat depth of 300-3600 m. The largest number of discovered deposits according to the size of the recoverable reserves, based on the global deposit classification, belongs to the marginal group, while small and medium sized deposits are rare.

Geological reserves. According to the data from 2009, total geological reserves of oil and gas in Vojvodina (as of 31/12/2009) are 186,36 Mtoe, of which balance reserves make 40,54 Mtoe.

Balance reserves. According to available data, the balance reserves of oil and gas amount to 40,54 Mtoe.

Nonbalance reserves. According to available data, the nonbalance reserves of oil and gas amount to 145,82 Mtoe.

Exploitation (recoverable) reserves. According to available data, the exploitation reserves of oil and gas are 20 Mtoe. The level of exploration and exploitation of the oil and gas deposits is high and in order to achieve the given future dynamics of production by 2015, it is necessary to apply the latest technical and technological advances in oil and gas exploitation.

Potential resources. According to the current level of exploration, potential reserves can be expected in the deeper parts of the Pannonian Basin. Reserve quantification cannot be determined at the moment since there are no relevant data to determine the potential more precisely.

There are several studies and papers on the subject, but mutually contradictory, so it is hard to specify the potential at the moment without the results of geological, geophysical and other explorations which are conducted according to the newly adopted geology and oil model.

Technogenic sources. Apart from natural gas sources, there are also significant technogenic sources of landfill gases produced by waste decomposition. It is estimated that landfills and dumpsites annually release 95x10 t of methane and 916x103 t of CO2. Landfill gases increase total gas emission of the Republic of Serbia and create the greenhouse effect. Part of the landfill gases could be used for local heating requirements.

4. „THE SOUTH STREAM“ AS SERBIAN ENERGY INVESTMENT

“The South Stream” is a gas pipeline under construction that should transport natural gas from Russia to the EU countries. The pipeline goes from the southern part of Russia to the city of Anapa in Krasnodar area under the Black Sea, through Turkish territorial waters to Vana in Bulgaria, and from Bulgaria it splits into two branches. One branch should go from Bulgaria to Greece and underwater to Italy, while the other one would go through Serbia and Hungary to Austria.

The construction process started on 7th December 2012 on the Black Sea coast, and the commencement of the construction was announced for 20th December with the presence of the Russian president Vladimir Putin. It was announced that the first two of the four planned branches would be finished by the end of 2015 or in the first quarter of 2016.

Under the original agreement, the gas pipeline is jointly funded by Russia and Italy, and later some companies from Germany and France also joined. The company “South stream transport” will be the owner of the pipeline. Russian “Gazprom” owns 50% of the company, Italian energy company “Eni” owns 20%, and German “Wintershall” and French “EDF” each own 15%. The maximum pipeline capacity is projected at 63 billion cubic meters of gas a year, and the investment is estimated at 16 billion euros.

The plans for the South Stream were officially presented in Rome on 23rd July 2007, when the director of Italian Eni Paolo Scaroni and the vice president of Gazprom Aleksander Medvedev signed a memorandum on the South Stream construction. In Moscow on 22nd November 2007, Gazprom and Eni signed an agreement on the feasibility study, i.e. an agreement on establishing a company which was to conduct a marketing and technical feasibility study for the project. The Serbian and the Russian parties started a joint company “South Stream Serbia” in Switzerland on 17th November 2009 in which Gazprom owns 51%, and Srbijagas 49%.

Milorad Dodik, the president of the Republika Srpska, signed in Sochi on 21st September 2012 a protocol on cooperation with the representatives of Gazprom on the construction of one branch in the Republika Srpska. A joint company with Slovenia “South Stream Slovenia” was established in February 2012, and in Moscow on 13th November the same year, an agreement was signed on the construction of a part of the pipeline through Slovenia with the director of the Slovenian company Plinovodi. During a working visit of Alexei Miller, the president of Gazprom, to Sofia on 15th November 2012, in the presence of the Bulgarian Prime Minister, the representatives of Russian Gazprom and Bulgarian Bulgargaz signed a protocol on financial investment, which is an agreement on construction of the Bulgarian pipeline route, and thus, all the necessary preparatory work was completed before beginning the construction.

The construction began on 7th December at the Black Sea coast by the compressor station "Ruskaja". The host was the Russian President Vladimir Putin, and the official delegations from all the countries on the pipeline route were present. The Serbian delegation was led by the then Minister of Energy Zorana Mihajlovic.

The pipeline starts from the Russian gas fields and extends for 3600 kilometers to the Black Sea coast. The underwater section goes from the Russian port Anapa in the Krasnodar district, on the Black Sea coast, through Russian, and then Turkish exclusive economic zone of the Black Sea, and then to the Bulgarian port Varna. The total length of the Black Sea underwater route is 900 kilometers and it does not pass the Ukrainian zone. In this section the pipes are laid at a depth of over 2000 meters.

According to the plan, the pipeline splits in Bulgaria and one branch leads to Greece and to the Ionian Sea, from where the underwater pipeline heads to the south of Italy. However, on 16th November 2012 appeared the news that there is no chance that Greece and the south of Italy will use significant quantities of gas in the near future, so we should not expect the construction of this branch in this phase. This section did not appear on the map published on 7th December. The second branch through Serbia leads to Hungary, and goes through Slovenia to the north of Italy. It was originally announced that this branch would go to Austria, but this intention was not mentioned later.

The pipeline enters Serbia near Zajecar, passes near Belgrade and goes to Backi Breg (originally announced Subotica) where it enters Hungary. Compared to the original idea that the entry should be in Dimitrovgrad and pass Nis, this route is 70 kilometers shorter, amounting to 411 kilometers. A pipeline hub is planned in Centa from where a branch would lead to the Republika Srpska. This project will also include a gas storage facility in Banatski Dvor which has already been in operational use. Another storage facility has been planned in Itebej, and the contract includes the construction of several gas plants. The construction of a compressor station near Dobro Polje in Backa is planned, and there is another one near Paracin seen at the map published on 7th December.

There is still no decision whether one branch will lead to Croatia, although on the map published on 7th December on the company website, there is a branch from Gospodjinci in Vojvodina to Vukovar. It was agreed that one line should go along the Sava River through the Republika Srpska, but on the map a line goes towards Zvornik. There is a possibility that this branch will serve to supply the Federation of Bosnia and Herzegovina. Russian officials claim that Montenegro expressed their interest in the South Stream gas.

The construction of the gas pipeline in Serbia officially started in the village of Sajkas on 24th November 2013, and the ceremony at the Palace of Serbia was held at the same time with the speeches of the President of Serbia Tomislav Nikolic, and the Prime Minister Ivica Dacic. (http://sr,wikipedia.org 07.11.2013. u 12:30)

Figure 2 South Stream map
Source: *https://www.google.rs/search?q=ju%C5%BEni+gasovod+slike*

5. THE IMPORTANCE OF THE SOUTH STREAM FOR SERBIA

There is no doubt that the pan European gas pipeline "South Stream" will have a huge economic and strategic energy importance for Serbia and other countries somehow included in the project. The benefits that Serbia and other countries involved in the project could have from the "South Stream" are the transport tariffs, creation of jobs in connection to the pipeline construction, work and maintenance, favourable price for businesses and citizens, as well as energy security which arises from long-term secured reliable energy supply. All this has an effect on the beneficiary countries and (except for the end users) the countries that profit from the transport. When it comes to gas exporters, i.e. Russia and the countries of Central Asia which also supply the Russian gas pipeline system, they get an even better position on the European market.

On the construction of this 421 kilometer long section of the transnational pipeline through Serbia, 25,000 workers from Serbian construction companies will be directly employed, and up to 100,000 indirectly from equipment manufacturers and service sector. The authorities in Serbia issued the zoning and building permits for the pipeline construction through Serbia, and a tender for contractors will be published by mid-December this year.

Gazprom and Srbijagas will provide around 500 million euros to be available for the construction of the Serbian section of the pipeline by the first quarter of the next year. As announced by the director of Srbijagas, Dusan Bajatovic, Gazprom will grant the Serbian side a loan of 175 million euros without government guarantees, with the interest rate of 4.25%, and the arrangement provides that Serbia pays nothing until the South Stream starts functioning. It is planned that Serbia will pay off this loan from the incomes of transit fees, because it is estimated that in the beginning the fees will amount to around 200 million euros a year. The construction of the pipeline through Serbia will last for two years and the commissioning of the pipeline, which 73% of the citizens of Serbia support, is planned for 2016. The capacity of the pipeline through Serbia will be 41 billion cubic meters of gas annually, of which Serbia will initially use around five billion cubic meters, and even more if the economic policy in the country improves.

The construction of the "South Stream" increases the military and political security of Serbia. In addition, the regional importance of Serbia rises. Serbia will be the indirect gas source for the neighbouring countries which are not situated on the main route of the pipeline – Croatia, Montenegro, Macedonia, and Bosnia and Herzegovina. This fact carries primarily economic and energy impact.

6. CONCLUSION

Although energetics is not an independent and most important activity of the secondary sector, it still has a crucial importance for industry as well as numerous other activities. Great attention is paid to optimal energy production and its rational use. Throughout history energy consumption has been rising. This phenomenon is expected since energy is today, as well as before, the basis of world development. Investments in energy represent a very important link in the economic development of Serbia. This sector solves all the technical, economic and legal issues before concrete construction of a larger object or investment planning.

The adopted strategic priorities and proposed development objectives of certain energy sectors, along with the appropriate development of legal and institutional framework, represent a good basis for Serbia to join the European path. The anticipated level of improving energy efficiency in final energy consumption should lead to a very significant reduction of consumption per unit of GDP, but also direct the entire economy and society towards sustainable development so that economic growth is not directly related to the intensity of energy consumption.

Analysis of energy consumption offers the possibility of locating large consumers that can be directly affected by certain measures with the aim of reducing consumption. Compared to other European countries,

Serbia belongs to a group of smaller energy consumers. However, in the developed countries, large final energy consumption is due to a high level of industrial development. In other words, production sector is the largest consumer of final energy in Europe, but in Serbia the largest consumer is the households sector. Increasing energy efficiency does not lead only to rational energy consumption. The impact on the environment is equally important. Reduced emission would produce a healthier environment with improved quality of life.

REFERENCES

Magdalinović, N., Magdalinović-Kalinović, M., 2012. *Upravljanje prirodnim resursima*. Fakultet za menadiment Zaječar.

Mihajlović, D., 2013. *Strategijsko upravljanje prirodnim resursima*. Fakultet za menadžment Zaječar.

Šećibović, E., Đoković, E., 2003. *Regionalna ekonomska geografija I — Evropa*. CID – Ekonomski fakultet, Beograd.

Harris J, M., 2009. *Ekonomija životne sredine i prorodnih resursa*. Data Status, 2009.

http://sr.wikepedia.org

http://sr.wikipedia.org/sr/Zemni_gas

4th International Symposium on Natural Resources Management
"*Sustainable Development and Green Economy in Transition Countries*"
31st May -1st June, 2014, Faculty of management Zajecar, Republic of Serbia
www.fmz.edu.rs

EVALUATING THE BEST SOLAR CELL PRODUCT USING TOPSIS IN AHP FUZZY ENVIRONMENT

Darko M. Milosevic[1], Marko Kimi Milic[2], Nenad M. Stojanovic[2]

[2]*Faculty for Management, Megatrend University, Park suma bb, 19000 Zajecar, Republic Serbia*

ABSTRACT

The aim of study is developing a fuzzy decision model to select the best Solar cell product. Proposed approach is based on analytic hierarchy process (AHP) and technique for order performance by similarity to ideal solution (TOPSIS). AHP method is used in determining the weights of the criteria by decision makers and then rankings of the solar cells are determined by TOPSIS method. In order to overcome the issue, we invite fuzzy set theory into the measurement of performance. Empirical study has also been demonstrated and involving fifteen evaluation criteria, seven initial solar cells product types, assessed by nine evaluators from the Info TeleNet Group company team.

KEYWORDS

Solar cell; Multiple criteria decision-making (MCMD); Fuzzy sets theory; AHP method, TOPSIS.

INTRODUCTION

The main processes of the photovoltaic industry can be divided into the upstream, midstream and downstream solar cell module and system sections. Crystallized silicon is used as a raw material to manufacture chips, and the chips are processed to produce solar cells, and the solar cells are further developed into solar cell modules. Some research has started on the utilization of fuzzy sets theory in area of solar energy. Marco, Maurizio and Davide, (1994) assessed energy planning trough ELECTRE multicriteria analysis approach compared to a FUZZY-SETS methodology. Rustom, Bilal and Salem (2000) write about Fuzzy sets programming to perform evaluation of solar systems in Jordan. Fausto write about Fuzzy TOPSIS approach for assessing thermal-energy storage in concentrated solar power (CSP) systems. Also we had paper work with AHP method based on other theories like Zahari and Sarkawt (2012).

However, compared with leading countries such as Japan and Germany, Serbia is still open for new investment in photovoltaic (PV) solar energy industry since its technologies are still far behind those countries. The main objectives of this study are to propose a systematic evaluation model to help Info TeleNet Group, Serbia to select the best solar cell type for buying among a set of available solar cells under fuzzy multi-evaluator and multi-criteria environment, and help enhance understanding by this organization of the performance criteria of solar cells test that are important to the account managers.

The remainder of this study is structured as follows. Section 2 briefly introduces fuzzy sets theory as utilized in multi-criteria decision-making processes. A hierarchical framework to evaluate initial solar cells test using TOPSIS under fuzzy environment is derived in Section 3. Section 4 presents an empirical Case Study initial elicited from the Info TeleNet Group Serbia. Conclusions and suggestions are also proposed in Section 5.

2. FUZZY SETS THEORY IN MULTI-CRITERIA DECISION-MAKING

To resolve the vagueness, ambiguity and subjectivity of human judgment, fuzzy sets theory (Zadeh, 1965) was introduced to express the linguistic terms in decision-making (DM) process. This approach helps decision-makers solve complex problems in a systematic, consistent and productive way and has been widely applied to tackle DM problems with multiple criteria and alternatives.

Let X be the universe of discourse, $X = \{x_1, x_2, x_3, ..., x_n\}$ A fuzzy set $\tilde{A}$ of X is a set of order pairs $\{(x_1, \int(x_1)), (x_2, \int(x_2)), ..., (x_n, \int(x_n))\}$, $\int : X \to [0,1]$, is the membership function of $\tilde{A}$, and $\int(x_i)$ stands for the membership degree of $x_i \in \tilde{A}$.

Definition 2.1. When X is continuous rather than fuzzy set $\tilde{A}$ is denoted as: $\tilde{A} = \int\int(x)/(x)$, where $x \in X$.

Definition 2.2. When X is a countable, the fuzzy set $\tilde{A}$ represented as: $\tilde{A} = \sum\int(x_i)/(x_i)$, where $x_i \in X$.

Definition 2.3. A fuzzy set $\tilde{A}$ of the universe of discourse X is normal when function is $\int(x)$ $max_x \int(x) = 1$.

Definition 2.4. A fuzzy number is a subset in the universe of discourse X that is not convex and normal.

Definition 2.5. The α-cut $\tilde{A}_\alpha$ and strong α-cut $\tilde{A}_{\alpha+}$ of the fuzzy set $\tilde{A}$ in the universe of discourse X is

$$\tilde{A}_\alpha^- = \left\{ xi \int_A^- xi \geq \alpha, xi \in X \right\}, where \alpha \in [0,1] \quad (1)$$

$$\tilde{A}_\alpha^+ = \left\{ xi \int_A^+ xi \geq \alpha, xi \in X \right\}, where \alpha \in [0,1] \quad (2)$$

Definition 2.6. A fuzzy set $\tilde{A}$ the universe of discourse X is convex if and only if every $\tilde{A}_\alpha$ is convex, that is $\tilde{A}_\alpha$ is a close interval of $\Re$. It can be written as $\tilde{A}_\alpha = \left[P_{(1)}^{(\alpha)}, P_{(2)}^{(\alpha)} \right]$, where $\alpha \in [0,1]$ (3)

Definition 2.7. A triangular fuzzy number can be defined as a triplet (a_1, a_2, a_3); the membership function of the fuzzy number $\tilde{A}$ defined as (see Fig. 1):

$$\begin{cases} 0, & x < a_1, \\ \dfrac{x - a_1}{a_2 - a_1}, & a_1 \leq x \leq a_2, \\ \dfrac{a_3 - x}{a_3 - a_2}, & a_2 \leq x \leq a_3, \\ 0, & x > a_3 \end{cases} = \int_{\tilde{A}}(x) \quad (4)$$

Let $\tilde{A}$ and $\tilde{B}$ two triangular fuzzy numbers (TFN) parameterized by the triplet (a_1, a_2, a_3) and (b_1, b_2, b_3) respectively, then the operational laws of these two triangular fuzzy numbers are as follows:

$$\tilde{A} (+) \tilde{B} = (a_1, a_2, a_3) (+) (b_1, b_2, b_3) = (a_1 + b_1, a_2 + b_2, a_3 + b_3) \quad (5)$$

$$\tilde{A} (-) \tilde{B} = (a_1, a_2, a_3) (-) (b_1, b_2, b_3) = (a_1 + b_1, a_2 + b_2, a_3 + b_3) \quad (6)$$

$$\tilde{A} (\times) \tilde{B} = (a_1, a_2, a_3) (\times) (b_1, b_2, b_3) = (a_1 + b_1, a_2 + b_2, a_3 + b_3) \quad (7)$$

$$\tilde{A} (\div) \tilde{B} = (a_1, a_2, a_3) (\div) (b_1, b_2, b_3) = (a_1 + b_1, a_2 + b_2, a_3 + b_3) \quad (8)$$

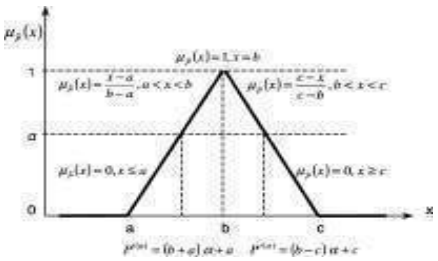


Fig. 1. Membership function of triangular fuzzy number $\widetilde{A}$.

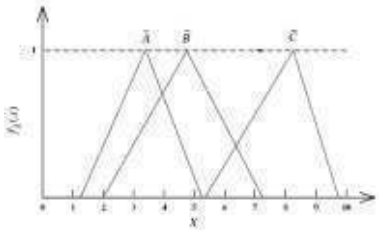


Fig. 2. Three triangular fuzzy numbers.

$$k\widetilde{A} = \left(ka_1, ka_2, ka_3\right) \tag{9}$$

$$\left(\widetilde{A}\right)^{-1} = \left(\frac{1}{a_3}, \frac{1}{a_2}, \frac{1}{a_1}\right) \tag{10}$$

According to the vertex method the distance between fuzzy number $\widetilde{A}$ and $\widetilde{B}$ is calculated as

$$d\left(\widetilde{A}, \widetilde{B}\right) = \sqrt{\frac{1}{3}\left[\left(a_1 - b_1\right)^2 + \left(a_2 - b_2\right)^2 + \left(a_3 - b_3\right)^2\right]} \tag{11}$$

For example, Fig. 2 shows three fuzzy numbers $\widetilde{A}$ = (1.2, 3.5, 5.2), $\widetilde{B}$ = (2, 4.8, 7.3) and $\widetilde{C}$ = (5.3, 8.2, 9.8). Based on the above Eq. (11), the distance measurement can be computed as

$$d\left(\widetilde{A}, \widetilde{B}\right) = \sqrt{\frac{1}{3}\left[\left(1.2 - 2\right)^2 + \left(3.5 - 4.8\right)^2 + \left(5.2 - 7.3\right)^2\right]} = 1.4988$$

$$d\left(\widetilde{A}, \widetilde{B}\right) = \sqrt{\frac{1}{3}\left[\left(1.2 - 5.3\right)^2 + \left(3.5 - 8.2\right)^2 + \left(5.2 - 9.8\right)^2\right]} = 4.4743$$

3. INITIAL EVALUATION OF THE BEST SOLAR CELL PRODUCT

A hierarchical analysis structure (see Fig. 3) for tackling the problems of evaluating the best solar cell product using TOPSIS in a fuzzy environment is constructed in this section.

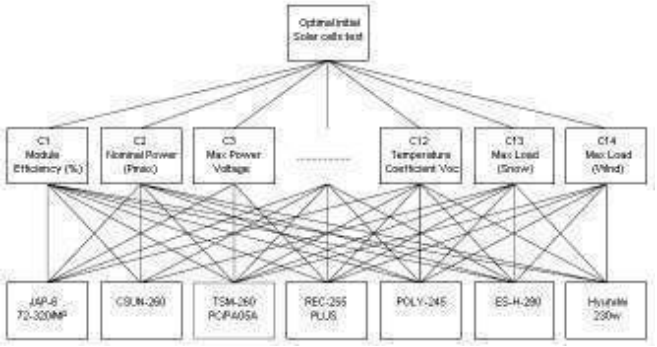


Fig. 3. The hierarchical model of evaluating the best solar cell product.

The content consists of three subsections, investigating the evaluation criteria, determining the importance weights of criteria and applying TOPSIS to obtain performance value of each solar cell product for ranking.

3.1. Investigating the evaluation criteria

The performance criteria for evaluating initial solar cell product were derived through widespread investigation and consultation with several experts, including three PhD students, one professor, and five

Technology Managers in TeleNet Company. Based on the literature review the opinions of these experts were used to yield the major 15 evaluation criteria in this study, which are briefly described in Table 3.

3.2. Determine the importance weights of evaluation criteria

Chen and Tzeng (2004) noted that the weights of criteria in decision-making problems have different meanings, and not all of them can be assigned equal importance. To resolve this issue, several methods can be utilized to determine the weights, including AHP (or fuzzy AHP), entropy analysis, and weighted least square method.

Suppose that a decision group has *k* members; take $\widetilde{W}_j^k$ to represent the fuzzy weight of j^{th} criterion assessed by k^{th} evaluator. To integrate the different opinions of evaluators, this study adopted the synthetic value notation to aggregate the subjective judgment for *k* evaluators, given by

$$\widetilde{w}_j = \frac{1}{k}\left(w_j^{-1} + w_j^{-2} + ... + w_j^{-k}\right) \tag{12}$$

3.3. Fuzzy TOPSIS in deriving the crisp performance values of alternatives

Hwang and Yoon (1981) originally proposed the order performance technique based on similarity to ideal solution (TOPSIS), in which the chosen alternative should not only have the shortest distance from the positive ideal reference point (PIRP), but also have the longest distance from the negative ideal reference point (NIRP), to solve the MCDM problems. Algorithms of this method are described as follows.

3.3.1. Construct the fuzzy decision matrix

Given *m* alternatives, *n* criteria and *k* decision-makers, a typical fuzzy multi-criteria group decision-making problem can be expressed in matrix format as

$$\widetilde{D} = \begin{array}{c} \\ A_1 \\ A_2 \\ . \\ . \\ . \\ A_m \end{array} \begin{array}{c} \begin{array}{cccccc} C_1 & C_2 & . & . & . & C_n \end{array} \\ \begin{bmatrix} \widetilde{x}_{11} & \widetilde{x}_{12} & . & . & . & \widetilde{x}_{1n} \\ \widetilde{x}_{21} & \widetilde{x}_{22} & . & . & . & \widetilde{x}_{2n} \\ . & . & . & . & . & . \\ . & . & . & . & . & . \\ . & . & . & . & . & . \\ \widetilde{x}_{m1} & \widetilde{x}_{m2} & . & . & . & \widetilde{x}_{mn} \end{bmatrix} \end{array}, \quad i = 1,2,...,m;\ j = 1,2,...,n \tag{13}$$

where $A_1, A_2, ...A_m$ are the alternatives to be chosen, $C_1, C_2, ...C_n$ denote the evaluation criteria, $\widetilde{x}_{ij}$ represents the rating of alternative A_i with respect to criterion C_j evaluated by *k* evaluators.

Perception toward solar cells varies in accordance with their individual experience, intuition or knowledge, this study applies the method of average value to integrate the fuzzy performance score $\widetilde{x}_{ij}$ for *k* evaluators concerning the same evaluation criteria, where x_{ij}^{-k} is the rating of alternative A_i with respect to criterion C_j evaluated by k^{th} evaluator, and $x_{ij}^{-k} = \left(a_{ij}^k, b_{ij}^k, c_{ij}^k\right)$, and that is $\widetilde{x}_{ij} = \frac{1}{k}\left(x_{ij}^{-1} + x_{ij}^{-2} + ... + x_{ij}^{-k}\right)$

(14)

3.3.2. Normalize the fuzzy decision matrix

The raw data are normalized to eliminate anomalies with different measurement units and scales in several MCDM problems. However, the purpose of linear scales transform normalization function used in this study is to preserve the property that the ranges of normalized triangular fuzzy numbers to be included in [0, 1]. If $\Re$ denotes the normalized fuzzy decision matrix, then

$$\Re = (\tilde{r}_{ij})_{min},\ i = 1,2,\ldots,m;\ j = 1,2,\ldots,n \tag{15}$$

where $\tilde{r}_{ij} = \left(\frac{a_{ij}}{c_j^+}, \frac{b_{ij}}{c_j^+}, \frac{c_{ij}}{c_j^+}\right)$, $c_j^+ = max c_{ij}$ (16)

3.3.3. Construct weighted normalized fuzzy decision matrix

Considering the different weight of each criterion, the weighted normalized decision matrix can be computed by multiplying the importance weights of evaluation criteria and the values in the normalized fuzzy decision matrix. The weighted matrix $\tilde{V}$ defined as

$$\tilde{V} = \left(\tilde{v}_{ij}\right)_{min}, i = 1,2,\ldots,m;\ j = 1,2,\ldots,n \tag{17}$$

$\tilde{v}_{ij} = \tilde{r}_{ij} \times \tilde{w}_j$ where $\tilde{w}_j$ represents the importance weight of criterion C_j . (18)

3.3.4. Determine the FPIRP and FNIRP

Because the positive triangular fuzzy numbers are included in the interval [0, 1], the fuzzy positive ideal reference point (*FPIRP*, A^+) and fuzzy negative ideal reference point (*FNIRP*, A^-) hence can be defined as

$$A^+ = \left(\tilde{v}_1^+, \tilde{v}_2^+, \ldots, \tilde{v}_n^+\right) \tag{19}$$

$$A^- = \left(\tilde{v}_1^-, \tilde{v}_2^-, \ldots, \tilde{v}_n^-\right) \tag{20}$$

where $\tilde{v}_j^+ = (1,1,1)$ and $\tilde{v}_j^- = (0,0,0), j = 1,2,\ldots,n$.

3.3.5. Calculate the distances of each initial solar cell to FPIRP and FNIRP

The distance of each initial solar cells test product from fuzzy positive ideal reference point and fuzzy negative ideal reference point can be derived respectively as

$$d_i^+ = \sum_{j=1}^{n} d\left(\tilde{v}_{ij}, \tilde{v}_j^+\right),\ i = 1,2,\ldots,m;\ j = 1,2,\ldots,n \tag{21}$$

$$d_i^- = \sum_{j=1}^{n} d\left(\tilde{v}_{ij}, \tilde{v}_j^-\right),\ i = 1,2,\ldots,m;\ j = 1,2,\ldots,n \tag{22}$$

where $d\left(\tilde{v}_a, \tilde{v}_b\right)$ denotes the distance measurement between two fuzzy numbers, d_i^+ represents the distance of alternative A_i from FPIRP, and d_i^- is the distance of alternative A_i from FNIRP.

3.3.6. Obtain the closeness coefficient and rank the order of alternatives

The closeness coefficient of each alternative is calculated as

$$CC_i = \frac{d_i^-}{d_i^+ + d_i^-}, i = 1,2,\ldots,m \tag{23}$$

4. EMPIRICAL CASE OF ASSESSING TECHNOLOGICAL INNOVATION SYSTEMS FOR SOLAR CELL PRODUCTS

Info TeleNet Group located in Serbia wishing to purchase the best solar cell product from among seven available solar cell producer, namely JAP6-320, SCUN-260, TSM-260, REC-255, POLY-245, ES-H-280 and HUNDAI-230. TeleNet R&D Office asked an evaluation committee to comprising 7 initial solar cells based on 15 performance criteria.

4.1. Calculate the synthetic importance weights of evaluation criteria

The 9 representatives were requested to express their perceptions level of importance for each evaluation criterion in linguistic variables according to the linguistic scales shown in Table 1. An integrated fuzzy importance weight matrix for evaluation criteria was generated using the method of average value described in Eq. (12), and is presented in Table 2. The BNP values presented in Table 2 reveal that the five most important performance criteria for assessing solar cells test product.

Table 1. Linguistic scales for the importance weight of each criterion

Linguistic variable	Corresponding triangular fuzzy number		
Very Low (VL)	0,0	1,0	3,0
Low (L)	1,0	3,0	5,0
Medium (F)	3,0	5,0	7,0
High (H)	5,0	7,0	9,0
Very High (VH)	7,0	9,0	10,0

Note: This table is the linguistic scales and their corresponding fuzzy numbers defined by Wang and Chang (1995), and fuzzy numbers used in Chen (2000).

Table 2. The fuzzy important weight, BNP and rank of each criterion

	Fuzzy importance weight W_j			BNP	Rank
C1	0,4199	0,6200	0,8066	0,6155	**8**
C2	0,4733	0,6733	0,8599	0,6688	**5**
C3	0,5666	0,7666	0,9199	0,7510	**2**
C4	0,4466	0,6466	0,8199	0,6377	**7**
C5	0,5133	0,7133	0,8799	0,7022	**4**
C6	0,5799	0,7799	0,9333	0,7644	**1**
C7	0,5399	0,7399	0,9066	0,7288	**3**
C8	0,4733	0,6733	0,8466	0,6644	**6**
C9	0,3999	0,5933	0,7733	0,5888	**12**
C10	0,4199	0,6199	0,7999	0,6132	**9**
C11	0,4066	0,6066	0,7933	0,6022	**10**
C12	0,4066	0,6066	0,7866	0,5999	**11**
C13	0,3799	0,5799	0,7799	0,5799	**13**
C14	0,3799	0,5800	0,7666	0,5755	**14**
C16	0,3799	0,5800	0,7666	0,5755	**14**

4.2. Construct the fuzzy decision matrix

First the evaluators adopted linguistic terms (Table 1), including ‘‘very poor’’, ‘‘poor’’, ‘‘fair’’, ‘‘good’’, ‘‘very good’’ to express their opinions about the rating of every solar cell performance criteria, listed in Table 3.

Table 3. Technological performance data of seven Polycrystalline Silicon Solar Panel type

Criteria	**Panel Specifications**						
(Electrical Details)	**JAP-6 72-320**	**SUN 260-60**	**TSM 260**	**REC255 PLUS**	**POLY 245**	**ES-H 280**	**Hyundai 230**
Module Efficiency (%)	16.51	16.02	15.9	15.5	14.6	14.31	14.2
Nominal Power (Watts)	320	260	260	255	245	280	230
Max Power (Volts)	37.62	30.60	31.30	30.60	30.60	35.71	29.40
Max System Voltage (Volts)	1000	1000	1000	1000	600	600	1000
Max Power Current (Amps)	8.51	8.50	8.31	8.34	8.02	7.87	7.90
Open Circuit Voltage (Volts)	45.98	38.00	38.20	38.00	37.50	44.06	36.90
Short Circuit Current (Amps)	8.89	9.01	9.02	8.89	8.62	8.55	8.40
Cell Configuration	72	60	60	20	60	36	60
Normal Operating Cell (NOCT)	46 °C	46 °C	46 °C	46.9 °C	45.5 °C	46 °C	46 °C
Temperature Coef. (%/°C)	-0.44	-0.50	-0.41	-0.36	-0.44	-0.43	-0.44
Temperature Coef. (%/°C)	0.06	0.06	0.05	0.02	0.04	0.05	0.05
Temperature Coef. (%/°C)	-0.34	-0.37	-0.32	-0.26	-0.32	-0.31	-0.34
Max Load Snow (Pa)	5400	5400	5400	5400	5400	3828	5400
Max Load Wind (Pa)	2400	2400	2400	2400	5400	3828	2400
Weight (Kg)	22.50	19.10	19.50	18.00	18.80	23.40	19.00

The fuzzy performance ratings of each solar cells candidate regarding evaluation criteria were averaged to synthesize the various individual judgments. With Eq. (14), the synthetic fuzzy decision matrix can be computed as in Table 4.

4.3. Normalize the fuzzy decision matrix

To ensure that the normalized triangular fuzzy numbers were included in the interval [0,1], linear scale transform functions were utilized in this study. By applying Eqs. (15) and (16), the synthetic fuzzy decision matrix were normalized, and the results are shown in Table 5.

4.4. Establish the weighted normalized fuzzy decision matrix

Since the importance weights of criteria are different, the weighted normalized fuzzy decision matrix can be obtained using Eqs. (17) and (18), and the results are presented in Table 7. For instance, consider the fuzzy numbers (0.22, 0.48, 0.81) of alternative A_1 with respect to criterion C_1 listed in Table 7:

$0.22 = 0.52 \times 0.42$; $0.48 = 0.77 \times 0.62$; $0.81 = 1.00 \times 0.81$

Table 4. The fuzzy decision matrix of seven solar cells candidate regarding each criterion

	A1			A2			A3			A4			A5			A6			A7			Max
C1	1,470	2,170	2,823	1,320	1,949	2,535	1,290	1,904	2,477	1,050	1,550	2,017	0,870	1,284	1,671	0,780	1,151	1,498	0,660	0,974	1,268	**2,823**
C2	1,927	2,741	3,501	1,826	2,597	3,317	1,826	2,597	3,317	2,096	2,982	3,808	1,657	2,357	3,010	1,995	2,837	3,624	1,082	1,539	1,965	**3,808**
C3	2,266	3,066	3,680	1,862	2,519	3,023	1,902	2,574	3,088	2,185	2,957	3,548	1,862	2,519	3,023	2,307	3,121	3,745	1,133	1,533	1,840	**3,745**
C4	2,169	3,141	3,982	2,169	3,141	3,982	2,169	3,141	3,982	2,169	3,141	3,982	1,659	2,402	3,045	1,659	2,402	3,045	2,169	3,141	3,982	**3,982**
C5	1,797	2,497	3,080	1,797	2,497	3,080	1,613	2,242	2,765	1,503	2,089	2,577	1,503	2,089	2,577	1,357	1,885	2,325	1,357	1,885	2,325	**3,080**
C6	2,237	3,008	3,600	1,947	2,618	3,133	1,947	2,618	3,133	2,278	3,064	3,667	1,905	2,563	3,067	2,527	3,398	4,067	1,325	1,783	2,133	**4,067**
C7	2,275	3,118	3,821	2,352	3,224	3,950	2,352	3,224	3,950	1,813	2,484	3,044	2,082	2,854	3,497	1,735	2,378	2,914	2,005	2,748	3,367	**3,950**
C8	2,096	2,982	3,749	2,096	2,982	3,749	2,096	2,982	3,749	1,217	1,731	2,177	2,096	2,982	3,749	1,690	2,405	3,024	2,096	2,982	3,749	**3,749**
C9	1,628	2,416	3,148	1,628	2,416	3,148	1,485	2,204	2,872	1,600	2,373	3,093	1,771	2,627	3,425	1,628	2,416	3,148	1,628	2,416	3,148	**3,425**
C10	1,770	2,612	3,371	1,860	2,745	3,542	1,560	2,302	2,971	1,530	2,258	2,914	1,590	2,347	3,028	1,590	2,347	3,028	1,440	2,125	2,743	**3,542**
C11	1,162	1,733	2,267	1,394	2,080	2,720	1,162	1,733	2,267	0,639	0,953	1,247	0,929	1,387	1,813	1,307	1,950	2,550	1,162	1,733	2,267	**2,720**
C12	0,987	1,473	1,910	1,220	1,820	2,360	0,813	1,213	1,573	0,639	0,953	1,236	0,755	1,127	1,461	0,726	1,083	1,405	0,784	1,170	1,517	**2,360**
C13	1,465	2,237	3,008	1,465	2,237	3,008	1,465	2,237	3,008	1,465	2,237	3,008	1,465	2,237	3,008	0,814	1,243	1,671	1,330	2,030	2,730	**3,008**
C14	0,923	1,409	1,862	0,923	1,409	1,862	0,923	1,409	1,862	0,923	1,409	1,862	1,628	2,486	3,285	1,167	1,781	2,355	0,923	1,409	1,862	**3,285**
C15	1,492	2,279	3,012	1,248	1,906	2,519	1,248	1,906	2,519	1,113	1,699	2,245	1,275	1,947	2,574	0,868	1,326	1,752	1,058	1,616	2,136	**3,012**

Table 5. The fuzzy normalized decision matrix of seven solar cells candidate

	A1			A2			A3			A4			A5			A6			A7		
C1	0,521	0,769	1,000	0,468	0,690	0,898	0,457	0,674	0,877	0,372	0,549	0,714	0,308	0,455	0,592	0,276	0,408	0,531	0,234	0,345	0,449
C2	0,506	0,720	0,919	0,480	0,682	0,871	0,480	0,682	0,871	0,550	0,783	1,000	0,435	0,619	0,790	0,524	0,745	0,952	0,284	0,404	0,516
C3	0,605	0,819	0,983	0,497	0,673	0,807	0,508	0,687	0,825	0,583	0,790	0,947	0,497	0,673	0,807	0,616	0,833	1,000	0,303	0,409	0,491
C4	0,545	0,789	1,000	0,545	0,789	1,000	0,545	0,789	1,000	0,545	0,789	1,000	0,417	0,603	0,765	0,417	0,603	0,765	0,545	0,789	1,000
C5	0,583	0,811	1,000	0,583	0,811	1,000	0,524	0,728	0,898	0,488	0,678	0,837	0,488	0,678	0,837	0,441	0,612	0,755	0,441	0,612	0,755
C6	0,550	0,740	0,885	0,479	0,644	0,770	0,479	0,644	0,770	0,560	0,753	0,902	0,468	0,630	0,754	0,621	0,836	1,000	0,326	0,438	0,524
C7	0,576	0,789	0,967	0,595	0,816	1,000	0,595	0,816	1,000	0,459	0,629	0,771	0,527	0,723	0,885	0,439	0,602	0,738	0,508	0,696	0,852
C8	0,559	0,795	1,000	0,559	0,795	1,000	0,559	0,795	1,000	0,325	0,462	0,581	0,559	0,795	1,000	0,451	0,642	0,807	0,559	0,795	1,000
C9	0,475	0,705	0,919	0,475	0,705	0,919	0,434	0,644	0,839	0,467	0,693	0,903	0,517	0,767	1,000	0,475	0,705	0,919	0,475	0,705	0,919
C10	0,500	0,737	0,952	0,525	0,775	1,000	0,440	0,650	0,839	0,432	0,637	0,823	0,449	0,663	0,855	0,449	0,663	0,855	0,407	0,600	0,774
C11	0,427	0,637	0,833	0,513	0,765	1,000	0,427	0,637	0,833	0,235	0,350	0,458	0,342	0,510	0,667	0,481	0,717	0,938	0,427	0,637	0,833
C12	0,418	0,624	0,809	0,517	0,771	1,000	0,344	0,514	0,667	0,271	0,404	0,524	0,320	0,478	0,619	0,308	0,459	0,595	0,332	0,496	0,643
C13	0,487	0,744	1,000	0,487	0,744	1,000	0,487	0,744	1,000	0,487	0,744	1,000	0,487	0,744	1,000	0,271	0,413	0,556	0,442	0,675	0,908
C14	0,281	0,429	0,567	0,281	0,429	0,567	0,281	0,429	0,567	0,281	0,429	0,567	0,496	0,757	1,000	0,355	0,542	0,717	0,281	0,429	0,567
C15	0,495	0,757	1,000	0,414	0,633	0,836	0,414	0,633	0,836	0,370	0,564	0,745	0,423	0,646	0,855	0,288	0,440	0,582	0,351	0,537	0,709

Table 6. The fuzzy weighted normalized decision matrix of seven solar cells candidate

	A1			A2			A3			A4			A5			A6			A7		
C1	0,219	0,477	0,807	0,196	0,428	0,724	**0,192**	0,418	0,708	0,156	0,340	0,576	**0,129**	0,282	0,477	0,116	0,253	0,428	0,098	0,214	0,362
C2	0,240	0,485	0,791	0,227	0,459	0,749	0,227	0,459	0,749	0,261	0,527	0,860	0,206	0,417	0,680	0,248	0,502	0,818	0,134	0,272	0,444
C3	0,343	0,628	0,904	0,282	0,516	0,743	0,288	0,527	0,759	0,331	0,605	0,872	0,282	0,516	0,743	0,349	0,639	0,920	0,171	0,314	0,452
C4	0,243	0,510	0,820	0,243	0,510	0,820	0,243	0,510	0,820	0,243	0,510	0,820	0,186	0,390	0,627	0,186	0,390	0,627	0,243	0,510	0,820
C5	0,299	0,578	0,880	0,299	0,578	0,880	0,269	0,519	0,790	0,250	0,484	0,736	0,250	0,484	0,736	0,226	0,437	0,664	0,226	0,437	0,664
C6	0,319	0,577	0,826	0,278	0,502	0,719	0,278	0,502	0,719	0,325	0,588	0,842	0,272	0,491	0,704	0,360	0,652	0,933	0,189	0,342	0,489
C7	0,311	0,584	0,877	0,321	0,604	0,907	0,321	0,604	0,907	0,248	0,465	0,699	0,285	0,535	0,803	0,237	0,445	0,669	0,274	0,515	0,773
C8	0,265	0,536	0,847	0,265	0,536	0,847	0,265	0,536	0,847	0,154	0,311	0,492	0,265	0,536	0,847	0,213	0,432	0,683	0,265	0,536	0,847
C9	0,190	0,419	0,711	0,190	0,419	0,711	0,173	0,382	0,648	0,187	0,411	0,698	0,207	0,455	0,773	0,190	0,419	0,711	0,190	0,419	0,711
C10	0,210	0,457	0,761	0,221	0,480	0,800	0,185	0,403	0,671	0,181	0,395	0,658	0,188	0,411	0,684	0,188	0,411	0,684	0,171	0,372	0,619
C11	0,174	0,386	0,661	0,208	0,464	0,793	0,174	0,386	0,661	0,096	0,213	0,364	0,139	0,309	0,529	0,195	0,435	0,744	0,174	0,386	0,661
C12	0,170	0,379	0,637	0,210	0,468	0,787	0,140	0,312	0,524	0,110	0,245	0,412	0,130	0,290	0,487	0,125	0,278	0,468	0,135	0,301	0,506
C13	0,185	0,431	0,780	0,185	0,431	0,780	0,185	0,431	0,780	0,185	0,431	0,780	0,185	0,431	0,780	0,103	0,240	0,433	0,168	0,391	0,708
C14	0,107	0,249	0,435	0,107	0,249	0,435	0,107	0,249	0,435	0,107	0,249	0,435	0,188	0,439	0,767	0,135	0,314	0,550	0,107	0,249	0,435
C15	0,188	0,439	0,767	0,157	0,367	0,641	0,157	0,367	0,641	0,140	0,327	0,571	0,161	0,375	0,655	0,109	0,255	0,446	0,133	0,311	0,544

Table 7. The closeness coefficient and rank of seven solar cells candidate

	Solar Cells	di^+	di^-	CCi	Rank
A1	JAP6	8,351	8,074	0,492	1
A2	SUN	8,443	7,947	0,485	2
A3	TSM-260	8,765	7,479	0,460	3
A4	REC255	9,209	6,896	0,428	5
A5	POLY	8,960	7,214	0,446	4
A6	ESH	9,210	6,880	0,428	6
A7	HYUNDAI	9,652	6,325	0,396	7

4.5. Calculate the distance of each solar cell to FPIRP and FNIRP

Eqs. (11) and (21)–(22) respectively derive the distance of each solar cell candidate to the fuzzy positive and fuzzy negative ideal reference point, as shown in Table 8. Take d_1^- and d_1^- as shown in Table 7.

4.6. Obtain the closeness coefficient for ranking of seven initial solar cells

Once the distances of solar cells from FPIRP and FNIRP are determined, the closeness coefficient can be obtained with Eq. (23). The index CC_2 for second candidate solar cell is calculated as:

$$CC_2 = \frac{7.947}{8.443 + 7.947} = 0.485$$

A solar cell candidate with a closeness coefficient close to 1 has the shortest distance from the fuzzy positive ideal reference point, and the largest distance from the fuzzy negative ideal reference point. In other words, a large closeness coefficient of solar cell indicates good performance. Table 8 shows the seven initial solar cell product in accordance with the closeness coefficient. Therefore, their ascending rank is substituted as follows: $CC_1 > CC_2 > CC_3 > CC_5 > CC_4 > CC_6 > CC_7$.

That is, JAP-320 (0.492) > SUN-260 (0.485) > TSM-260 (0.460) > POLY-245 (0.446) > REC-255PE (0.428) > ESH-280 (0.428) > HYUNDAI-230 (0.396).

The **JAP6-320** having the largest closeness coefficient value, is the best among the even initial solar cells.

5. CONCLUSION AND SUGGESTION

This study, presenting a scientific framework to assess solar cells product, uses triangular fuzzy numbers to express linguistic variables that consider the subjective judgments of evaluators and then adopts fuzzy multiple criteria decision-making approach to synthesize the group decision.

TOPSIS extended to a fuzzy environment is utilized to determine overall performance value and rank of the solar cells. The importance weight ranking of the evaluation criteria demonstrate that the operation and account managers are very concerned about the technological performance criteria, such as open circuit voltage (V_{oc} , max. power (V_{mpp}), short circuit current (I_{sc}), max. power current (I_{mpp}), and nominal power (P_{max}), of initial the best solar cell product. This information improves the better understand about the critical performance criteria that should be considered when buying initial solar cell.

REFERENCES

Aouam, T., Chang, S. I., and Lee, E. S., 2003. Fuzzy MADM: an outranking method. *European Journal of Operational Research*, 145 (2), 317–328.

Chen, M. F., and Tzeng, G. H., 2004. Combing Grey relation and TOPSIS concepts for selecting an expatriate host country. *Mathematical and Computer Modelling*, 40, 1473–1490.

Chen, C. T., 2000. Extensions of the TOPSIS for group decision-making under fuzzy environment. *Fuzzy Sets and Systems*, 114, 1–9.

Chu, T. C., and Lin, Y. C., 2003. A fuzzy TOPSIS method for robot selection. *International Journal of Advanced Manufacturing Technology*, 21 (4), 284–290.

Deng, H., Yeh, C. H., and Willis, R. J., 2000. Inter-company comparison using modified TOPSIS with objective weights. *Computers & Operations Research*, 27, 963–973.

Mamlook, R., Akash, B. A., and Nijmeh, S., 2001. Fuzzy sets programming to perform evaluation of solar systems in Jordan. *Energy Conversion and Management*, 42(14), 1717-1726.

Wang, Tien-Chin, and Chang, 2007. Application of TOPSIS in evaluating initial training aircraft under a fuzzy environment. *Expert Systems with Applications* 33, 4 870-880.

4th International Symposium on Natural Resources Management
"Sustainable Development and Green Economy in Transition Countries"
31st May – 1st June, 2014, Faculty of Management Zajecar, Republic of Serbia
www.fmz.edu.rs

GREEN ECONOMY IN THE EUROPEAN UNION AND THE RELATIONSHIP WITH BOSNIA AND HERZEGOVINA

Milinko Ranilović[1],
Mirjana Ranilović[2]
Danijela Ranilović[3]

[1]*International University of Travnik, Travnik, email: milinko.ranilovic@gmail.com*
[2]*International University of Travnik, Travnik, email: mirjana.ranilovic@gmail.com*
[3]*International University of Travnik, Travnik, email: danijela.ranilovic@gmail.com*

ABSTRACT

Energy is essential for development of any country. Without adequate energy sector policy, it is not possible to achieve industrial and economic progress. But as far as energy was important for development, it is only a mechanism towards achieving the ultimate goals - a sustainable economy, a clean environment, high standard of living, prosperity and health of the population.

Therefore, it is important that decision-makers and policy-makers understand the implications and effects of different energy pogrom, alternative policies, strategies, plans and modeling of the energy sector and the impact of their policies on the population.

KEYWORDS

Energy, green economy, environment, objectives, standards of living.

1. INTRODUCTION

Energy indicators and data, when properly interpreted and analyzed, can serve the civilian sector and the public as an argument for dialogue with policy-makers. Indicators related to the production and consumption sectors, can be used to analyze the factors that affect the energy, environment, economy and social well-being, and how these may be affected in order to improve the trend. They can also be used for the monitoring of implemented policies and to assist in the modeling of current and future strategies. However, policies in the energy sector can not be explained without a critical analysis of the consequent - causal factors that are related to the problems of structurally management energy sector.

The following brief analysis of the energy sector in Bosnia and Herzegovina we will present indicators that tell us about how the BiH energy is produced and consumed, to be with her and managed by the perspectives development and implications for the citizens , as the road is selected , and depending on the chosen model of management energy sector.

2. BODY OF PAPER

In order trends of European and global energy sector was clear, it is necessary to reflect on the current practice of planning and development of energy systems (Couture, Gagnon, 2010). In the past , it was mainly

based on the so-called optimization model - investing in the energy sector depended on the minimization of financial cost , are invested where there is already a certain infrastructure or certain natural resources to production was as large as possible , as to the level of technological capacity allows .

The Eastern bloc countries electricity prices were liberalized to the same extent as in the West - they were more social, subsidized by the state. At about the same times when Western countries decided to devote more attention to renewable energy sources and even subsidize producers (and consumers) of renewable energy to reduce environmental pollution, stimulate innovation and increase energy security, the former Eastern Bloc countries began the liberalization of the energy market, which among other things resulted in a price increase in electricity prices (International Energy Agency, 2008).

Clearly, the long-standing policy of social subsidies proved to be not only unsustainable, but also long lasting. Subsidizing electricity prices , the cost of heating or power generation cost only means that the cost of shifting the burden of citizens through lower investment in infrastructure, the modernization drive, and less investment in other sectors of the economy or the social services. Thus, the Eastern Bloc countries significantly retarded in the technological development and the level of investment in the energy sector, which, among other things, cause a lower standard of living in these countries. The changes that have occurred through the liberalization of markets and raising energy prices have hit the already impoverished population, but they were necessary in order to keep up with development countries. On the other hand, subsidizing the price of a large impact (non-transparent) state planning of the energy sector have not resulted in establishing a stimulating environment for private investment, technological innovation, cross - sectoral networking and sustainable development. In addition, emissions of CO2 in the poorer countries of the Eastern bloc remained at a level that has long been obsolete in Western Europe.

The reduction of CO2 emissions and investment in renewable energy often have a secondary role in the public debate and strategic goals of political authority in transition countries for the simple reason that policy change requires a change in the established paradigm and the vicious circle of public goods in a system where there is no clear separation between the executive , judicial and legislative powers on the one hand, and the monopoly on the other side, and consequently no mechanisms for transparency , accountability and sanctions for misuse of public resources (IMF, 2003).

So on one hand we have the developed countries where the cost of electricity , heating and other energy lower than in countries in transition , in relative and absolute terms , although it is based on the market , not on subsidies, and , on the other hand, we have countries that are brought into a situation that is only now liberalize prices . In addition, these countries are lagging behind in the situation that they have to import new technologies for renewable and clean energy sources for the West or import "clean " but costly natural gas from the East, from Russia, which in fact may be the need to use energy dependence on countries which delivers gas for political favors (UNDP, 2007).

Internationally active commitment to reducing pollution and unsustainable current policy creates an increasing need for the production and use of renewable, clean sources of energy. Countries that do not have or do not produce this technology and have no local capacity for innovation that leads to new technologies, will have to import them , which further hinders their development because the price of imports and transfers of money abroad rather than in the domestic economy , we must add the cost of transportation, production, distribution, consumption, social costs of brain drain towards developed countries , political conditionality and the like.

Thus, we can conclude that there are three general scenarios that are imposed in the policy of the energy sector, namely:

- The scenario under which a country is investing in renewable energy and energy efficiency in order to rationalize spending and strengthen the local capacity of energy production as much as allow climatic and geographical and technological conditions (green economy) ;
- The scenario under which the energy strategy is based largely on imports of clean energy sources such as natural gas and expensive technologies produced abroad , and
- Scenario "business as usual" under which continues with politics as usual , and as in the case of BiH means a disproportionate exploitation of lignite , low energy efficiency , subsidizing unprofitable power plants , and non-performance of obligations arising from ECSEE (Energy Community of South East Europe / Energy Community of South East Europe) (Energy Community, 2008).

2.1 . Indicators for BiH

Let us now turn to the energy sector in BiH. One common indicator of the situation in the energy sector, energy intensity . Energy intensity is generally silent on how the energy is used to make a single product. What is an energy intensity of a country's smaller , it is the production and use of more efficient saver - less is being spent to make something prozvelo . More accurate indicator of the energy intensity of gross domestic product, for example, how much energy is consumed to the country's economy produced $ 1,000 of GDP. Again, a lower level of energy intensity implies a relatively efficient way of producing a higher marginal profit. According to the World Bank, the energy intensity in BiH is very high and is estimated to amount to 0.77 tons per $ 1,000 of GDP. By comparison, this is four times more than the average in the European Union and the member states of the OECD. The European country average for the same amount spent saver produce four times more than the national income BiH. Annual consumption of power with per capita amounts to about 2.320kWh , while inpatient spending in the EU about 6,145 kWh per capita as a result of the low standard of living and low levels of economic activity (Kovacevic, 2010).

High energy intensity indicates high losses amount to about 40% of the total energy produced. For example, the energy mix of energy sources in BiH is divided into about 45 % of the sources from hydropower and 55 % of the sources of poor quality coal - lignite. This ratio in the Federation is even more striking, 65 % to under 35 % in favor of coal. The average price of coal by power plants pay when purchasing are not sufficient to cover the operating costs of the mine that are great for low labor productivity (0.4 tons per year of production per employee in FBiH) and the use of obsolete equipment . The World Bank is still 2004th was estimated that the mine has 60 % of redundancy, so that the mines each year accumulated losses in manufacturing, which is not sufficient to cover the cost (acquisition price paid by coal power plants according to the analysis of the World Bank in 2004 was 1.80 Euro per GJ and market price of 2:00 Euro per GJ , and this difference is paid by the state through subsidies) . As a result, the mining industry is not able to pay pension insurance or modernization in such operations. Differences and compensate for these losses paid by the state through subsidies lignite mining industry, as well as plants for their enormous losses. These are actually hidden costs built into the price of electricity and heating paid by the citizens. Furthermore, the exploitation of lignite has a very negative impact on the environment as pollution and acidification of the soil, so the air pollution and climate change. Soil pollution threatens the opportunity for the development of agriculture, polluting the water and natural resources and reduces the competitive advantage of tourism and sustainable development in rural areas. Indicator that tells us about the amount of pollution relative to the achievement of the gross domestic product is the Carbon intensity to GDP (CO2/GDP) that BiH has a value of 0.62 , while the EU 0.33 therefore energy production in BiH resulted in twice as much pollution than in the EU. BiH recorded large losses in energy distribution, also in the amount of 40 % of energy, mainly due to obsolete plants and technology in plants , and because of the lack of plants for combined heat and power (combined heat and power - CHP). And for these losses the state allocates subsidies (Energy Efficiency Road Map, 2011).

Finally, BiH recorded large losses in energy use. It is estimated that at least 30% of heating energy wasted due to poor insulation of residential buildings and private houses for the poor in quality of devices for firewood. More than 60 % of the population is used for heating the wood. When the price of electricity , oil and other energy sources increases, it increases the price of firewood, which is expensive in BiH than elsewhere in Europe, or the tree obtained by illegal deforestation, often high-quality wood . Again deforestation causes soil erosion and decreasing arable land, and the use of firewood and further polluting the environment and indoor living spaces. According to estimates, during the winter months, the average household is heated only about 10 square meters of living space, which is probably the minimum for survival, but using that much energy that the quality of living spaces and the use of better equipment for heating could heat about 40 square meters of living space, which is more than average living space in the EU. In addition, households in BiH pay a higher relative price of energy than households (EU PEEREA, Regular Review, 2008).

So to sum up energy in BiH comes from a disproportionately large share of coal, which has a negative impact on the productivity and efficiency of all sectors of the economy. Lignite production involves digging overburden and coal. Excavation, transport and disposal of overburden and coal in BiH proizovodi higher traffic volume than the entire agriculture, industry, households and imports expensive. If the lignite mines in BiH to the level of productivity and the use of machinery such mines in the EU, they would dig up the same

number of tons of material, but it would represent 3-4 times less energy because the energy content of lignite many times less than that of coal, which is the mainstay of the energy industry in the EU. Measured in energy units, the productivity of the mine would still four times lower. The backlog in productivity than 4 times in such a large part of the economy suggests that the economy of Bosnia and Herzegovina would have comparable overall productivity even when all other industries have productivity above the EU average.

This in turn makes it difficult to balance the foreign trade balance. As much as loans provided to encourage the development or adopt measures to boost exports that would not be enough to compensate for the economic loss. Energy intensity indicators tell us that the energy that would be produced in Europe at $ 1,000 national product in BiH produces about $ 250. In addition, these countries imported energy-intensive products, copper, steel, aluminum, etc., while BiH these products are exported. There are no reliable data and analysis, but it is easy to conclude that I would probably in the export of these products achieved a net loss. Most of the gross national product of $ 250 is a trading profit on imports of consumer goods and the profit of foreign banks operating in BiH, and not a result of actual production. This is confirmed by the large foreign trade deficit which BiH has from year to year. Energy production in BiH, as it is irrational directed , produced only a fraction of the value that is the same amount saver achieved in the EU . If the effort to dig and transport coal was directed to an industrial production, BiH would be able to significantly improve its gross national product.

Furthermore, the plants are burned gas and produces hot water that is transported to the building that need two times more energy per square meter of the building in the European Union. The total capacity is used for about 10 to 15 % of the available time. This form of heat energy could simultaneously produce and electricity (CHP combined), but in BiH reduced to hot water radiators. Plant in BiH are under the direction of 11 companies that are all owned by municipalities. Municipalities set tariffs below market prices and pay more for gas than households, leading to further deteoraciji services and infrastructure. For the entire circuit energy inefficient production and consumption citizens pay extremely high hidden costs. Electricity bill or heating does not reflect this price. When a citizen pays the shadow price of the budget subsidies and sub-optimal investment in the whole cycle of production, distribution and consumption sectors, it remains less money available for food , education, health , as well as the investment in better equipment and an energy efficiency of housing . Thus the cycle of poverty continues. The prices for the consumers on the other hand are the motivation for Investor to invest in renewable energy, and the country still lags behind the European average. Political power and financial institutions have little understanding of these problems and usually are passing the ball with their policies on international agreements signed on the liberalization of the market as this is the reason the more expensive tariffs, and the population is essentially not clear why and how energy prices rise or what could do about it (Simurdic, 2009).

So before BiH is crucial development dilemma. Continue to practice as before, which inevitably leads to economic collapse and misery guarantee future generations, or to change course and focus on market liberalization to attract investors in renewable energy saver, restructuring of production through modernization and the closure of unprofitable mines and power plants, and investment in energy efficiency. The prerequisite for this is structural reform in the sector under which here we mean a change of management in the energy sector, in line with the EU in the energy sector.

2.2 . Green economy 's EU accession and in connection with the Western Balkans

How important is energy policy at the EU level shows that attention is paid to this sector , not only through specific investments, but also by the strategies adopted , binding for all member states . Intervention economic measures adopted in recent years to combat the global economic crisis is largely concerned with just the "green economy" as a key driver of development , with special emphasis on sub- energy efficiency and renewable energy . Globally, it is enough to mention the data Bloombergovog research investment in renewable saver. According to these data, last year invested a record $ 243 billion. The biggest part is related to Chinese investments in renewable energy and European offshore wind farms, and a significant increase in small solar power plants across the European Union. This is compared to 2009 represents an increase of 30 %, with respect to the 2004th 500 % a year. The global economic crisis, which particularly affected the European Union, underscored two key things that have a significant impact on the strategic response of the European Commission. First, the economic crisis requires a unified political response to all member countries

, both at the strategic level of harmonization of energy policies , and to strengthen the unified voice of the EU -level negotiations with third countries, which proved to be particularly important nakog gas crisis with Russia , and second , the relative economic decline in the EU compared to the rest of the world that is expanding rapidly , requires intensification of investment in the green economy and faster binding of the European market , including better sharing of technology .

Therefore, a key component of this vision is the energy sector and the environment that can integrate the term " green economy " . This strategic vision includes the regions and countries of South-Eastern Europe and the Western Balkans (UNDP, 2007).

At the strategic level, there is a whole series of documents based on mutual co-ordinated policy of the EU:

- 2020;
- Energy 2020 - Energy Strategy for Europe 2011-2020;
- The package of energy infrastructure and communication on energy infrastructure priorities for 2020;
- Action Plan for Energy Efficiency, 2011;
- 2050 - The Road Map;
- Communication concerning external dimension of energy policy in 2011;
- The third package of liberalization of the energy market;
- The climate energy package;
- The package of energy security and efficiency, and
- The program of financial support for priority projects in the energy sector within the European recovery

.

The vision and main principles of EU policies in these documents could be summarized in the following points, namely (Energy Community. 2008):

a) Completing the internal energy market 2014;

b) No member state can not remain isolated in the energy policy of Europe , including the candidate countries and potential candidates , ie , no country can remain energetic island after the 2015th years;

c) The key objective is to focus on energy efficiency;

d) The introduction and implementation of a coordinated , common external energy policy ;

e) Integration of the neighboring countries to the east and south of Europe into a single energy market and the strengthening of cooperation with key partners to deliver energy EU ;

f) Continued expansion and diversification of portfolio and network of energy supply , and

g) The establishment of a unified data system of the EU and the mechanisms of information exchange on energy agreements with third countries until 1 january 2012.year.

Document 2020, and in particular the Road Map in 2050, most vividly is the direction in which the policy of the European (and global) energy sector to move. First of all, the strategies are conditioned by the policy of preserving the environment and climate (Energy Efficiency Road Map, 2011). This implies a large reduction in CO2 emissions and other environmental pollutants. In addition to the limits that already exist in most of the pollution emission, which is the result of the function of power plants, and gradually introduced mandatory reduction of greenhouse gas emissions for each country . International law is based on the emission of these gases compared to in 1990 year will be in 2050 year will be at least halved , which automatically causes the design and implementation of energy strategy that assumes strategic and structural changes in the production and use of energy.

2.3 . Attitude towards a green economy in BiH

Taking into account the main economic indicators for Bosnia and Herzegovina, including the level of unemployment, the quality of housing and infrastructure , state of the environment especially in large urban centers , the existing level of energy efficiency in industry , public buildings and households , the impact of rising electricity prices and energy to social vulnerable populations , and the state of health care , pension , education and the like, come to the conclusion that politics is geared towards a green economy in the context of poverty reduction and sustainable development is more important for BiH than in the average EU country .

In other words, the relative benefits of reform and investment in this area would be greater than in developed countries , while the price paid for the delay in reforms is extremely high.

However, in Bosnia and Herzegovina has no significant investment in renewable energy (OEI) , despite great potential. After a period of relative interest and the odd investment in small hydro, with the economic crisis further development of these infrastructure projects is stopped. Since the establishment of the entity regulatory commission issued a total of 17 permits for construction of small hydropower plants. According to the Regulatory Commission for Electricity in Federation of Bosnia and Herzegovina (FERC) issued 22 licenses and 10 preliminary permits for the construction of small hydro power plants. Energy Regulatory Commission of the Republic of Serbian approved a seven licenses for the production of electricity from small hydropower plants. Investors are not looking for licenses for the production of electricity from other renewable energy sources. The exception is the license for construction issued by the FERC for a small wind farm "Moštre 1" High . According to the regulations of FERC , any plant that produces electricity , including plants that generate energy for their own use , must obtain permission from the Regulatory Commission , so that the records FERC clearly shows that there was no interest in building a solar power plant or other biomass (ECFR, 2007) .

Regulation on the use of renewable energy sources and cogeneration (CHP) was adopted in mid- last year in the Federal Parliament (Official Gazette of BiH no. 36/10) regulates the so-called. feed -in tariffs for renewable energy, which increases the return on investment in renewable energy. However, of this regulation is not being implemented in practice, which hinders the further development of this sector (World Bank, 2008).

On the other hand, the current practice in Bosnia and Herzegovina is contrary to the provisions of the EU Directive. One example is this: the preparation for the construction of the mine and power plant in Duvno Congo, and to the "dirty" coal that has already been banned in Europe for years, are being intensified. The project, which should be finished 2013th, mine, according to plans, should have surface mines within a radius of 10 kilometers, depths up to 250 meters. The Plant Kongora should burn more than 3.5 million tons of lignite per year, the worst quality coal with high ash percentage, about 27 percent, sulfur 1 to 2 percent, high humidity and coal increased radioactivity. Gas emissions into the atmosphere would be omitted year between 2 and 3 million tons of CO2, 2500 tons of sulfur dioxide, 1,000 tons of nitrogen oxides, 300 tons of dust and 300 pounds of mercury. Within a radius of 50 kilometers would lead to thermal changes and pollution of groundwater in which Duvanj field a lot. All these alarming data provided in pre-feasibility study for the mine and TPP Kong. News of the preparation of the construction is all the more shocking because Bosnia and Herzegovina belongs must fulfill its obligations under the Large Combustion Plants Directive of the European Energy Community in 2017, which includes modernization of power plants (elimination of subsidies, the closure of unprofitable mines, modernize equipment, and reducing emissions of CO2 and other contaminants to acceptable levels). If that happens there could be closure of some power plants (OECD 2004).

Sometimes in public debates on investments in renewable energy, we can hear that H "is not Denmark" (or Germany or Austria), and that is why we are not in a position to apply the policies and standards of an economically developed country in the European Union when it comes to energy efficiency policies and renewable energy sources. Investment in coal mines, for example, cost much less than the investment in the plant to produce energy through biomass in a shorter period of time can hire more people. Therefore, such investments are desirable because we are a country with a large number of unemployed. The fact that lignite-fired steam power plant polluting the environment over the extent permitted by international conventions for us is not of primary importance.

All this points to the view that the signed international conventions and standards that would sooner or later need to apply it imposed by the EU without any relation to the needs and abilities of the energy sector in BiH. If it is applied, it makes no assurance that such policies affect the reduction of poverty in BiH . According to this hypothesis, BiH as a country in transition, has that kind of benefit from investments in energy efficiency measures and energy efficiency means, because the limited funds could be used to invest in infrastructure, and especially no great benefit from investments in renewable energy because it has a large mineral resources and large hydro, and investments will be directed towards the exploitation of mines and construction of large hydroelectric power plants, regardless of the negative impact that such policies may have on the environment. In short, there is a belief that economic development is complementary to the preservation of the environment. However, the benefits of membership in the Energy Community of Bosnia and Herzegovina has already been demonstrated in practice. During the gas crisis 2009th, BiH has received

solidarity gas supplies only by the membership, which is not adequately explained to the public (OECD 2004).

The concept of green economy is just the opposite - it is possible and necessary to achieve synergy between economic development and environmental responsibility policy, these notions are complementary . Exactly what H "is not Denmark", Energy efficiency and renewable energy sources have even greater importance than in developed countries. BiH is a country which, according to the Human Development Index ranks the lowest in the region and beyond. In this status significantly affected by low levels of energy efficiency, fluctuating energy prices and poor security of energy supply , the increasing pollution of air, land and housing interior surface that deteriorates the use of coal and wood for heating, and low employment in rural areas.

Another reason that is often cited as a major obstacle to the creation and implementation of modern and tansparent energy policies that BiH has a problem of lack of institutional ministries at the state level, which is exacerbated by a lack of political will, and therefore there is no national strategy of the energy sector, without which we can not go the deadlock. While it is true that this issue BiH unusual example, this argument ignores the fact that economic development is always a function of structural changes - it implies a significant change in the mode of production and consumption, as well as the approach to strategy development.

When you look at the adopted strategy of the energy sector in the RS, and the proposed strategy in FBiH entity, notice that this strategy does not pay great attention to sub-sectors of energy efficiency and renewable energy sources, ie . that the paradigm has not changed significantly from the trends of the 60s and 70s of the last century, and therefore even if there is adopted a unique strategy of the energy sector at the state level , the question is, what would it be and whether citizens since it had helpful .

So the problem is greater than the institutional or political is actually a structural problem. With structurally problem in the economy in general, and particularly in the energy sector, meet all the countries in transition, as all the countries of the former Yugoslavia. It is possible and necessary to implement reforms before the adoption of the national strategy. Each principal development strategy includes the implementation of certain reforms to the principles of the EU, and it largely depends on the entity ministries and energy companies, power utilities (EBRD, 2005).

Taking this into account, the question: What is an obstacle to adequate investment in the green economy? There are objective and subjective obstacles. Objective reasons for the weak investment: Little is known about the investment opportunities due to lack of quality data on renewable energy sources, their sources, resources and potential revenue. It is difficult to make an assessment of the level of investment required to make it profitable for potential investors (World Bank, 2010).

Evidently, only that the potential high, especially when we talk about biomass , while data on how energy is used in homes are also not adequate and complete, although it is evident that this is an inefficient use of energy .

Data from being handled, for example, are based on acres of forest, but not based on the amount of agricultural waste which is practically throws, and could be used in the production of renewable saver. It is clear therefore, that the potential is greater than these existing data.

Subjective barriers to investment are structurally nature. In systems where the energy company owned by the state, it would be logical that the directors of energy companies and ministries deciding on investment spend money on behalf of the citizens, not the investors who enter into contracts (World Bank, 2010). Contracts should be made only to investors who agree to the estimated benefit of specific investments to the public. Taking into account that investments in renewable energy (and energy projects in general) is almost always a combination of public-private partnerships, the managers of these investments, or part of the investment that comes out of the public money, have a great no responsibility to the citizens. If the controller determines that the public funds with private investors enter into a contract that is solely or primarily created in accordance with the interests of private investors, to the detriment of citizens whose funds available, then he has a motive to conceal the necessary project information to the public and to implement long-term adverse programs. This happens in BiH (EBRD, 2005).

The public has a right to know all the details of the analysis that led to the decision to be given to the investor entrusts a particular project, as well as alternatives to accepted project. We almost always comes down to the choice of an investor. In this case, if there is public debate, it comes down to vote yes or no . It's not enough. In completing this area should play the role of professional associations and non-governmental sector. Until now, professional associations proved inadequate, and the non-governmental sector incompetent or uninterested / unable to significantly influence the decision. Clearly, the system is non-transparent

decision-making and here plays a major role - as a competent individuals appear in professional associations or non-governmental sector, financially powerful public- private lobby and buy these individuals as did the media. Impact on citizens? Again, the vicious cycle of poverty.

2.4 . European Integration - Opportunities for development through reform

From the point of BiH , the EU vision of the energy sector affects the country signed the Energy Community Treaty (ECT) with the European Union in which the mechanism of policy and strategic objectives of the EU actually transmitted and the region . The principle of the common market and the obligations that no country long term and sustainable can not be "energy island" , that takes energy policy that is substantially inconsistent with EU guidelines , including a focus on energy efficiency and renewable energy, is true for the country (Bank Watch, 2005).

EU accession has a practical purpose: political arrangements with neighboring countries regarding energy transit are difficult to make out the legal framework of the European Union. EU technical standards are needed to reduce pollution from domestic power plants. Accessing ECT is a prerequisite for meaningful investment in energy infrastructure and improve existing investment arrangements. EU market it is indispensable for the valuation of valuable energy services that BH could produce. Exchange of technology and knowledge from EU countries is a prerequisite for better use of energy in BiH. Imports of energy and arrangements to the exporting countries it is difficult to make out a framework that builds from these countries of the EU. In this way, it is essential in the energy sector is already integrated in the EU (IMF, 2008).

The main objectives of the Treaty are: the creation of an integrated energy market in South East Europe, which enables cross-border trading and connectivity to the internal market of the Union, strengthening security of supply, to attract investment in power generation, reconstruction and construction of the transmission network and improve the situation in the field of environmental protection.

In fact, in this area could be talking about Europe - 34th Because basically ECT member states are "sectored" integrated into the EU and are committed to the implementation of EU rules and directives. Return to attract investment and strengthen the market position of the regions and Member States. Estimates suggest that over the next two decades to secure a stable and reliable supply of energy states that have gathered in the community will be necessary to 20 billion Euros. In addition, the development of cross-border networks for electricity and gas opens up the possibility not only of increased trade, but also solidarity in the event of supply problems or breakdowns. To strengthen the energy security of countries in the region , through the diversification of options for their energy supply. The former Dutch Foreign Minister Jozias Van Arcen (Jozias Van Aartsen) believes that it is important to bear in mind that membership in the Energy Community is not a second-rate substitute for accession to the EU, but is a kind of promise connection 14 .

The main challenges facing BiH are (IMF, 2008):

- Institutional capacity building and improvement of the process of policy formulation;
- The implementation of the reform and the application of market regulation under EU directives;
- Strengthening of energy security in particular through investment in renewable energy sources;
- Improving energy efficiency, which is a priority for necessary not only to protect the environment but also for the fight against energy poverty;
- Meaningful transitional social policy.

3. CONCLUSION

There are indications that now is the right time for a paradigm shift in the energy sector. First, the policy of subsidies and investments in production surpassed species reached a level of economic sustainability. Second, the process of European integration and international agreements signed represent a chance for BiH to join the trends prevailing in the European Union and thus seize the opportunity for reform that will guarantee sustainable development. The trends that are current in the EU in terms of investment in renewable

energy are actually complementary to sustainable development, and investment in energy efficiency in Bosnia and Herzegovina has produced many benefits to considering the current situation and provide a great return on investment in a relatively short period of time.

The key to success is in changing the way in which public resources are managed. No structurally reform, according to which public funds are invested transparent and accountable, it is not possible to design and implement energy sector policy in favor of citizens. Guidelines and directives of the European Union on this issue represent a kind of road map for BiH and are essential for improving the standard of living.

This paper analyzes the mode of production and consumption in BiH in the context of sustainable development and the impact of energy management on poverty in BiH, and proposes some measures to reform. Recommendations relating to the possible temporary social programs in response to the increase in prices of electricity and other necessary reforms, and energy efficiency, structural change and renewable energy.

REFERENCES

Bank Watch, 2005. *Arrested Development in the Balkans: Energy Efficiency and Renewables*., Bank Watch, Prague.

Couture, T., Gagnon, Y., 2010. An analysis of feed-in tariff remuneration models: Implications for renewable energy investment. *Energy Policy*, 38 (2), 955-965.

ECFR, 2007. *Power Audit of EU Russia Relations.* Ecfr, leonard, popescu.

Energy Efficiency Road Map, 2011. *FOR THE TRANSPOSITION OF THE ENERGY EFFICIENCY DIRECTIVES, UPDATED TEMPLATE*. BOSNIA AND HERZEGOVINA.

Energy Community, 2008. *About the Treaty*. Available from URL: http://www.energy-community.org/portal/page/portal/ENC_HOME/ENERGY_COMMUNITY/Legal/About_the _Treaty.

Evropski pokret Srbije i Slovak aid, 2010. Vodič kroz EU politike, *Energetika*, Aleksandar Kovacevic.

EBRD, 2005. *Can poor consumers pay for energy and water? An affordability analysis for transition countries*. Samuel Fankhauser.

INTERNATIONAL ENERGY AGENCY, 2008. *United Nations Development Program*, 2008, The Path to Reform and Reconstruction.

IMF, 2008. *Reforming Government Subsidies in the New Member States of the European Union*.

Carlos Mulas-Granados, Taline Koranchelian and Alex Segura-Ubiergo

IMF, 2003. *Energy Reform and Social Protection in Hungary*, Dr. Michael J.G. Cain, Ph.D.

OECD, 2004. *Improving District Heating Policy in Transition Economies*, OECD.

PEEREA, Regular Review, 2008. *Energy Charter Protocol on Energy Efficiency and Related Environmental Aspects Bosnia and Herzegovina.*

Simurdic M., 2009. *Energetska politika EU*. Zapadni Balkan.

UNDP, 2007. *Environmental Policy in South-Eastern Europe*. undp.

World Bank, 2010. *Status of Energy Efficiency in the Western Balkans*. A Stocktaking Report, Peter Johansen WB 2010.

World Bank, 2008. *Energy study for BiH, MoFTER Sarajevo*. BiH.

4th International Symposium on Natural Resources Management
"Sustainable Development and Green Economy in Transition Countries"
31st May -1st June, 2014, Faculty of Management Zajecar, Republic of Serbia
www.fmz.edu.rs

POLITICAL WILLINGNESS OF BOSNIA AND HERZEGOVINA FOR SUSTAINABLE DEVELOPMENT (achievements and difficulties)

Milinko Ranilović[1],
Mirjana Ranilović[2]
Miro Ranilović[3]

[1]*International University of Travnik, Travnik, email: milinko.ranilovic@gmail.com*
[2]*International University of Travnik, Travnik, email: mirjana.ranilovic@gmail.com*
[3]*International University of Univerzitet Travnik, Travnik, email:ranilovic.miro@gmail.com*

ABSTRACT

Sustainable development is based on economic and environmentally acceptable development in which society realizes the main benefit. The current economic crisis in the world is connected to the other two pillars of sustainable development and with the negative impact on the environmental conditions, as well as on society (humankind). Climate change, loss of biodiversity, acidification of the seas and oceans, chemical pollution, problems with the ozone layer, changes in land use, lack and inefficient use of drinking water and other problems and disastrous situations that we face, clearly shows the direction that we are moving on. In the area of environment, Bosnia and Herzegovina has made significant progress and shows a clear intention to join the European Union. In the last ten years, Bosnia have been adopted and started to implement the law sets in the appropriate entity, as well as most of the necessary secondary legislation.

KEYWORDS

Sustainable development, green economy, environment goals, Bosnia and Herzegovina.

1. INTRODUCTION

Since 1992 when in Rio de Janeiro held the "Earth Summit - Rio 92", and the UN Conference on Environment and Development (UN Conference on Environment and Development - UNCED), sustainable development is a step forward for future global action. Rio Declaration on Environment and Development, Agenda 21, adopted as a tool for the implementation of the sustainable development. It was a global action program for the 21st century, that calls on all countries to formulate concepts and strategies for sustainable development. Promotion of environmental protection in other areas of economic and social activity and remains a much-needed goal that guarantees not only sustainable, but also the protection of public health and social welfare. A prerequisite for achieving this goal is the effective cross-sector collaboration.

Five years after the Earth Summit was organized on 19 Special Session of the General Assembly of the United Nations (UNGASS-19) called the Rio +5, during which a program of further implementation of Agenda 21.

New World Summit on Sustainable Development Rio +10 (World Summit on Sustainable Development - WSSD) , which was attended by a delegation of Bosnia and Herzegovina , held 2002nd in Johannesburg , South Africa. The aim of the meeting was to create a 10-year review of activities related to the UNCED process at the summit, and to refresh global support sustainable development (Blumenshine, Wunnava, 2010). The Summit adopted two main documents: the Johannesburg plan of implementation (JPOI) and the

Johannesburg Declaration on Sustainable Development. Johannesburg Plan of Implementation is designed as a framework for action to implement the original decision UNCED and includes chapters such as poverty eradication , consumption and production , natural resources, health, small island developing countries (Small Island Developing States - SIDS) chapter Africa, other regional initiatives, the importance of the implementation of the institutional framework. The Johannesburg Declaration on Sustainable Development highlighted the path of sustainable development since UNCED to the WSSD, and indicates the challenges, expresses a commitment to sustainable development, states the importance of multilateralism, while stressing the need for the implementation of the commitments of Rio de Janeiro. Bosnia and Herzegovina is understood that the Rio +20 a unique opportunity for interdependent world to secure political commitment for sustainable development. It will assess progress and gaps in implementation of the decision earlier conferences, and new challenges, with two very close topics:

1. Institutional framework for sustainable development, and
2. Green economy in the context of sustainable development and poverty eradication.

The institutional framework is mainly related to the reform of the international framework for cooperation and management of sustainable development, but also includes any sovereign country, and its democratically elected government, responsible for its own internal organization and management capacity to increase the quality of life of its citizens. The green economy is defined as one that effectively uses natural resources and ecosystem services, is socially inclusive, more energy efficient and significantly reduce environmental risks. Bosnia and Herzegovina is trying to become a member of the EU to the European strategic commitment to guiding our future goals and achievements in sustainable development.

Bosnia and Herzegovina is clearly committed to Euro-Atlantic integration. Negotiation on signing the Stabilization and Association Agreement (SAA) between Bosnia and Herzegovina and the EU were officially opened to the public in 2005, that the agreement was initialed 4 December 2007, and after they gained political conditions, was signed on 16 july, 2008 in Luxembourg. Bosnia and Herzegovina has completed ratification of the SAA in November 2008th, after being approved by the both Houses of the Parliamentary Assembly of BiH and the BiH Presidency decided to ratify the SAA. The European Parliament and all 27 EU member states have ratified the SAA is late 2010, But he has not yet entered into force. Delaying the entry into force of the SAA, the European Commission is in fact a concession to the authorities of Bosnia and Herzegovina, because, otherwise, immediately after the initial implementation, the Agreement was suspended. This would happen because it has still not completed all the tasks to which they committed during the signing (Finn, 1975).

The Law on State Aid, adopted 03.02.2012, important reform - European law, delayed the full 19 months. The adoption of the Law on Census, housing and households in BiH, also in February 2012, and which should be implemented in April 2013th year, for the first time since in 1991 years, is of great importance for the progress of BiH on the EU path, and even the development of BiH. It will be facing the truth in BiH on all indicators - economic, social and environmental broadest sense, it will also be a unique opportunity for those social and political forces, which are struggling to BiH is better, credible, reasoned and evidence-based, really working for change towards sustainable development of BiH (Russel, Powell, 1996)

In the area of environment, Bosnia and Herzegovina has made significant progress and shows a clear intention to join the European Union. In the last ten years, the law sets of the appropriate entity have been adopted and started to implement, as well as most of the necessary secondary legislation. However, at the state level has not yet reached full political agreement on the framework law on the environment, so many problems still exist in the inter-entity and international cooperation, as well as the implementation of internationally agreed commitments.

2. BODY OF PAPER

2.1 Sustainable Development in Bosnia and Herzegovina in the period 2002-2012

The adoption of the Declaration on Environment and Development for the Earth Summit , in which sustainable development is a beacon for the 21st Century , a consensus was reached that indicates the

necessity of environmental, economic and socially equitable development in the interests of present and future generations .

At the time of the Earth Summit , the largest gathering to discuss the new vision of the world , in Bosnia and Herzegovina raging war that human lives and destroys the material and natural resources. During the second half of the 90s of the 20th century , the post-war period and the recovery phase BiH, there has been little progress in the implementation and operationalization of the conclusions of the Rio . A number of international organizations , through special programs and ongoing activities, supporting recovery and development in BiH and the 2002nd The introduction starts with an organized environmental practices in BiH , in accordance with the legislation of the European Union , when the Serbian Republic delivers first set of environmental laws. In 2003 in the Federation of Bosnia and Herzegovina (Faure, Visser, 2003).

The first decade of the 21st century is the period in which the BiH turns to identify and develop responses to the challenges of sustainable development and was one of the 191 countries participating in the World Summit on Sustainable Development Rio + 10 held in 2002. in Johannesburg. From then until now, the process is continuous and stable, although not sufficiently quick and effective.

Sustainable Development in Bosnia and Herzegovina is taken seriously and is a constant task , which pervades all aspects of society, especially through the process of Euro -Atlantic integration . According to resources, the existing institutional arrangements of Bosnia and Herzegovina, and the opportunity and the needs of the institution authorities, companies, organizations, and all other entities of society participate in the process of sustainable development, each in their own way, whether it be through the adoption of laws and regulations, making strategy or the implementation of national commitments and international obligations, with varying degrees of success. In terms of mechanisms and policy (Eng. policy) instruments for the implementation of sustainable development , it is necessary to note that Bosnia and Herzegovina has no commission for sustainable development at the national level (Eng. National Commission on Sustainable Development) which would be entrusted with the strategic direction efforts to implement the principles of sustainable development .

The process of Bosnia and Herzegovina to the European Union is one of the main drivers of the implementation of sustainable development through the harmonization of national legislation with the EU acquit, given that EU legislation is considered one of the most progressive, which seeks to achieve the goals of environmental protection and natural resources, the development of knowledge-based economy and social inclusion. Efforts have been made to implement reforms in the environmental sector in Bosnia and Herzegovina have just encourage a possible membership in the EU, namely, the takeover of the EU acquit. Set of six fundamental environmental laws relating to environmental protection, air protection, water management and protection, waste management, nature protection and the Fund for Environmental Protection was adopted in a period of 2002nd the 2004th The entities and the Brcko District (Anderson, 1990).

Bosnia and Herzegovina is committed to the implementation of the Millennium Development Goals (Millenniums Development Goals). Reports of societal development / MDGs Bosnia and Herzegovina (NHDR / MDG) was created in 2003 for the period 2003-2015. The document contains a number of policy proposals with a view to achieving progress towards the full achievement of the relevant Millennium Development ciljevana locally and 18 goals specific for Bosnia and Herzegovina. Defined 48 indicators for more accurate monitoring of progress, and periodically prepare and development. Reports on progress in implementing the Millennium Development Goals in Bosnia and Herzegovina for 2010 adopted by the Council of Ministers of Bosnia and 29.11.2010. Herzegovina. Poverty Reduction Strategy Paper (Poverty Reduction Strategy Paper) in Bosnia and Herzegovina for the medium term 2004-2007. is compliance with the Human Development Report.

Bosnia and Herzegovina, only ten years after the Earth Summit in 1992, ratified three major UN conventions that have been adopted during the Summit (McGinn, 2009)

1. Convention on Biological Diversity (ratified in 2002), The Protocol of Katragene on Biosafety (ratified 2008th year);
2. Framework Convention on Climate Change (ratified in 2000) From the Kyoto Protocol (ratified 2008th year);
3. United Nations Convention to Combat Desertification in countries with severe drought and / or desertification (ratified in 2002).

In addition to these three major conventions, Bosnia and Herzegovina is a party , and many other multilateral agreements in the field of environmental protection. In addition to other international agreements only during the 2008th. The ratification are: Aarhus, CITES and the Bern Convention and the Cartagena and the Kyoto Protocol. In 2009- the age ratified the Espoo Convention and in early 2010 the year and the Stockholm Convention , and in 2011 ratified the Beijing Amendment to the Montreal Protocol of the Vienna Convention on the Protection of the ozone layer. In the next period it is expected, given that they have already initiated processes ratification of the Convention on the Conservation of Migratory species of Wild Animals (CMS)

Agreement on the Conservation of bats in Europe, London, 04.12.1991. Protocol on Integrated coastal Zone Management in the Mediterranean 4 Protocol for the Prevention of Pollution of the Mediterranean Sea cross-border transportation of hazardous wastes and their disposal. Data on the ratified treaties are on the web site of the Ministry of Foreign Trade and Economic Relations. Data shows that for Bosnia and Herzegovina, is coming period of tense activity in the implementation of international commitments.

In addition to legislation, implementing legislation and procedures, and international documents, produced a large number of strategic documents for the period 2000-2012, Which form the basis for continuing work to achieve the goals of sustainable development (Luppi, Parisi, Rajagopalan, 2010):

- Medium-term Economic Development Strategy 2000 - 2004 (2000) ; Solid
- Waste Management Strategy (2002) ;
- Assessment of Sustainable Development in BiH - Report for WSSD (2002) ;
- National Environmental Action Plan - NEAP BiH (2003) ;
- PRSP - Medium Term Development Strategy 2004-2007 (2004) ;
- UNECE EPR1 - Environmental Performance Review 1 (2004) ;
- Initial National Communication on Climate Change (2009) ;
- The first report on the implementation of the Aarhus Convention in BiH (2010) ;
- Biodiversity Strategy with Action Plan (2010) ;
- Report NCSA (National Capacity Self-Assessment , 2012) ;
- Development Strategy of Bosnia and Herzegovina (2008 D0 2018 , which has not yet been formally adopted by the continuation of the PRSP) ;
- UNECE EPR2 - Environmental Performance Review 2 (2011) ;
- Draft Prospects 2012-15 (DEP , April 2012) ;
- Draft Report on the State of the Environment (drafting in progress) ;
- Preparation of the Second National Communication on Climate Change.

2.2 The challenges to the achievement of sustainable development goals

In general, compared to other European countries have revealed certain areas where BiH faces a stronger challenges that will inevitably affect the sustainable production and consumption (Haris, 2009):

1. unstable and missing institutions
2. Underdeveloped infrastructure, especially transportation
3. Lack of investment in research and development
4. Education system not adapted to market needs and high unemployment
5. Starting a business slow, expensive and complicated
6. Irrational use of energy and
7. The low level of national savings.

These and other key questions to which Bosnia and Herzegovina has to work intensively, are set forth in the draft document of the Development Strategy of Bosnia and Herzegovina from 2008 to 2018, but were partly mentioned in the other above-mentioned strategic documents developed and adopted at the entity and state level. Therefore Bosnia and Herzegovina should take appropriate steps to identify measures to improve the process of sustainable development and turned towards a green economy, a trend globally.

2.3 The political willingness for implementation the principles of sustainable development

The European Union (EU) and its Member States support the proposal aims of sustainable development as a valuable contribution to the outcome of the Rio +20 Summit. Bosnia and Herzegovina has recognized the need for developmental global, regional, national and local level in accordance with the principle of common but shared responsibility, and respect for the sovereign right of every State over its natural resources. Bosnia and Herzegovina believes that the transition to a green economy is a way of strengthening the implementation of sustainable development and the fight against poverty. The priorities identified during the preparation for Rio +20 and the key challenges for accelerating progress towards sustainable development over a period of next 10 years are (Munitlak, Penezić, 2009):

•Conservation and sustainable use of water resources;
• Regional energy security, energy efficiency in all areas, and orientation towards the use of renewable energy;
• Conservation and sustainable management of mountain areas, protecting biodiversity and preserving the stability of the ecosystem;
• Food.

2.4. Opportunities for the development of a green economy in Bosnia and Herzegovina

Bearing in mind the so far mentioned, and found that the provision of sufficient quantities of water, food and energy, coupled with the safety aspects of our society, we believe that we should take advantage of every opportunity, increasing the chances of success in this area. Analyzing trends in the world, leading to their own experience and done and available documents and strategies, we believe that the mountains are an important source of vital ecosystem services and play an important role in economic development, environmental protection, environmental sustainability and human well-being. It is no accident that sustainable mountain development based on the development of a green economy in the focus of this year's Rio +20 Conference. Bosnia and Herzegovina is a mountainous country. Mountains are a significant source of water, energy and biodiversity. There are complex key resources, such as minerals and forestry and agricultural products. In the context of global trends in environmental protection tendency for the protection of mountain ecosystems and the scientific basis of its management in the future should be on the list of priorities of Bosnia and Herzegovina. The fact that it is a very sensitive nature of the complexes that are exposed to sudden changes in advance confirms the presented thesis. Mountain complexes are susceptible to accelerated soil erosion, landslides and rapid loss of habitat, which in turn has resulted in the reduction of genetic diversity. Mountains are centers of biodiversity and shelter numerous endemic species of plants and animals. Ecological and biological diversity of mountain ecosystems including mountain lawns in carbonates and silicates, glaciers, heaths, crack rocks, sandbanks, border zone forests, mountain forests and mountain folds.

Today, the mountain areas at risk due to a very wide range of human activities. The main environmental problems of high ecosystem are deforestation, soil erosion, impaired water regime, acidification (SOx , NOx, COx), an increase in the concentration of CO2 - global warming and loss of habitat.

Bosnia and Herzegovina has a great advantage when it comes to the representation of mountain ecosystems. Land in BiH is very hilly - mountainous with an average altitude of 500 m . Of the total land area , 42 % goes to the mountain, and recent data suggest that forests and forest land , accounting for over 60 % of the territory. BiH also has significant water resources . Bosnia and Herzegovina is characterized by the presence of a high level of ecosystem biodiversity , which are distributed from sea level to the highest peaks of the mountain ranges of what is , for example Maglič (2386 m) .

In this relatively small area is represented by several types of climate - Mediterranean and sub-Mediterranean, Continental, and several varieties of mountain climate.

The geological substrate is also varied. The dominant role of carbonate rocks - limestone and dolomite and dolomitize limestone. In the central, northern and northeastern parts of the country are silicate rocks of different geological age. Soil types represent different stages in the development of carbonate and silicate

soils dominated by carbon soils. In the southern part of the country, the dominant role is played by the dark fertile soil. Heterogeneous a biotic factors have enabled the development of a unique mosaic of high biological diversity. Bosnia and Herzegovina is a country that is characterized by very high levels of biodiversity at both the species and the ecosystem level (Popov, Stanković, 2009).

There are three major biogeography regions in Bosnia and Herzegovina: Mediterranean, Continental and Alpine. The richness of the flora has allowed the development of a very diverse ecosystem. Taking into account the geographical, geological, climatic and historical circumstances, it is possible to distinguish three major phyto-geographical regions: (1) Mediterranean (2) Euro-Siberian -bore American, and (3) high- Alpine - Nordic including also the highest mountain peaks.

Bosnia and Herzegovina is characterized by a very rich flora with about 5200 tax of vascular plants. Taking into account the number of species and the relatively small area of the state, the density and diversity of taxes in BiH are among the highest in Europe. Changes in general physical-geographical conditions, especially the emergence and disappearance of natural insulation barrier during the geological past have had a very strong influence on the development and composition of biota in the streams.

According to the socio-economic indicators, BiH is among the developing countries, which is due to the social and political circumstances in the past 20 years managed to preserve its natural resources and only a small percentage of them subjected to exploitation. The biggest challenge that the country faces today is how to balance economic development with the preservation of natural resources. One solution may be just encourage the development of green economy. The available resources provide a development opportunity for BiH, which is reflected in the development of green business sectors in the production of healthy food, exploitation of natural (mineral) water, utilization of renewable energy, and tourism sector. The development of green business can have their base in mountain ecosystems as the greatest natural resource of the country and it has been offering all the above services (Posen, 1985):

- Encouraging the development of mountainous areas of research
- Interventions in the existing policy and strategy development of entrepreneurship;
- Increased information flow from higher to lower levels of government and a common strategy towards maximum use of EU funds for the development of green business;
- Dissemination of information about green entrepreneurship;
- Conducting training sessions / workshops / seminars on green business;
- Sharing knowledge with professionals / entrepreneurs from the EU.
- Put emphasis on the use of benchmarking and sharing of best practices as a clear added value gained from learning from others' experiences;
- Collection of successful green business of the association and to build the capacity to defend their rights and promote the work of green entrepreneurs in the country;
- Implementation of demonstration projects.

Short-sighted to think that ecology and economy are two diametric opposites that can not find common ground on issues of economy and environmental quality. It is the green economy, which includes encouraging the development activities that will have a significantly reduced negative impact on the environment is an important step towards a balanced development. Significant features of the landscape in the European context, including water resources, as the sources of all major watercourses in BiH are in mountainous areas. there are also very important woodland habitats that play an important role in maintaining the ecological services of our planet. As most important form of support of the majority of economic activity, natural resources provide a key contribution to sustainable development (Prokopijević, 2005).

2.5. Institutional framework for sustainable development

Bosnia and Herzegovina believes that the integration of the three pillars of sustainable development in all spheres of activity of society and the economy at the local, national, regional and global level to the right to request a reorganization of the institutional framework to the extent that they will be able to respond effectively to the challenges and given the ambitious goals set by Rio +20 initiative. In this regard,

management (en. governance) at all levels, and insistence on the further implementation of Agenda 21, the Rio principle of respect is crucial.

Bosnia and Herzegovina welcomes the continued central role of the General Assembly of the United Nations (General Assembly) as a platform for policy-making in order to further strengthen the integration of sustainable development. The next, ECOSEC role in coordinating, monitoring and promoting the integration of sustainable development into operational activities of the institutions of the UN is necessary (Skogh, Stuart, 1982).

The initiative for the establishment of the Council for Sustainable Development (Sustainable Development Council) should be supported by the provision of clear and transparent indication that the formation of the Council of practical achievement of the objectives of sustainable development. Countries of UN, members should be actively involved in defining the mandate of the Council. Bosnia and Herzegovina supports the establishment of an organization that will be able to respond to global environmental challenges.

In order to strengthen environmental standards and practices, and the fulfillment of obligations arising from international agreements to protect the environment at the global and regional level, it is crucial to strengthen the capacity of UNEP as a specialized UN agencies and provide regular and predictable source of funding for sustainable development programs. The United Nations and other international institutions to support developing countries in developing strategies that will be tailored to the specific needs and circumstances of those countries, through additional funding and strengthening of state (en. national) capacity.

One of the key challenges facing the international financial institutions to strengthen the connection between sustainable development, environmental protection and funding mechanisms. In order to provide better support to developing countries, is of paramount importance to integrate the principles of sustainable development in environmental and social policies and program strategies of international financial institutions (Faure, 2000).

The existing cooperation and exchange of information and experience on international, regional and sub - regional levels should be strengthened in order to enable the transition to a green economy , with special focus on developing countries . The green economy is a means to achieving sustainable development goals . This approach requires capacity building at all levels with the participation of all stakeholders: government , public and private sector , civil society organizations and international institutions . Bosnia and Herzegovina has recognized the need to integrate the principles of sustainable development into their development plans , and the need for integrated planning. Since Bosnia and Herzegovina is committed to the way of joining the community of European states in the following way and support, which has set itself the EU in terms of sustainable development and the green economy. Strengthening the institutional framework demands the adoption of existing management capacity at all levels, with a focus on improving communication in horizontal and vertical direction. Taking into account the specific and localized context of decision-making relating to Bosnia and Herzegovina, the management structure are aware of the limitations of state (en. national) institutional framework for sustainable development, and expressed readiness for further efforts to strengthen the coherence of state institutions to achieve the goals sustainable development. Establishment of the State Committee for Sustainable Development is a tool for coordination, consolidation and including inter sectored issues, as well as all stakeholders. This approach is relevant to decision-making at the national level (en. national) level and the integration of the human three pillars of development, and to cooperate in sub - regional and regional levels that Bosnia and Herzegovina is of great importance.

Capacity building, increasing the level of knowledge and skills, access to information and participatory planning at the local and state (en. national) level are prerequisites for sustainable development. International financial institutions and bilateral partners should provide greater support to local initiatives, in cooperation with the state (en. national) institutions for achieving sustainable development and the transition to a green economy.

CONCLUSION

It is noting that Bosnia and Herzegovina are in the period of the 2002nd by 2012 achieved significant results, which are reflected in the adopted new international treaties environment, new and improved statutory legislation, a number of policy documents that we have had so far, increasing human capacity and

strengthened public awareness of all citizens and make decisions. People of Bosnia believe that further action must be intensified in towards building a society of a green economy.

Eradication of poverty using existing resources is a chance but an obligation. This will ensure greater public safety, and the environment will manage in a sustainable manner.

In order to prosperous, secure and sustainable future for people and the planet , Bosnia and Herzegovina must cooperate with the other countries of the region and the world to work towards the eradication of all forms of poverty . Investment in education, human resource development and well-planned infrastructure projects are the only effective measures for the liberation of part of humanity that lives in the developing world from the vicious vortex of poverty and corruption. In this sense, technology transfer is a key to energy sustainability and development of the green economy. Rich nations are different from the other just by a well developed and maintained infrastructure and adequately trained workforce.

In orderr to strengthen the implementation of sustainable development goals and reinforce the fight against poverty, it is necessary to actively participate in the process, to monitor the activities of rio +20, and to advocate for the strengthening of cooperation and addressing current and emerging issues in a way that will improve opportunities for all and will focus on human development and achieving better integration among the three pillars of sustainable development-economic, social and environmental. in this process, all of bosnia and herzegovina have a place, role, duties and responsibilities, but also the right to use the benefits that will give us the proper approach to address issues of sustainable development will bring.

REFERENCES

Anderson, D, 1990. *Environmental policy and public revenue in developing countries*. World Bank – Environment Department.

Blumenshine, N., Wunnava, P., 2010. The value of green: The effect of environmental rankings on market CAP. *Technology and Investment*, br. 1, str. 239-242.

Faure, M., 2000. Compensation of non-pecuniary loss: An economic perspective. U: Magnus U., *Spier J. (ur.) European tort Law: Liber Amicorum for Helmut Koyiol*, Frankfurt: Peter Lang, str. 143-159.

Faure, M., Visser, M.,2003. *Law and economics of environmental crime*. A survey. May, str. 2

Finn, F. (1975) The polluter-pays principle and transitional period measures in a dynamic setting. *Swedish Journal of Economics*, br. 56-68

VBS3 Haris, D., 2009. *Ekonomija životne sredine i prirodnih resursa savremeni pristup*. Beograd: Data status.

Luppi, B., Parisi, F., Rajagopalan, S., 2010. *Environmental Protection for Developing Countries-The Polluter-Does-Not-Pay- Principle*. U: Referat podnet na 26. godišnjoj Konferenciji EALE- Evropskog udruženja za ekonomsku analizu prava, 22-25. septembar, Pariz

McGinn, D., 2009. *The greenest big companies in America*. Newsweeks top 500 green rankings Newsweek.

Munitlak, O., Penezić, N. D. Ekonomski instrumenti u funkciji eksternih efekata. U: *Životna sredina ka Evropi*, zbornik, str. 228-232.

VBS2 Popov, Đ., Stanković, F., 2009. *Osnovi ekonomije*. Novi Sad: Pravni fakultet.

Posen, R., 1985. An economic theory of the criminal law. *Columbia Law Review*, br. 85, str. 1193-2009.

VBS2 Prokopijević, M., 2005. *Evropska unija*. Beograd: Službeni glasnik.

Russel, C., Powell, Ph., 1996. *Choosing environmental policy tools*. Washington.

Skogh, G., Stuart, C., 1982. An economic analysis of crime rates, punishment and the social consequences of crime. *Public choice*, str. 171-179.

4th International Symposium on Natural Resources Management
"Sustainable Development and Green Economy in Transition Countries"
31st May -1st June, 2014, Faculty of Management Zajecar, Republic of Serbia
www.fmz.edu.rs

IMPLEMENTATION OF MODERN TECHNOLOGIES IN METALLURGY IN THE FUNCTION OF PROTECTION OF THE ENVIRONMENT AND NATURAL RESOURCES

sci. Nenad M Stojanović MS.c, Ph.D candidate
Marko Kimi Milić MS.c, Ph.D candidate
Darko M Milošević MS.c, Ph.D candidate

Faculty of Management Zajecar, Park šuma Kraljevica bb, info@fmz.edu.rs

ABSTRACT

The tendency is to continuously and permanently reduce the production of metals from primary raw materials and increase the production of metals from secondary raw materials in order to reach the final goal that is to meet the full demand for metals from secondary sources. To achieve this goal, it is necessary to develop and apply new technologies in the metals` production process, save mineral resources and protect the environment. How modern metallurgical technologies can affect everything within the production process, will be explained on the example of copper production.

KEYWORDS

Metallurgy, metals` recovery, environment, natural resources

1. INTRODUCTION

The modern world is already facing a shared responsibility with a necessity to align its development with the needs of people and nature and the awareness that the Earth must be saved not only for the current generation but also for future generations. The obligation of the present generation is to leave at least the same number of opportunities for future generations as they currently have, which is the fundamental principle of moral justice and of equal rights to broadest freedom for all people that do not violate the freedom of others. The present generation has the right to resources and a healthy environment, but must not compromise the same rights to future generations. *(National Strategy of Sustainable Development).*

Environmental pollution is one of the main limiting factors for further development of mankind. Disturbance of ecosystems caused by the discharge of untreated effluents over time has grown to such an extent that their treatment is imposed as a necessity (Bugarin M, et.al.,2012). Copper production process inevitably leads to an intervention in the natural environment along with small and big disturbances. Consequences of mining operations are tailings and dust and consequences of metallurgy are the slag, dust, flue gases and waste solutions. In the hydrometallurgy of copper, seems that the problem of by-products can be reduced to the problem of waste solutions (Jonović R., et. al, 2007).

Outdated and inadequate treatment of exhaust gases from RTB Bor has resulted in the serious environmental pollution and a significant loss of copper through effluents (Fideco 2006). In the area of RTB Bor's operations, in the region of Bor, over 29,000 ha of land under forests and fields have been degraded, and the area of degraded agricultural land in the Bor municipality accounts for more than 60 % of the total agricultural land. The Bor river with all the effluents from the tailings dump, from the flotation facility as well as other facilities of copper production and processing, is one of the most polluted rivers in the world.

The greatest cause of pollution of the Bor river is the industrial effluents generated in the process of the copper electrolytic refining, the production of copper sulfate and precious metals. The analysis of heavy metals` content in river sediments of the Bor River, showed that copper concentration was up to 30 times higher than the maximum permissible levels prescribed by the legislation of the Republic of Serbia. Samples of effluents were analyzed from the sulfuric acid production process, copper sulfate production, copper electrolytic refining and the anode slurry processing plant. Also carried out was a detailed qualitative and quantitative analysis of effluents` samples from the production process. A composite sample was set aside from all industrial effluents and they were treated with the neutralization process (Bugarin M, et.al.,2012).

The tradition of mining in eastern Serbia is very long and is one of the oldest in Europe. Modern history of mining in eastern Serbia begins in the late 19th and early 20th century (1902) when rich deposits of copper ore were discovered. There are no more such rich copper ore deposits nowadays, but there is still a lot of low content ones, which are economically viable to mine, therefore the prospect of mining is provided in the years to come. Mining in relation to recycling is far more developed in Serbia and it is unrealistic to expect for primary sources of minerals to be replaced by secondary raw materials in the near future. Aspirations and goals are for the primary sources to be gradually replaced by secondary ones, but it is a long process that requires commitment of the society, the state, science and high investment as well. During this time, it is necessary to do everything for primary mineral resources to last as long as possible, to protect the environment from pollution and at the same time to achieve economic profit.

2. COPPER SMELTER AND REFINERY

In order to show effects of the introduction of modern technologies in the metallurgy of copper, we will compare the technical and economic parameters of the technology that was once the most common in the world and the technology which is currently the most common in the world, that is the reverberatory furnace technology and the flash furnace technology. The parameters used are of the average value from a number of smelters implementing mentioned technologies.

The first reverberatory furnace was first put into operation in 1765 in Yorkshire, England. Reverberatory furnace technology is still used nowadays in about a dozen countries of the world and the main difference, apart from the smelting furnace itself, is that fluo-solid reactors are used for producing roasted ore with low sulfur content which is then smelted in a furnace and purified in converters and anode furnaces (Požega E. et. al. 2010)

Outotec flash smelting process was first implemented in 1949 in Harjavalta, in Finland and is currently the best available technology (BAT) for copper production according to the classification of the European Union. Nominated as the "metallurgical innovation of the 20th century", this technology is characterized by high production capacity, excellent emission control and lower production costs. Nowadays, Outotec holds a leading position as the primary technology in copper production. (http://www.outotec.com/)

2.1. Technology of copper production in reverberatory furnaces

Copper production starts by bringing ore to the mill where the ore is crushed, milled and then sent to the Concentrator where after adding various reagents to the flotation process, concentrate is produced with copper content of 18-25 % Cu, with over 30% of S, and sent further to dry and tailings are sent to the tailings dump.

The concentrate is then transported to the storage area where slag for smelting is formed and transferred to an area where the feed for the reactor is provided. Excess sulfur is burnt in the reactor, gases generated by burning contain about 8-9 % SO_2 and are transferred to the sulfuric acid plant, an integral part of the smelter, and roasted ore goes to the reverb furnace.

Sulfuric acid plant was built in the 70s by the German company "Chemiebau", where the contact process was implemented with a single catalysis.

The smelting process where ore is roasted in the reverberatory furnace, in figure 1, is exothermic, which means it is not necessary to provide heat from other sources but is obtained by burning sulfur from the remaining roasted ore. The product of reverberatory furnace is gas with 0.5-1.5 % SO_2 and due to its low

sulfur dioxide concentrations and various impurities, is not suitable for processing into sulfuric acid but after de-dusting, it is released into the atmosphere, and slag of 0.5-1 % Cu and copper matte with 35-45 % Cu are also released.

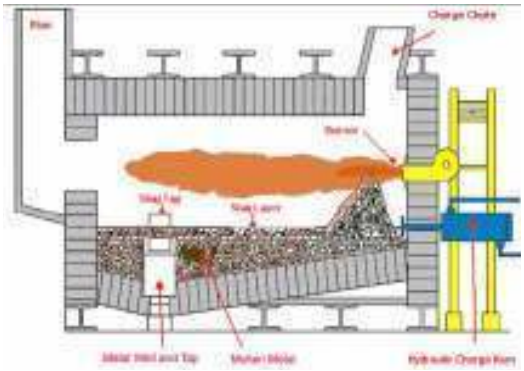


Fig.1. Reverberatory furnace www.lenoxinst.com

Copper matte from the furnace goes into converters where the air is introduced by blowing when blister copper with 96-98 % Cu is produced, as well as the converter slag and gases containing 3-5 % SO_2. Converter slag, due to high copper content of 3 -5 % is sent back to the reverberatory furnace where fire refining is done and the gas after cooling and de-dusting is sent to the sulfuric acid plant along with reactor gases.

Blister copper, with the system of pots and cranes enters the reverberatory furnace, where fire refining or purification is done to the level of up to 99,5 % Cu. After the fire refining, anodes are cast and sent to the Tank House for electrolytic refining, where cathodes with copper content of 99.99 % Cu are produced (Najdenov I. 2013).

2.2. Technology of copper production in the flash furnace

In this copper production process with flash smelting technology, the process of grinding, flotation and production of concentrate is the same as with the previous technology, but in this one there is not any fluo solid reactor. The concentrate, after drying, is directly fed into the flash furnace as shown in fig.2. Products of the flash furnace are the slag with copper content of 1.5% which must be returned to the process along with the converter slag containing 5-6% Cu, gas -with SO_2 content of 33-45% and copper matte containing 65-70% Cu (Najdenov I. 2013).

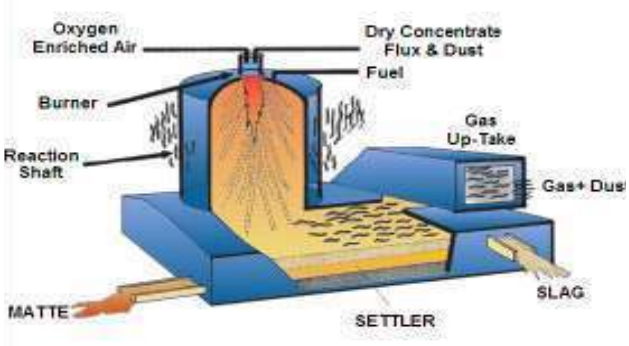


Fig.2. Flash furnace

In order to meet the needs for processing large amounts of exhaust gases, along with the system of flash furnaces, more suitable and efficient is the sulfuric acid plant with the contact process and dual catalysis. This type of plant is a more sophisticated version of the plant with a single catalysis except that it has a

higher degree of conversion of SO_2 to SO_3 and hence higher utilization (purification) of sulfur from exhaust gases and therefore higher production of acid with the same amount of gas. Increased sulfur recovery from exhaust gases in addition to the increased production of sulfuric acid means more and cleaner exhaust gases and cleaner production of copper.

Beside the aforementioned advantages, such a system of the flash furnace and sulfuric acid plant with dual catalysis treats all gases generated during the production of copper.

There are two methods of processing slag from the flash furnace by a process of reduction in electric furnaces and flotation process where the slag is cooled, ground and flotated and returned to the process as the concentrate with a copper content of 35-45%(Najdenov I. 2013).

After casting of matte, the process of copper refining in converters, in anode furnaces and in the Tank House is the same as in the previous case.

2.3. Technical and technological parameters of the old and new technology

All advantages and disadvantages of this technology are listed in table 1.

Each of these technologies has its own advantages and disadvantages, which are better when it comes to protecting the environment and saving of energy and copper recovery from the ore is best seen when the good and bad qualities of those technologies are compared.

Table 1: Characteristics of the two copper production technologies

	Flash furnace technology	**Reverberatory furnace technology**
Advantages	- Higher copper and other precious metals` recovery from concentrates - Low investment and operating costs for the smelter and sulfuric acid plant - Some operations take less time - More efficient use of sulfur from the concentrate for smelting - High sulfur (SO_2) recovery from exhaust gases for sulfuric acid production - Continuous production of the gas with high SO_2 content - Improved working conditions without the presence of gas and dust - High degree of mechanization and automation of the process - Meets the most stringent environmental standards - High energy efficiency - Adaptability - Copper matte with a high copper content, which contributes to greater energy efficiency - Long periods of time between two overhauls - High productivity	- Simple construction for easy maintenance - The use of concentrates with various concentrations - Sulfuric acid plant can operation with lower SO_2 concentrations - Flexibility of the sulfuric acid plant as for the minimum and maximum SO_2 concentration in the gas. - Simplicity of the equipment.
Dis-advantages	- Slag from the furnace contains a lot of copper, additional treatment of slag needed - Use of oxygen in the smelting process	- Low metal from the concentrate recovery - Low level of sulfur recovery - Low energy efficiency - Inability to treat exhaust gases from the furnace for the production of sulfuric acid - Environmentally unfriendly

The exact comparative data on technical and technological characteristics of these two technologies are presented in the following tables. The quality of the technological process is impacted by: the quality of raw materials and their preparation, chemical composition of the matte and slag and their temperature, oxygen content in the air blown into the furnace, SO_2 content in the gas used for the production of sulfuric acid, copper and sulfur recovery, etc.

Table 2. shows a portion of the comparative data necessary for the process control, which is the same information that can be used to explain the reason for replacing the old technology with the modern one and also its impact on the protection of the environment, energy efficiency, recovery of copper and other metals from concentrates, which directly affects the extension of mining of mineral deposits and lower pollution from exhaust gases, tailings and effluents.

Table 2. Comparative data on the technological parameters of the old and new technology

Technological parameters	Units	Smelting process	
		Reverberatory furnace	Flash furnace
Specific capacity	t/m^2 day	4,2-4,7	10-12
Concentrate	%Cu	19-30	24-30
Copper matte	%Cu	36-45	65-70
Slag	%Cu	0,5-0,8	0,5-1,5
The content of O_2 in the air	$\%O_2$	21-25	45-70
The content of SO_2 in the exhaust gases	$\%SO_2$	2,5-6	33-45
Cemperature mattes of copper	^oC	1150	1250
The temperature of slag	^oC	1200	1300
Copper recovery	%Cu	93	98
Sulfur recovery	%S	40-50	98,5

Table 3 shows comparative values of energy consumption in various technological operations during copper production processes. Energy is reduced to the equivalent energy processes (EEP) or energy per ton of produced copper anode.

Tabela br.3. The amount of energy needed for technological operations

Technological operations	Units	Reverberatory furnace	Flash furnace
Drying	MJ/t a.c.		1917
Roasting	MJ/t a.c.	1103	
Melting	MJ/t a.c.	11961	7175
Converting	MJ/t a.c.	3852	1302
Anode refining	MJ/t a.c.	1295	1564
Production of sulfuric acid	MJ/t a.c.	1972	3282
Equivalent energy process (EEP)	MJ/t a.c.	**20183**	**15240**
Equivalent amount of coal per ton of copper anode	MJ/t a.c.	688,8	520,1

3. THE ANALYSIS OF TECHNICAL AND TECHNOLOGICAL PARAMETERS AND THEIR IMPACT ON THE ENVIRONMENT

The way modern technical and technological solutions affect the environment, energy efficiency, recovery of metals and their economic effects, will be explained with specific examples.

Copper deposits in Serbia are mostly located in the area of Eastern Serbia and are characterized by the low copper content of 0.3-0.4% of copper in the ore, with occasional deposits with even a few percent of copper in the ore, but rich deposits like these are negligible. Having in mind that the percentage of copper in

the ore is very low, even more important is the parameter that tells us about the recovery of copper from the ore, for two reasons, the first is of course of the economic character and is essential for profit and general feasibility of opening a mine and the construction of the smelter. The second reason is environmental protection.

3.1. Land pollution

The biggest problem of mining and metallurgy are tailings dumps and if we have a higher recovery of copper in the ore, we will need less ore and less waste will be generated for the same amount of produced copper.

Deposits in Serbia contain about 0.4% Cu and copper recovery is 93% and 98% of the quantity of processed ore, which is shown in table 4.

Table 4. Required amount of ore to obtain one ton of copper anode

	Copper recovery	The amount of of processed ore per ton of copper anode (kg)	The amount of overburden per ton of copper anode (kg)	The amount of of concentrate per ton of copper anode (kg)
Reverberatory furnace	93%	267474,5	262125,502	5349,48
Flash furnace	98%	253825	248748,5	5076,5

The difference in the quantity of processed ore is about 5.3% per ton of anode copper with the same amount of tailings more generated.

3.2. Air pollution

Air pollution is a major problem per quantity of emission and the area that is affected by its harmful impact. The biggest drawback of the copper production technology with the reverberatory furnace technology is that the vapours from the reverberatory furnace cannot be used for the production of sulfuric acid and therefore it cannot be treated from other harmful elements that are released in the air through the stack. Recovery of SO2 emissions from copper produced by the reverberatory furnace technology is around 40% while the percentage reached in the flash furnace is 98.5%. This figure speaks for itself of how much progress can be achieved in the protection of environment by applying modern copper production technologies.

When copper ore is processed in the reverberatory furnace, 200000t SO_2 or 100000t S are released in the atmosphere each year on average, while the remaining part of metallurgical gases from all pollutants is discharged through the reverberatory furnace stack.

The quantity of sulfur and sulfur dioxide emitted into the atmosphere per ton of concentrate is given in table 5.

Table 5. The amount of sulfur released into the atmosphere per 1t of concentrate

	The percentage of S in the concentrate (%)	Utilization of sulfur from the concentrate (%)	The amount of S in H_2SO_4 (kg)	The amount of produced H_2SO_4 (kg)	The amount of CO_2 released into the atmosphere (kg)	The amount of S released into the atmosphere (kg)
Reverberatory furnace	30	40	120	255	360	180
Flash furnace	30	98,5	295,5	627,94	9	4,5

The table shows how much progress has been made in terms of reducing air pollution by using the new technology compared to the old one, but if we look at the amount of produced copper anodes in table 6, this ratio is even higher, and due to higher copper recovery from the ore, small amount of concentrate is treated and the amount of sulfur released into the atmosphere is reduced.

Table 6. The amount of sulfur released into the atmosphere by 1t anode copper

	The amount of of concentrate per ton anode (kg)	The percentage of S in the concentrate (%)	The amount of S in the concentrate (kg)	Utilization of sulfur from the concentrate (%)	The amount of S in H_2SO_4	Quantity of H_2SO_4 (kg)	The amount of CO_2 released into the atmosphere (kg)	The amount of S released into the atmosphere (kg)
Reverberatory furnace	5349,8	30	1604,94	40	641,98	1364,2	1925,93	962,96
Flash furnace	5076,5	30	1522,95	98,5	1500,1	3187,71	45,7	22,85

The quantity of sulfur and SO_2 emitted into the atmosphere from the old technology is over 42 times higher. This is a very important fact in favor of the new technology which clearly shows the feasibility of investing in the modern technology which is environmentally friendly too.

3.3. Pollution of waterways

Modern methods of copper production envisage that all effluents are collected, purified and returned back to the production process for flotation or other needs, and possibly to return to waterways with the pollution that will not impact wildlife in waterways into which they are released.

4. ECONOMIC AND FINANCIAL ANALYSIS

With the introduction of new technologies in copper production, significant economic effects will be achieved with higher copper recovery from 93% to 95%. In this way, the amount of copper from the same amount of concentrate will significantly increase. The average amount of copper produced in this way, taking into account possible losses, will be around 3500 tons per year, or with the current price of around $6,800/t, the amount will be $23.8 million annually.

The acid produced by the "Chemibau" technology from the 70s is 145.200 t/year while by using modern sulfuric acid production technology with double catalysis, annual production will increase up to 260 000 t/y with lower power and production cost.

Replacement of technology will lead to changes in the structure of energy sources that will be applied. Consumption of electricity, including the production and consumption of oxygen will get higher while the consumption of coal and fuel oil will get significantly lower. However, what is important is that the total sum of the consumed power will be lower on average by about 26%, or $3-5 million/year.

By implementing the flash technology, we will produce copper that is cheaper by 114 $ -158 $ per ton of cathode copper or from 9.7 to 13.4 million $/year.

What should be taken into account here is more gold, silver, rhenium, germanium, tellurium and other metals that will be produced with values that are not negligible.

5. CONCLUSION

Introduction of new technologies will make possible better recovery of copper and other precious metals from the ore, higher efficiency of the workers, machines and equipment, lower maintenance and consumables cost with work in conditions that will be more humane and safer for workers. Any modernization and introduction of new technologies will require training and education of new employees to work in a modern plant, so that putting the new smelter and sulfuric acid plant into operation will inevitably lead to rejuvenation of staff working in the entire metallurgical complex which will partly solve the problem of unemployment of young people in Bor.

Justification of new technology is always viewed through economic benefits and efficiency of the process, in this case it is a significant factor but perhaps even more important knowing that the environment and health of people living in such a polluted area have never been properly taken care of.

Upon the construction of the new smelter and sulfuric acid plant, flue gases containing many harmful elements and heavy metals will be processed in an appropriate way in order not to endanger the health of people or disturb the natural environment. Some of these metals will be filtered out by new methods of metals` refining and also flue gases release into the atmosphere will be significantly reduced.

Effluents contain high amounts of copper and other valuable metals, particularly from the electrolytic refining plant. Owing to the technical modernization of electrolytic refining, favorable results can be achieved so that no additional treatment of output water will be necessary in order to extract copper and precious metals. The slurry that remains after the treatment of effluents, will be dried in vacuum presses and stored in a specially prepared landfill and after filling up the landfill capacity, it will be covered with a layer of soil and planted.

All said above justifies the investment in the development and implementation of new technologies in metallurgy, with further investments directed towards the development of methods and technologies for higher energy efficiency in all the facilities, modernization of the Concentrator and Tank House as well as in the development of technology to extract copper from old slag dumps.

REFERENCES

Bugarin M , Jonović R , Avramović Lj., 2012. *Tretman industrijskih otpadnih voda iz procesa proizvodnje bakra u rtb bor*, Rudarski radovi, vol. 4, strana 67-73.

Fideco, 2006. Analiza stanja životne sredine od šteta nastalih kao posledica prethodnog rada RTB, *Bor - Finalni izveštaj*, Beograd, Fideco.

Jonović R. et. al. ,2007. *Prečišćavanje otapdnih voda nastalih u hidrometalurškom procesu prerade anodnog mulja*, Tehnički fakultet Bor - Univerziteta u Beogradu, Zavod za zaštitu zdravlja "TIMOK" Zaječar, Centar za poljoprivredna i tehnološka istraživanja- Zaječar, Društvo mladih istraživača Bor Fakultet zaštite na radu-Niš, *EkoIst' 07, Ekološka Istina / Ecological Truth*, 27. – 30. 05. 2007. Hotel "Zdravljak" Sokobanja, Bor, Tehnički fakultet Bor - Univerziteta u Beogradu.

Najdenov I., 2013. *Upravljanje procesima topljenja i rafinacije bakra u funkciji unapređenja energetske efikasnosti*, doktorska disertacija, Univerzitet u Beogradu, Tehnološko-metalurški fakultet.

National Strategy of Sustainable Development, („Службени гласник РС”, бр. 55/05, 71/05-исправка и 101/07).

Occupational Safety & Health Administration, Reverberatory Furnace, Unite States department of labor, https://www.osha.gov/SLTC/etools/leadsmelter/popups/reverbfurnace_popup.html (preuzeto 25.04.2014.)

Outotec, *Flash smelting and flash converting,*Otutec, http://www.outotec.com/en/Products--services/Non-ferrous-metals-processing/Copper/Flash-Smelting-and-Flash-Converting/ (preuzeto 25.04.2014.)

Požega E., Gomidželović L., 2010. Topionice bakra sa plamenom i Isasmelt peći, *Copper*, vol. 35, br. 2, str. 25-32.

Trumić Ž. M., Trumić S. M., 2009. The role of mineral processing technology in recycling and sustainable development of Serbia, *International Journal of Environment*, vol. 2, no. 1, pp 201-209.

4th International Symposium on Natural Resources Management
"Sustainable Development and Green Economy in Transition Countries"
31st May -1st June, 2014, Faculty of Management Zajecar, Republic of Serbia
www.fmz.edu.rs

POLLUTION OF THE RIVER BORSKA WITHIN THE CONTEX OF SUSTAINABLE DEVELOPMENT

Slavica Miletic[1] , Jane Paunković[2], Daniela Urošević[3], Valentina Velinov[4]

[1]*Mining and Metallurgy Institute Bor, Zeleni Bulevar 35, 19210 Bor, Serbia*
[1]*slavica.miletic@yahoo.com*
[2]*Faculty of Management Zajecar, Megatrend University*
[2]*jane.paunkovic@fmz.edu.rs*
[3] *Mining and Metallurgy Institute Bor, Zeleni Bulevar 35, 19210 Bor, Serbia*
[2]*daniela.urosevic@irmbor.co.rs*
[4]*Technical Faculty Bor, University in Belgrade, Vojske Jugoslavije 12, 19210 Bor, Serbia*
[3]*valentina_velinov@yahoo.com*

ABSTRACT

This paper is presenting the problem of the pollution level of the Bor River within the concept sustainable development, with the aim of finding a solution that will minimize negative impacts on the . Understanding the importance of sustainable development is a key and ethical model for accumulatng i the economic, environmental and social problems. Sustainable development is "development that meets the needs of the present without compromising the needs of future" and from that point of view, the authors of this paper analyzed and disscused the pollution levelof the River Borska . The aim of this paper is to find the opportunities and means to act in a direction of reducing pollution in real terms, with no negative impact on the environment. Sustainability of the River Borska is only possible with the use of new technologies, adequate infrastructure and monitoringof the impact of primary factors on the environment that reduce pollution by toxic substances.

KEYWORDS

Pollution, River Borska, sustainable development, new technology

1. INTRODUCTION

The crucial question, based on the the numerous research in recent decades , is the importance of sustainable development as a key and ethical model for accumulated the economic, environmental and social problems. The concept of sustainable development is also one of the basic concepts of economics of natural resources.

Contemporary tendency is to protect the natural resources and preserve the environmental quality in terms of sustainable development which seeks a new balance between use and protection of natural resources. To achieve the highest possible quality of life, is essential for the approach to the concept of sustainable development.

Sustainable development, in terms of realization the economic growth, "which is forceful and at the same time socially and environmentally sustainable", was instigated more than 20 years ago by the Brundtland Commission (WCED, 1987). In the past decade, the term triple P - or People, Planet, Profit was formulated to capitalize a need of competitive focusing of managers on social, environmental and economic dimensions of corporate activities as it would help the creation of (sustainable) future of society worldwide (Henriques, Richardson, 2004).

The origin of sustainable development is much older, but for the modern environmental movements, the modern society has revitalized it and gave a different model and application.

Discourse on the concept of sustainable development that can be found in the literature has nowadays the central place in consideration the long-term prospects of survival and progress of mankind. In the paper *"International Business, Corporate Social Responsibility and Sustainable Development",* Ans Kolk and Rob van Tulder, gave an analysis of the most prominent magazine that deal with the topic of sustainable development with social responsibility (CSR). Reviewing approximately 1700 papers, it can be concluded that more than 97% of papers in the leading journals of management over the past two decades in their contents did not have anything about CSR and sustainable development (Van Tulder, , Van der Zwart, 2006).

The success of the concept of sustainable development is evaluated by appropriate indicators, based on the modern environmental laws, identifying the cause-and-effect relationship between the economic policy and protection policy and improvement of the environment (Veljković, 2011).

Sustainable development indicators indicate where the cause-effect relationships between the economy, environment and society are weak and show us a guide map how to solve these problems (http://www.sepa.gov.rs/download/teme3-2006-08.pdf).

Indicators are different as well as the types of systems that monitor. Effective indicators are relevant, easy to understand, reliable, based on the available data and have some characteristics that are common.

With development of indicators of sustainable development, the problem is that they are often the most needed indicators for which there is no data, until those for which there are data, they are least suitable for measuring the sustainability.

Implementation of the principle of sustainable development on the case of the River Borska is the opportunity to achieve the common goal of the all, which is to preserve the water resources.

Sustainable development and sustainability in general are considered as a modern obligation of humanity, especially when it comes to preserve the quality of rivers, i.e. reduction of pollution. The main focus in the present work is to analyze the condition of the River Borska, which is the one of the most polluted rivers in the world by the pollution level.

Bearing in mind that all waste water from the production process of copper ore processing flow into the River Borska, it is evident that concentrations of the heavy metals ions exceed the MAC (maximum allowable concentration).

Sustainable development of the River Borska becomes the major imperative in the future in terms of reducing the pollution level not only the River Borska, but also the all watercourses by development and strengthening the environmental awareness, in order to maintain the state of water resources at an acceptable level. Proper management of water resources, which includes the treatment of all wastewater prior to discharge into waterways, may be considered as a function of sustainable development.

A reliable indicator in the problem analyzing, helps us to understand what should be done with the aim of solving the same problem before entering into the framework of unsolvable, so the authors of this work used reliable indicators for solving pollution of the Bor River.

2. POLLUTION OF THE RIVER BORSKA

Over the past hundred years of mining, the production of copper and other precious metals in Bor instigated a great burden on the environment, not only the town of Bor but also the whole on Timok Region.

In the area of Bor, over 29,000 ha of land under forests and arable lands are degraded in the zone of RTB (Rudarsko Topionicarki Basen Bor) action, while the area of degraded agricultural land in the Bor municipality is over 60% of the available agricultural land (INREAT, 2003). The River Borska, in which all wastewater flow from tailing dumps, flotation plants and other facilities for copper production and treatment, is one of the most polluted rivers in the world (Bugarin et al., 2012).

The greatest impact on the pollution of River Borska has the industrial wastewater generated in the process of electrolytic copper refining, copper sulphate production and precious metals production as well as disposal the large amounts of mining waste (mine overburden, waste and flotation tailings (Bugarin et al., 2012).

The high concentration of accumulated heavy metal ions in the Borska river, such as: Cu, Fe, Mn, Zn, Pb, Ni, Bi, Cd, etc., that exceeds MAC (maximum allowable concentrations), defined by legislation, threatens not only its natural potential but also leads to the significant losses of valuable metals. Wastewater treatment is not only a need but an urgent necessity, in order to react in time and minimize the possible consequences that might eventually lead to an ecological disaster.

The problem of pollution does not end by cessation of mining activities; it may last even after the closure of the mine and even for centuries. After underground and open pit mining, there is a problem with abandoned mines after a certain time upon pumping the mine water and cessation the mine operation. Also, the surface water adversely affects the environment, by overflow. The negative impact, caused by mine water to the environment, is reflected in the long-term contamination of soil with which the mine water comes into contact and accumulation of heavy metal ions in it; the mine water inflowing into surface water; mixing of mine water with ground water and their pollution, etc. (Bogdanović et al., 2013). Mine water may contain a considerable amount of dissolved heavy metal ions and, in addition a contamination of significant losses of valuable metals (Bogdanović et al., 2013; Bogdanović et al., 2007; Bode et al., 2010; Bogdanović et al., 2011). Mine waters are one of the most serious threats to the water world and surroundings, but unfortunately they are rarely treated as such. (Bogdanović et al., 2013)

Mine water from the site Cerovo, partly from the underground mine Jama Bor and Veliki Krivelj mine flow into the Krivelj River. The second part of the mine water from the underground mine Jama Bor leads in into the River Borska after minimal treatment. Both rivers are much polluted with metal ions, suspended particles and sulfuric acid. The same are connected near place Zagradje and form the White River, which flows into the Timok near the village of Vražogrnac in the north of Zaječar. Timok is polluted with heavy metals which concentration is above the MAC at the place of the River Borska inflow. Timok is also a cross-border river in the lower part of flow, and the pollution problem is the international problem.

Figure 1 Riverbed of the Bor River before Bor, immediately before a dike in Brezonik

Figure 2 The old riverbed of the River Borska below the collector of RTB

Figures 1 and 2 present a comparative view of pure riverbed of the River Borska without the presence of heavy metal ions and the old riverbed of the River Borska below the collector of RTB, with concentrations of heavy metal ions above MAC.

Table 1 Chemical composition of composite samples of wastewater that inflow into the River Borska (Bugarin et al., 2012)

Parameter	Unit	Composite sample of waste water		III, IV class of water mg/dm^3	Analytical method
		Before neutralization	After neutralization		
Content of H_2SO_4	g/l	2.25 – 10.47			V
Aluminum (Al)	mg/dm^3	66 - 243	<1		AES-ICP
Antimony (Sb)	mg/dm^3	<1	<1	0.05	AES-ICP
Arsenic (As)	mg/dm^3	45 - 172	<1	0.05	AES-ICP
Cadmium (Cd)	mg/dm^3	1 - 11	<1	0.01	AES-ICP
Calcium (Ca)	mg/dm^3	310 - 670			AAS
Chromium(Cr)	mg/dm^3	<1	<1	0.5	AES-ICP
Cobalt (Co)	mg/dm^3	1-2	<1	2.0	AES-ICP
Copper (Cu)	mg/dm^3	123 - 1080	<1 – 2.3	0.1	AAS
Iron (Fe)	mg/dm^3	3360 - 11690	<1 – 4.1	1.0	AAS
Lead(Pb)	mg/dm^3	2.8 – 5.9	<1	0.1	AES-ICP
Magnesium (Mg)	mg/dm^3	73 - 250	<1 -0.2		AAS
Manganese (Mn)	mg/dm^3	2.9 – 9.0	<1		ICP
Nickel (Ni)	mg/dm^3	4.3 - 62	<1	0.1	ICP
Selenium (Se), soluble	mg/dm^3	1 - 121	<1	0.01	ICP
Sodium (Na)	mg/dm^3	10 - 270	11- 211		AAS
Vanadium (V)	mg/dm^3	1.3 - 6	<1	0.5	ICP
Zinc (Zn)	mg/dm^3	51 - 2197	<1 – 11.7	1	ICP
Silver (Ag)	mg/dm^3	<1	<1	0.02	ICP
Bismuth (Bi)	mg/dm^3	1 – 2.2	<1		AAS
Mrcury (Hg)	mg/dm^3	0.001 – 0.014	<0.001	0.001	CV-AAS
Chlorides (Cl^-)	mg/dm^3	17.47 – 131.72			T
Silicates (SiO_2)	%	2.72 – 27.93			XRFA
Fe_2O_3	%	17.07 – 28.64			XRFA
CaO	%	0.24 – 1.15			XRFA

The data is presented in the paper *"Treatment of Industrial Wastewater from the Copper Production Process in RTB Bor"* (Bugarin et al. 2012). Table 1 shows the chemical characterization of wastewater samples that inflow into the River Borska from the copper production. The same were treated with lime milk to remove the present heavy metal ions. Series of experiments of neutralization process were carried out. The results of neutralization indicate that the wastewater of composite sample of all industrial wastewater from the copper production (which includes the copper smelting and refining process) after neutralization process belongs to the class IV of water by the legislation of the Republic of Serbia.

High copper concentration in the analyzed industrial wastewater, imposes a necessity for copper extraction before the neutralization process. The level of pollution by heavy metal can be clearly seen from Table 1.

The open problem of *mine water* or *industrial waste water*, poses the question: What to do with them?

With the aim of sustainable production, it is necessary to solve the problem of this water so it means to make a strategy for wastewater management as follows:

1. To find out the new technologies for mine water treatment using prior experiences on an integrated treatment of mining waste with industrial wastewater;
2. To make a pilot treatment plan with the consideration of return this water to further technological process which leads to sustainable development;
3. To consult the scientific organizations with modern equipment for testing and analysis of heavy metals;
4. To hire good experts to address the problem of pollution.

3. CONCLUSION

This paper is presenting a problem of the River Borska as a natural resource that is treated as one of the most polluted in the world. Since the concept of sustainable development is a key term in finding a balance between protection and use of natural resources, the obligation of the state authorities is to ensure the sustainable use of this resource.

The authors of this paper, analysing the pollution of the River Borska in the framework of sustainable development, make the following suggestions:

- Introduction of the latest technologies for mine water treatment;
- Development of appropriate studies: conceptual design, preafisibility stady, feasibility study, general design, detailed design and implementation project;
- Projects for wastewater treatment should be based on previous research and innovations by some of the scientific research house;
- Selected company must possess high professional staff, modern equipment for design, and modern laboratory equipment for analyses of water with a good knowledge of technology for wastewater treatment.

REFERENCES

INTREAT, 2003. *Integrated Treatment of Industrial Wastes towards Prevention of Regional Water Resources Contamination*.

Bugarin M., Jonović R., Avramović Lj., 2012. Treatment of Industrial Wastewater from the Copper Production Process in RTB BOR. *Mining Engineering*, No. 4, pp. 68-73.

Bogdanović G. D., Trumić M- Ž., Stanković V., Antić D. V., Trumić M. S., Milanović Z., 2013. Mine waters from mining & smelting basin Bor - a resource for the recovery of copper or polluter of the environment. *Reciklaža i održivi razvoj*, 6, pp. 41-50.

Bogdanovic, G., Antonijevic, M., Milanovic, Z., Šerbula, S., Milić, S., 2007. Analiza stanja rudničkih voda Rudnika bakra Bor. *II Simpozijum "Reciklažne tehnologije i održivi razvoj"*, Soko Banja, Srbija , pp. 269-275.

Bode A., Zoga P., Xhulaj D., Xhulaj S., 2010. Mining residues around lake Ohrid. *Journal of Mining and Metallurgy* 2010, 46 A(1), pp23 – 31.

Bogdanović G., Trumić M., Trumić M., Antić D.V., 2011. Upravljanje otpadom iz rudarstva- nastanak i mogučnost prerade. *Reciklaža i održivi razvoj*.

WCED, 1987. *Our common tuture* .Oxtord Universite Press.

Henriques A. & Richardson J. (Eds.), 2004. *The triple bottom line. Does it all add up?* London: Earthscan.

Van Tulder, R., & Van der Zwart, A. (2006). International business-society management: Linking corporate responsibility and globalization. London: Routledge.

Kolk A, & van Tulder R., 2010. International business, corporate social responsibility and sustainable development. *International Business Review*, 19, pp. 119–125.

http://www.sepa.gov.rs/download/teme3-2006-08.pdf
Veljković N., 2011. Putokaz ka održivom razvoju - nacionalna strategija održivog razvoja. Ministarstvo za nauku i tehnološki razvoj Republike Srbije.

4th International Symposium on Natural Resources Management
"Sustainable Development and Green Economy in Transition Countries"
31st May -1st June, 2014, Faculty of Management Zajecar, Republic of Serbia
www.fmz.edu.rs

MONITORING AND CORRELATION BETWEEN ELF ELECTROMAGNETIC POLLUTION AND EXHAUST FUMES AIR POLLUTION IN NOVI SAD

Prof Dr Tamara Galonja Coghill
MA Milica Stojnić

Department for Ecology
Faculty of Economics and Engineering Management
University Business Academy, Novi Sad, Cvećarska 2
Corresponding author e-mail: tamaragc@ymail.com

ABSTRACT

During three months period, weekly measurements of ELF electromagnetic fields ("electrosmog") and carbon monoxide (CO) concentrations were performed at ten locations in Novi Sad, selected as a function of increased urbanization. Measurements were performed the same day, in the morning, at noon and evening, because of different types and intensities of human activities during different periods of day. The results of two sets of measurements were analysed separately as well as for possible correlation between EM fields and loads of air emissions through the CO concentration.

These results suggest possible interdependence of measured parameters..

KEYWORDS

Urban ELF electromagnetic fields, carbon monoxide.

1. INTRODUCTION

Since the seventies of the twentieth century there have been concernes and investigations into the exposure levels of electric and magnetic fields in residential and occupational areas (Werthaimer and Leeper, 1979), for it has been established that there is not a single entity, or part thereof, which is insensitive to these fields. The root of this lies in the fact that organisms use electric fields (whose emanations are routinely measured as ECG or EEG) as a means of intercellular communication, as confirmed by hundreds of scientific papers (Barsam et al., 2012; Galonja, 2003). Obviously, the body electric processes are much more fundamental chemical (Little, 2004).

Urban ecology recognizes anthropogenic electromagnetic emanations as ubiquitous pollutants, resulting in the creation of the term "electrosmog". It is characterized by elevated levels of electric and / or magnetic field, which affect the chemical composition of air and extend retention of some airborn particles (often confirmed pollutants) in the air mixture (Nowak and Radon, 2004). An excellent indicator of those is carbon monoxide, therefore simultaneous monitoring of these two types of pollutions is logical and justified.

Electricity is the most common form of energy used by man today. The high transmission speed over long distances with relatively small loss of energy and ease of conversion to other forms of energy make it indispensable in today's society. In the city of Novi Sad the development plans aimed at improving the electricity transmission network are being implemented (www.ems.rs, 2013), (Figure 1).

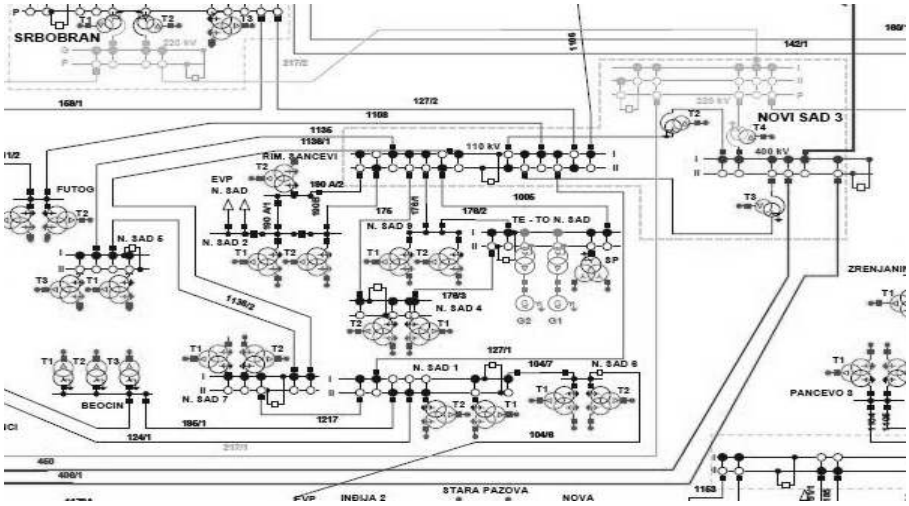


Figure 1. Transmission system development plan until 2015 , the picture shows part of the plan for 2013 (http://www.ems.rs/media/uploads/2013/06/Prilog-2-Jednopolne-seme.pdf, 2013).

Around thirty years ago , the World Health Organization has pointed that the development of industry and electricity distribution networks has resulted in increased public exposure to electromagnetic fields from alternating current high-voltage transmission lines (WHO , 1984) . These fields, which belong to extremely low frequency region of the electromagnetic spectrum (ELF), have been linked to an increased risk of acute leukemia in children (Pasquini et al., 2003). One of the most investigated malignancies whose genesis is linked to exposure to EM fields indeed is leukemia. Minder and Pfluger (2001) demonstrated an association between occupational exposure to these fields and the incidence of leukemia, using a sample of railway workers.

Cecconi et al (2000) experimentally showed that ELF fields may reduce the reproductive potential of female mammals, reducing the ability of the follicle to reach the stage of development necessary for reproductive success.

On the other hand, CO is not classified in the group of "greenhouse gases", but it still affects the atmosphere by changing its chemistry. As the key air pollutant, it can well be used as a tracer in the separation of CO_2 and CH_4 originating from biogenic and esfpecially anthropogenic sources (Haiduc and Beldean, 2011).

IPCC manual (2006) classifies gases according to their potential to participate in the process of global warming:

a) gases with the potential to contribute to global warming (GWP Global Warming Potential) including: CO_2, CH_4, N_2O, SF_6, NF_3, SF_5CF_3, $C_4F_9OC_2H_5$, $CHF_2OCF_2OC_2F_4OCHF_2$, $CHF_2OCF_2OCHF_2$ and other halocarbons CF_3I, CH_2Br_2, $CHCl_3$, CH_3Cl, CH_2Cl_2.

b) gas resources without contributing to global warming: $C_3F_7C(O)C_2F_5$, C_7F_{16}, C_4F_6, C_5F_8 and C_4F_8O.

Electromagnetic emanations interfere with the quality of air, affecting the airborn particles therefore it was interesting to determine the possible correlation of the intensity of "electrosmog" with the level of air emissions through the determination of the concentration of carbon monoxide at the same locations. This is the first study of this kind conducted in Novi Sad.

2. MATERIAL AND METHODS

Field studies were carried out in the period from september to 18 novembar 2013 and included the measurement of the magnetic flux density of the ELF electromagnetic field (power distribution frequency 50 Hz), as well as the level of air polluting exhaust emissions in the urban area (Novi Sad) at ten locations. The measurements of the magnetic flux were performed 1 m above the ground using EMF professional meter, Perspective Scientific, London, UK. The CO concentration measurements were carried out using Testo 310 apparatus, gas analyzer set.

The locations for the study were chosen in a function of increased urbanization, from lowest to highest, and include suburban settlement Adice, Telep (primary school "József Attila"), Novo naselje, two sites at Liman (ambulance and Mercator building), sports and business center "Vojvodina", University of Novi Sad - Student city, Novi Sad city center (the main post office), the main railway station and the Clinical center of Vojvodina.

During the research project, three measurements of levels of electric and magnetic fields and the concentration of carbon monoxide (CO) were performed at all ten locations, the same day each week. The measurements were taken in the morning (starting at 07 am), afternoon and evening (starting at 18 pm), because of the different types and intensities of human activities during different periods of the day.

The collected data were analyzed and processed, comparatively for each location in terms of time of day, as well as comparatively for different locations.

3. RESULTS AND DISCUSSION

The average values of CO concentration at all ten locations measurements were different.

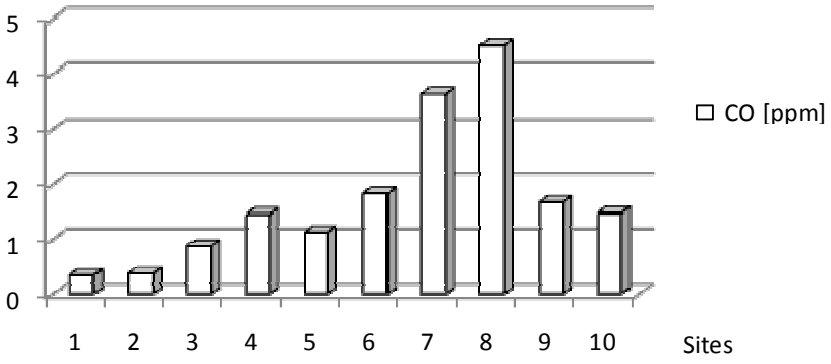


Figure 2. CO concentration [ppm] – morning measurements, at ten locations in Novi Sad.

Key: 1 - Adice, 2 – primary school "József Attila", 3 – Ambulance Liman, Balzakova street, 4 – Merkator center, 5 – University in Novi Sad, campus, 6 – sports and business center "Vojvodina", 7 – main post office, Tačka 8 – main railway station, 9 – Clinical center of Vojvodina, 10 – C market, Novo Naselje.

The concentration of exhaust gases was lower in the morning with a mean of 0:36 ± 0:11 ppm in the least urbanized and congested traffic measuring point (Adice). The increased urbanization resulted in higher average measured morning concentrations with a mean of 4:51 ± 0.62 ppm at the location with heaviest traffic (Main railway station), also contributed by the vicinity of the main bus station. Locations at the main post office (average 3.63 ppm) and Mercator building on Liberation Boulevard (1.45 ppm) also showed higher morning CO concentrations (Figure 2).

Midday measurements found the lowest concentration of CO in suburban part Adice, which remained of the average morning levels for the site (0.32 ± 0.1 ppm). The highest average CO concentrations were found at the main post office (4.29 ppm) and Hajduk Veljkova street in front of the Clinical Center of Vojvodina

(3.78 ppm). In the inner circle of the Clinical Center of Vojvodina, the average measured concentration of CO was 1:36 ± 0:22 ppm. Despite a significant increase in traffic intensity, the concentration of CO at the site of Mercator on Liberation Boulevard, did not show a large increase (average 1.91 ppm), probably due to the proximity of the Danube, and the constant flow of air. Evening CO measurements have shown various fluctuations, both increase and the decline and retention at the midday level, as well, at different locations.

Magnetic fields varied between 0,02 μ T (the lowest level measured), and 0,55 μT (highest measured value) during all measurements.

In the morning, strongest magnetic fields were recorded near the main post office, sports and business center "Vojvodina" and Mercator center. They were slightly lower at the main train station and Clinical Center. During the morning measurements, only at the main post office site the ICNIRP residential safety recommendations of 0.4 μT (Straume et al., 2008) were exceeded.

Midday measurements showed that the magnetic component of the electromagnetic field at the measurement locations 1, 7, and 10 (Adice, main post office, and C-market at Novo Naselje) has not changed. At all other measurement points higher values were measured, as compared to morning values. Significantly higher levels were measured at the sports and business center "Vojvodina" (from morning 0,32 to 12,48 midday μT).

Evening measurements showed an average reduction of measured values only in the measuring point 3 (from 0.4 to 0.2 μ T). At points 1, 2, 5 and 9 average values were unchanged as compared to the midday values. Furthermore, an increase was found in five locations, compared to the midday measurements.

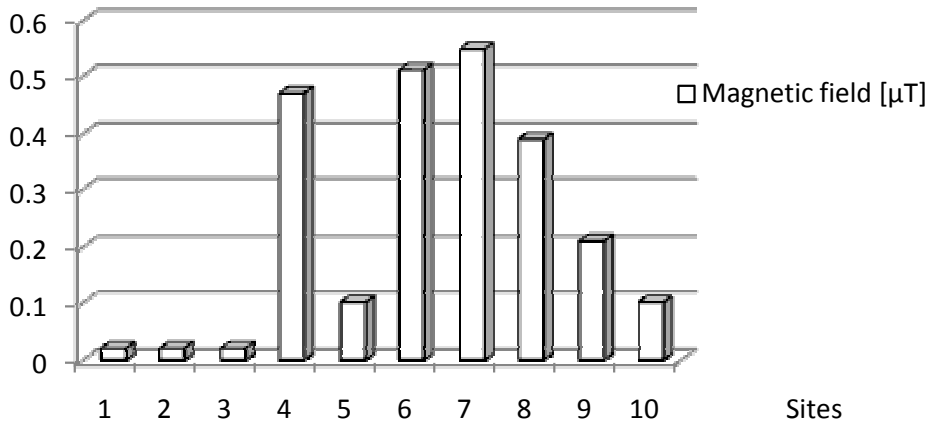


Figure 3. Average magnetic flux density CO concentration [μT] – evening measurements, at ten locations in Novi Sad.

Key: 1 - Adice, 2 – primary school "József Attila", 3 – Ambulance Liman, Balzakova street, 4 – Merkator center, 5 – University in Novi Sad, campus, 6 – sports and business center "Vojvodina", 7 – main post office, Tačka 8 – main railway station, 9 – Clinical center of Vojvodina, 10 – C market, Novo Naselje.

The correlation of the average magnetic flux density [μT] and the average concentration of CO [ppm] at all ten measurement locations in Novi Sad, indicate the existence of a trend of interdependence between the measured parameters with minor sporadic deviations.

In the interest of better understanding of these results, it would be interesting to carry out a study of given parameters in different weather conditions and different seasons, which is characterized by significant differences in the levels of emitted electromagnetic fields (Peniagua et al., 2004).

The example of EMF-CO interdependence is shown in Figure 4.

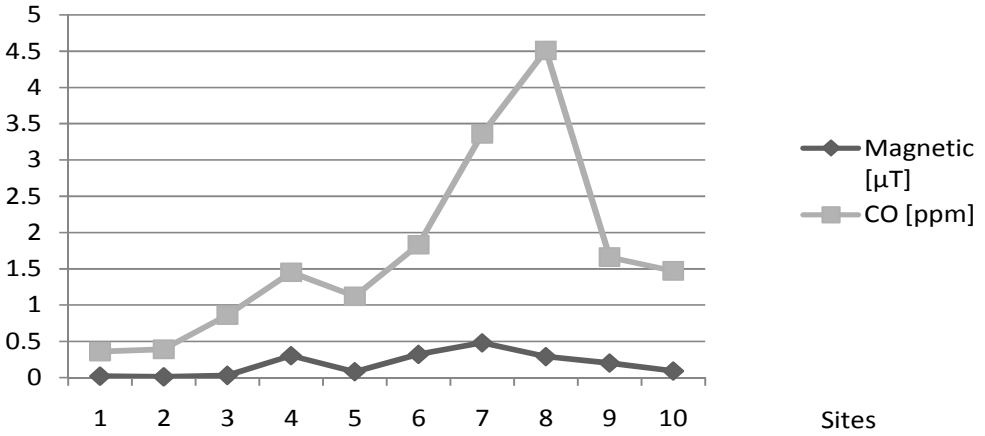


Figure 4. The correlation of the average magnetic flux density [μT] and CO concentration [ppm], morning measurements at ten locations in Novi Sad

Key: 1 - Adice, 2 – primary school "József Attila", 3 – Ambulance Liman, Balzakova street, 4 – Merkator center, 5 – University in Novi Sad, campus, 6 – sports and business center "Vojvodina", 7 – main post office, Tačka 8 – main railway station, 9 – Clinical center of Vojvodina, 10 – C market, Novo Naselje.

The world has witnessed a gradual decrease of CO concentration, up to almost five times (the United States between 1980 and 2006, established decline of the average CO concentration from 14 to 3 ppm, Washington from 9 to 2 ppm and Los Angeles from 14 to 4 ppm). Given the undiminished expansion of traffic, and the negligible use of renewable energy sources that are not based on combustion, it is possible to assume that some of reasons behind this decline are higher quality fuel and combustion systems. The highest average CO concentration in the world, 44 ppm, was measured in Seoul (Korea), while the lowest average CO concentration, 0,1 ppm, was measured in Helsinki in 1997.

4. CONCLUSION

There seems to exist quite strong interdependence between the magnetic flux density and CO concentrations at all ten sites studied in Novi Sad, changing in the same manner throughout the day.

It has been known that electrosmog can affect the composition of air, acting towards retaining the airborn particles in the atmosphere.

These results call for another study of given parameters in different weather conditions and different seasons, characterized by significant differences in the levels of emitted electromagnetic fields.

ACKNOWLEDGEMENT

The study was co-funded by the City council for environmental protection, City of Novi Sad, the Autonomous Province of Vojvodina, Project number VI-501-2/2013-40.

REFERENCES

Barsam, T., Monazzam, M.R., Haghdoost, A.A., Ghotbi, M.R., Dehghan, S.F.. 2012. Effect of extremely low frequency electromagnetic field exposure on sleep quality in high voltage substations, *Iranian J Environ Health Sci Eng*. 2012 Nov 30;9(1):15. doi: 10.1186/1735-2746-9-15.

Cecconi, S., Gualtieri, G., Di Bartolomeo, A., Troiani, G., Cifone, M.G. i Canipari, R. 2000. Evaluation of the effects of extremely low frequency electromagnetic fields on mammalian follicle development, *Faseb Journal* 15(11): 2319-2325

Galonja, T. (2003): Biological effects of Mobile Phones Radiation, Monography of The International Eco-conference "*Environmental protection of Urban and Suburban Settlements*, ISBN 86-83177-16-5, Vol I, 349-354,

Haiduc, J. and Beldean G. M.S. 2011. *Variation of Greenhouse Gases in Urban Areas-Case Study; CO2, CO and CH4 in Three Romanian Cities, Air Quality- Models and Applications*, book, Nicolas Mazzeo ed., ISBN 978-953-307-1, Oceanography and Atmospheric Sciences

http://www.ems.rs/media/uploads/2013/06/Prilog-2-Jednopolne-seme.pdf, (26.11.2013., 13:15)

Little, J.W. (2004): Complementary and alternative medicine: Impact on dentistry, *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 98(2):137-45

Minder, C.E. i Pfluger, D.H. (2001): Leukaemia, brain tumors, and exposure to extremely low frequency electromagnetic fields in Swiss railway employees, *American Journal of Epidemiology* 153(9): 825-835

Nowak, D., Radon, K. (2004): Electromagnetic pollution (electrosmog) -- potential hazards of our electromagnetic future, *MMW Fortschr Med*. 2004 Feb 26;146(9):38-40.

Paniagua, J.M., Jiménez, A., Rufo, M., Antolín, A. (2004): Exposure assessment of ELF magnetic fields in urban environments in Extremadura (Spain), *Bioelectromagnetics*. 2004 Jan;25(1):58-62.

Pasquini, R., Villarini, M., Scassellati Sforzolini, G., Fatigoni, C. i Moretti, M. (2003): Micronucleus induction in cells co-exposed in vitro to 50 Hz magnetic field and benzene, 1,4-benzenediol (hydroquinone) or 1,2,4-benzenetriol, *Toxicol In Vitro*. 17(5-6):581-6

Straume, A., Johnsson, A., Oftedal, G. (2008): ELF-magnetic flux densities measured in a city environment in summer and winter, Department of Physics, Norwegian University of Science and Technology (NTNU), Trondheim, Norway, *Bioelectromagnetics*. 2008 Jan;29(1):20-8.

Werthaimer, N. i Leeper, E**.** (1979): Electrical Wiring Configurations and Childhood Cancer, *Am. J. Epidemiol*. 109: 273-284

WHO (1984): *Environmental Health Criteria 35: Extremely Low Frequency (ELF) Fields*, Geneva, World Health Organisation

4th International Symposium on Natural Resources Management
"Sustainable Development and Green Economy in Transition Countries"
31st May -1st June, 2014, Faculty of Management Zajecar, Republic of Serbia
www.fmz.edu.rs

DIVERSITY AND ABUNDANCE OF LICHENS IN URBAN AREAS IN CORRELATION WITH AIR POLLUTION THROUGH ELECTROMAGNETIC FIELDS AND EXHAUST FUMES EMISSIONS

Prof Dr Tamara Galonja Coghill
MA Milica Stojnić

Department for Ecology
Faculty of Economics and Engineering Management
University Business Academy, Novi Sad, Cvećarska 2
Corresponding author e-mail: tamaragc@ymail.com

ABSTRACT

Lichens are specific bioindicators of air pollution, which is partly based on the fact that they have no ability to excrete the absorbed substances. During the period from September to November 2013, nine genera of lichens present were sampled once a week (*Xanthoria, Physcia, Parmelia, Candelariella, Phaeophyscia, Buelia, Lecanora, Caloplaca, Graphis*) at ten locations in Novi Sad, where the levels of electromagnetic fields (50 Hz) and the concentration of carbon monoxide (CO) were pre-determined. The results indicate the existence of an inverse proportionality trend between the abundance of lichenoflora with the other two monitored parameters at the sites examined.

KEYWORDS

Lichens, bioindicators, ELF electromagnetic fields, carbon-monoxide.

1. INTRODUCTION

Lichens are specific bioindicators of air pollution. Lichen populations change both in terms of diversity and abundance of individual populations following levels and concentrations of air pollutants.

As these are organisms with minimum requirements in terms of the growth medium, they can occur on almost all types of hard surfaces. This is the result of concerted physiology of fungi and algae (or cyanobacteria and fungi) making their essentially antagonistic individual activities act synergistically in ensuring the functioning of lichen as a whole (Galonja Coghill, 2011).

Bioindicating excellence of lichens is mostly based on the fact that they have no ability to secrete substances absorbed, but accumulate them in the body, hence dying when the amount of pollutants reach critical levels. Therefore, the condition of lichen populations at a particular location indicates the longer-term level of air pollution. Amongst the few species that can live in human settlements *Xantoria parietina* and *Physcia sp*. stand out.

Composition of air pollution in cities is becoming increasingly complex. One of the newer types of pollution is anthropogenic electromagnetic pollution (known as "electrosmog"), which can correlate with the concentration of the exhaust gases, and have some impact on concentrations of carbon monoxide (CO) in air both indirectly and directly. Although CO is not classified as "greenhouse gas ", it changes the chemistry of the atmosphere and affects the amount of other greenhouse gasses.

Despite these known correlations and the fact that lichens indicate even subtle changes in the composition of air, no study of the dependence of the variety and abundance of lichens on electromagnetic smog in urban

areas has been done so far. Electromagnetic fields, kind we encounter in everyday life, present a new experiential moment for nowadays organisms. Different organisms show different tolerance threshold, due to the bio-feedback mechanisms that tend to offset the undesirable changes. Sources of such fields include, inter alia, transmission lines and substations, internal electrical cables and grounding of buildings and equipment .

Anthropogenic electromagnetic fields and radiation are ubiquitous pollutants. The sum total electromagnetic emanations at any point of the planet is called " electrosmog " . It affects the chemical composition of air and prolong the retention of polluting particles in it (Nowak and Radon , 2004). As carbon monoxide is an excellent indicator, simultaneous monitoring of electromagnetic and exhaust emissions pollution using CO as a reference parameter was methodologically very reasonable.

There is no place on our planet that would not be influenced by artificially introduced electromagnetic emanations (Seitz et al., 2005), and this is a new evolutionary - experiential moment for today's organisms. As the electric fields are additive, external electromagnetic fields can impair the physiological processes in which organisms use electrons (Schreier et al., 2006). The creation, transmission and use of electric energy is associated with generation of weak 50 or 60 Hz frequency electric and magnetic fields. The standards of exposure should be adjusted according to the parameters of normal biological processes (Galonja, 2003) , since the literature data indicate that those fields may have the ability to cause DNA damage (Belyaev et al., 2005) , disorders of intercellular communication, metabolism and cell reparation processes . Johansson (2004) categotized electromagnetic hypersensitivity as one of many medically recognized hypersensitivities to stimuli of any nature. Oztas et al. (2004) found that exposure to ELF EM fields at 50 Hz may cause a change in the permeability of the blood- brain barrier.

Major European cities tend to keep an average CO concentration below 2 mg/m^3 of air, with maximum values below 6.0 mg/m^3 air. Global average concentration of carbon monoxide is in the range between 0.05 and 0.12 ppm in the air (Park and Kim, 2007), taking into account the total value of both urban and rural areas . CO concentrations in urban areas vary depending on human activities , while in rural areas and natural habitats are more affected by natural processes . The concentration of CO in urban areas is proportional to the number of combustion sources, topography, weather conditions, and the distance between the point of measurement and roads .

2. MATERIAL AND METHODS

Field studies were carried out in the period from September to mid novembar 2013. Lichenes were sampled once a week at ten locations in Novi Sad. During the sampling, levels of electric and magnetic fields (power distribution frequency 50 Hz) and the concentration of carbon monoxide (CO) were also measured. Electromagnetic fields were determined using EMF professional meter, Perspective Scientific, London, UK. The CO concentration measurements were carried out using Testo 310 apparatus, a gas analyzer set. Sampling locations were chosen in a function of increased urbanization, from lowest to highest, and include suburban settlement Adice, Telep (primary school "József Attila"), Novo naselje, two sites at Liman (ambulance and Mercator building) , sports and business center "Vojvodina", University of Novi Sad - Student city, Novi Sad city center (main post office), the railway station and the Clinical center of Vojvodina.

Lichenes collected were analyzed in terms of diversity and abundance (numbers) in the laboratory of Ecology, Faculty of Economics and Engineering Management in Novi Sad. Lichens were determined according to Wirth (1995).

3. RESULTS AND DISCUSSION

Nine lichen genera were analyzed during the study. Those were *Xanthoria*, *Physcia*, *Parmelia*, *Candelariella*, *Phaeophyscia*, *Buelia*, *Lecanora*, *Caloplaca* and *Graphis*. Although some were present in larger numbers at some locations, generally no lichen populations were either abundant or showed significant variety at any site investigated.

Throughout the study, dominant genera were *Xanthoria*, *Physcia* and *Parmelia*. This was as expected, considering that they are more tolerant to high levels of air pollution.

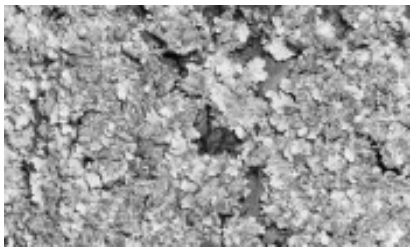


Figure 1. *Phaeophyscia sp.* found at the Clinical center of Vojvodina

Representatives of genera *Candelariella* and *Phaeophyscia* (Picture 1) were present in a smaller proportion.

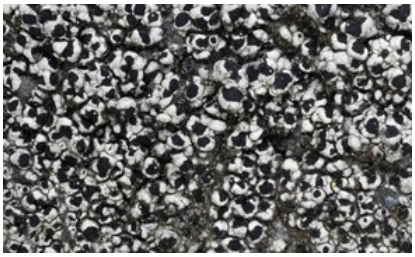


Figure 2. *Buelia sp.* found at the University of Novi Sad campus

The rarest were representatives of the genera *Buelia* (Picture 2) and *Lecanora*, while genera *Caloplaca* and *Graphis* were found at two locations only.

Clearly there were parts of the town where the abundance and diversity of lichenes were much greater, than in others.

Table 1 gives the overview of presence and relative abundance of lichen genera studied, indexed + for slight presence to +++ for greater presence.

The studied zones in the city of Novi Sad can be classified as "lichen deserts" (characterized by a low diversity of lichens, which are present with low abundance), "transition zones" (lichens are present, but in small numbers) and the "zones of normalization", very conveniently devised by Stamenkovic (1997 , 2002) in his studies.

Table 1. The presence and the relative abundance of monitored lichen genera at ten locations in Novi Sad.

Genus / Site	*Xanthoria*	*Physcia*	*Parmelia*	*Candelariella*	*Phaeophyscia*	*Buelia*	*Lecanora*	*Caloplaca*	*Graphis*
1	++	+++	++	++	+	+	+	+	+
2	+++	+++	+++	++	++	+	+	-	-
3	++	+++	++	+	+	-	+	-	-
4	++	+	++	-	+	-	-	-	-
5	+++	++	++	++	++	+	+	+	+
6	+	++	+	-	+	-	+	-	-
7	+	-	-	-	+	-	-	-	-
8	++	+	-	-	+	-	-	-	-
9	+++	++	++	+	++	-	+	-	-
10	++	+	++	+	+	+	-	-	-

Key: 1 - Adice, 2 – primary school "József Attila", 3 – Ambulance Liman, Balzakova street, 4 – Merkator center, 5 – University in Novi Sad, campus, 6 – sports and business center "Vojvodina", 7 – main post office, Tačka 8 – main railway station, 9 – Clinical center of Vojvodina, 10 – C market, Novo Naselje.

The normalization zones, with 7-9 lichen genera present are the suburban part Adice, part of Telep area (Šarplaninska Street) and student campus.

The transition zone, with 5 to 6 lichen genera found, in accordance with the suggestions in the interpretation of results by Gajević et al. (2007), includes the location of Ambulance Liman (Balzakova street), sports and business center "Vojvodina", railway station, Clinical Center of Vojvodina and location around the C market at Novo naselje.

Only *Xanthoria* and *Phaeophyscia* genera were found at all ten locations, first one being present in great abundance at three locations. Although presetn at all locations investigated, genus *Phaeophyscia* was not found in large numbers at any of them.

The mean values of the CO concentration and magnetic fields were different were different at all locations. The results indicate the existence of a trend of inverse proportionality between the diversity and abundance of lichen populations and other two monitored parameters at the locations investigated (Figure 3).

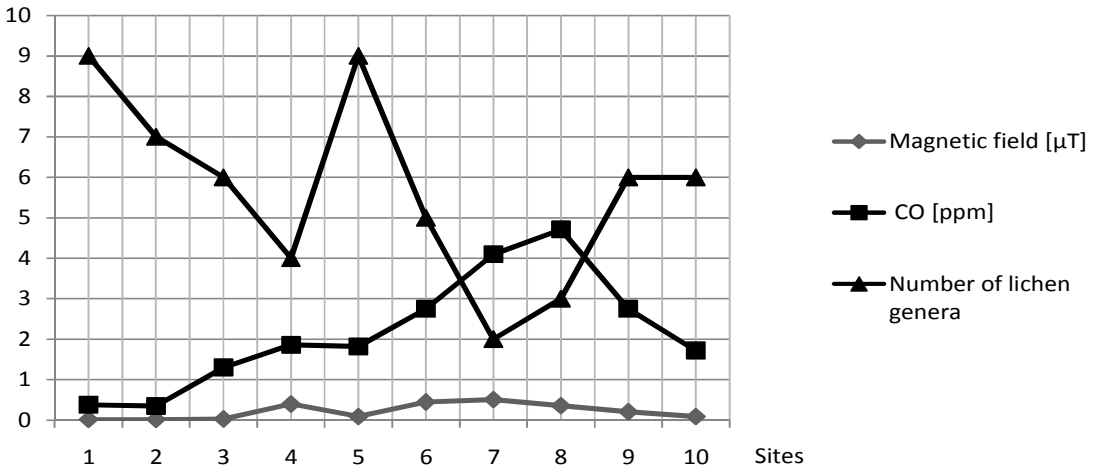


Figure 3. The correlation between the average magnetic flux density [μT], the concentration of CO [ppm] and diversity of lichen populations at ten locations in Novi Sad

4. CONCLUSION

The study focused on the comparative analysis of lichen abundance and diversity at different locations while aspects of daily fluctuations in the concentration of CO and levels of electromagnetic fields were used only to help defining local loads of the specified pollutants. The results indicate the existence of a trend of inverse proportionality between the diversity and abundance of lichen populations and other two monitored parameters at the locations investigated. Such interdependence deserves further investigation.

Although a gradual decrease in the concentration of CO to up to almost five times was achieved at various locations worldwide, one can not define it as the creation of favorable conditions for the development of lichen populations, as they are sensitive to a variety of other air pollutants.

ACKNOWLEDGEMENT

The study was co-funded by the City council for environmental protection, City of Novi Sad, the Autonomous Province of Vojvodina, Project number VI-501-2/2013-41.

REFERENCES

Belyaev, Igor Y., Lena Hillert, Marina Protopopova, Christoffer Tamm, Lars O.G. Malmgren, Bertil R.R. Persson, Galina Selivanova, Mats Harms-Ringdahl (2005): 915 MHz microwaves and 50 Hz magnetic field affect chromatin conformation and 53BP1 foci in human lymphocytes from hypersensitive and healthy persons**,** Wiley-Liss, Inc , *Bioelectromagnetics*, Volume 26, Issue 3, pages 173–184

Gajević, Ivana, Ranđelović, V., Stamenković, S. (2007): Promene u sastavu zajednice epifitskih lišajeva na području grada Prokuplja (1995-2005), *9th Symposium on Flora of Southeastern Serbia and Neighbouring Regions*, Proceedings, 133-135

Galonja Coghill, Tamara (2011): *Mikrobiologija*, Textbook, Megatrend University, Belgrade, ISBN 978-86-7747-424-9, COBISS.SR-ID 182216204, 579 (175.8)

Galonja, T. (2003): Biological effects of Mobile Phones Radiation, *Monography of The International Eco-conference "Environmental protection of Urban and Suburban Settlements*, ISBN 86-83177-16-5, Vol I, 349-354,

Haiduc, Jovana i Beldean Galea, M.S. (2011): *Variation of Greenhouse Gases in Urban Areas-Case Study; CO2, CO and CH4 in Three Romanian Cities, Air Quality- Models and Applications*, book, Nicolas Mazzeo ed., ISBN 978-953-307-1, Oceanography and Atmospheric Sciences

Johansson, O. (2004): Electrohypersensitivity: Observations in the Human Skin of a Physical Impairment, *Symposium on Electrosensitivity in Human Beings, September* 2004, London, Abstract CD, published by Coghill Research Laboratories

Nowak, D., Radon, K. (2004): Electromagnetic pollution (electrosmog) -- potential hazards of our electromagnetic future, *MMW Fortschr Med*. 2004 Feb 26;146(9):38-40.

Oztas, B., Kalkan, T. i Tuncel, H. (2004): Influence of 50 Hz frequency sinusoidal magnetic field on the blood-brain barrier permeability of diabetic rats, *Bioelectromagnetics*, 25(5):400-2

Park,, S.S. i Kim, Y.J. (2007): Titulul., *Environmental Monitoring and Assessment*, No 128, pp. 231-240

Schreier, N., Huss, A., Röösli, M. (2006): The prevalence of symptoms attributed to electromagnetic field exposure: a cross-sectional representative survey in Switzerland, *Soz Praventivmed*. 51(4):202-9.

Seitz, H., Stinner, D., Eikmann, T., Herr, C., Röösli, M. (2005): Electromagnetic hypersensitivity (EHS) and subjective health complaints associated with electromagnetic fields of mobile phone communication--a literature review published between 2000 and 2004., *The science of the total environment*, 2005 Oct 15; 349(1-3):45-55

Stamenković, S. (1997): Biological indication of air pollution in Prokuplje (Serbia, Yugoslavia) by means of lignicolous lichens, *Ekologija*, ISSN 0531-9110, v. 32(1) p. 107-110

Stamenković, S. (2002): Bioindication of air pollution in Pirot [Serbia, Serbia&Montenegro] by use of lichens, *Ekologija*, Acta Biologica Iugoslavica, Serija D, v. 37(1-2) p. 33-39

Wirth, V. (1995): *The lichens Baden-Wurttemberg*, 1-2. Ulmer. Stuttgart