7TH INTERNATIONAL SYMPOSIUM ON ENVIRONMENTAL AND MATERIAL FLOW MANAGEMENT

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BOOK OF PROCEEDINGS

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7TH INTERNATIONAL SYMPOSIUM ON ENVIRONMENTAL AND MATERIAL FLOW MANAGEMENT

Plenary lectures:

THEORETICAL AND PRACTICAL CONSIDERATIONS ON CO-MANAGEMENT OF NATURAL RESOURCES AND RELATED PROFESSIONAL EDUCATION

Jukka Tikkanen

Research Director, University of Eastern Finland School of Forest Sciences

Abstract: Co-management has been among the most popular solutions proposed for making use of natural resources more sustainable. Management science has produced wide range of methodological innovations to enhance different aspects of co-management, but still practice seems to be reluctant to apply consistently proposed innovations. One reason for the resistance is that the co-management practices and applied methodologies aren´t firmly and transparently grounded on theoretical standing points. Weak theoretical basis may lead to ad-hoc methodological solutions and there after negative experiences on co-management. In the presentation, basing on the consistent literature review, a theoretical frame-work of co-management is presented to guide the co-management practices and educational efforts of natural resource professionals. Frame-work is then exemplified, first, by the case-studies on the co-management of forest resources, and secondly, by the study programs of natural resource managers in Finnish Universities.

ADVANCES AND CRITICAL ASPECTS IN THE LIFE-CYCLE ASSESSMENT OF BATTERY ELECTRIC CARS

Eckard Helmers

Trier University of Applied Sciences, Germany

Abstract: Concerns over climate change, air pollution, and oil supply have stimulated the market for battery electric vehicles (BEVs). However, the environmental impacts of BEVs, typically evaluated through life-cycle assessment (LCA), have been discussed critically. On the one hand, BEVs are much more energy efficient and thus form an indispensable component of an energy and mobility transition. BEVs decrease exposure to air pollution as their impacts largely result from vehicle production and electricity generation outside of urban areas. The carbon footprint of BEVs, being highly sensitive to the carbon intensity of the electricity mix, will probably improve in the nearby future through technological progress (more efficient components, changes in battery production) as well as through smart applications (e.g. directed charging, V2G, V2H) and battery second uses.

Impact categories other than the carbon footprint reveal a mixed picture.

LCA is usually based on standardized input data. However, when it comes to passenger car energy consumption and emissions, deviation between laboratory and real world measurements can easily reach a factor of ten. The effects of such deviations on the life-cycle impact comparison of combustion engine and electric vehicles will be discussed.

BUILDING STRATEGIC PARTNERSHIP BETWEEN ACADEMIA AND INDUSTRY. A CASE STUDY

Luminita Parv

Transilvania University of Brasov, Romania

Abstract: There is a clear need for universities to increase capacities to educate and train students to participate as leaders and partners in sustainability initiatives.

The purpose of this paper is to present a new concept of university organizational culture at Transilvania University of Brasov based on actions for student motivation and involvement in the university life and their career development (e.g. student internal competition, involving students in solving administrative problems, early cooperation between students and companies).

The correlation of didactical, educational and research an activity with the employers' needs (companies, firms, institutions, agencies) is a strategic element of Transilvania University management plan.

Certain initiatives started to be implemented recently such us: (a) participation of companies in the annual student scientific conferences in order to find joint solutions for cooperation in the final diploma project, (b) organizing of an annual conference called The graduates in front of companies, where each graduating student of the BSc or MSc programs, who want to participate, has the possibility to present in front of interested company representatives his or her diploma or dissertation project.

Furthermore, we have developed the project Podium of the Companies. This way, we launched a project enabling the main regional companies to present themselves, to discuss with our students and teaching staff, to submit technical and research subjects, to propose diploma-project themes, to offer part-time or full-time jobs. Thereby, by enhanced dialogue, the interests of both parties (university and economic environment) are intertwined and the graduates' chances to succeed on the labor market substantially increase.

ENVIRONMENTAL AWARENESS, ATTITUDES AND SELF-EFFICACY OF STUDENTS FROM EU AND NON-EU COUNTRIES: A COMPARATIVE STUDY

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Abstract: In this paper, authors investigate the level of environmental awareness, attitudes, and selfefficacy of students in the EU countries as well as in the EU candidate countries. The countries involved in this study are Poland, the Czech Republic, Hungary and Slovakia (EU countries) and Serbia, Macedonia and Albania (non-EU countries). Comparative analysis results have shown that differences in environmental attitudes among youth exist as the influence of EU member countries, but differences are not so expressed. The structural model has determined that relations among environmental attitudes, self-efficacy and environmental awareness work the same way in both groups of countries.

Keywords: *Environmental Awareness, Environmental Attitudes, Self-efficacy, Students*

Conference papers:

INFLUENCE EFFICIENCY OF THE WOODS FROM THE STOCK OF SNOW COVER ON THE TIMBERLAND

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Abstract: Work on research of reserves of snow cover in forest areas was carried out for the conditions of the Ufa area of Republic Bashkortostan. The studies were conducted snow measurement survey and the data were processed in geographic information systems. Monitoring indicators of snow depth on the forest plots are presented for the 2015-2016 year from October to April. Determined the height, density and structure of snow cover, water storage in the snow cover by months. Conducted field, laboratory and statistical processing of research results. Produced by digitizing topographic maps of forest areas and the surrounding area, and it is printed on reserves data and snow density.

Keyword: *forest plot, forest, the snow and water, field and laboratory work, GIS technology, Ufimski district.*

1 Introduction

One of the most important characteristics of the landscape forest areas in winter is the properties of the snow cover - its power and density. These parameters affect both the depth of soil freezing, and snow and water. It is well known that water reserves in the soil, the rate of runoff during snowmelt depend on snow cover thickness, density and snow (A. A. Molchanov) [1]. Currently, in the age of technological progress, particular attention is drawn geoinformation technologies. An exception is the determination of the remaining snow. For example, shooting is carried out using aerial gamma-survey in the Republic of Bashkortostan in 2016 and 2017 made it possible to assess the exact thickness of the snow cover in remote and mountainous areas. The technique allows efficient processing of data of snow surveys, the result achieved in the shortest time and is more accurate. Therefore, the use of geoinformation technologies in the study of the snow of reserve forest areas is relevant in determining forest productivity.

As the object of research for soil and snow cover of forest areas in the territory of the Republic of Bashkortostan for the 2015-2016 year.

The aim of the study is the identification of regularities of formation of the snow cover and the definition of the reserves of snow and water in the soil in forest areas of the Ufa area of Republic Bashkortostan with the use of GIS shooting.

2 Technique

In 2016, the Republic of Bashkortostan, during preparations for the spring tide, was performed aerial gamma-survey for the most accurate prediction of the passage of floods, collect data on water supplies, as well as for the most efficient execution of works on regulation of river runoff in the Belaya river basin waterworks. Catchment area of the White river was divided into 4 rings circled with a total length of 2200 km Route covered the catchment area of the Ufa river (from source to target Pavlovsky dam), the river Nugush (from source to target Nugushskoe of the dam), rivers and SIM, Inzer, and also of the White river (from source to target yumaguzinskaya hydrosystem). The detour routes were designed to cover the mountain-forest zone of the Republic, which formed the main water reserves in the snow, and the number of hydrological sites Belgidromash is insufficient [2,3].

With daily observations of snow cover were determined:

- the degree of coverage of the surrounding area the snow cover (expressed in points);
- the nature of the snow cover on the ground (recorded in code);
- the structure of the snow (recorded in code);
- the snow depth at the meteorological site or at a selected area near the station (expressed in centimeters).

During the snow surveys on each selected route was determined:

- snow depth (the average of a specified number of measurements);
- the density of snow (the average of a specified number of measurements);
- structure of the snow cover (presence of layers of ice, water and snow saturated with water);
- the nature of the snow cover on the route;
- the degree of coverage of a snow route;
- as the soil surface under snow (frozen, thawed).

3 Results and discussion

We found that the seasonal precipitation in the urban district of Ufa for 10 years amount to 517 mm, of which the spring is 18.4% in summer and 33.6% in the fall of 28.0%, in the winter of 20.0%. For the period 1 September 2015 to 30 April 2016 year, there were 176 observations of snow depth.

The average height of 21.8 cm and the maximum height is 46 cm (this figure was 04.03.16). Change the height of the snow cover of forest land from October to April are shown in table 1.

Study for snow cover consisted of daily observations for change (dynamic) snow cover and periodic snow surveys for determination of snow accumulation and water storage in the elements of natural landscape (soil under forest, meadow, beams and ravines).

Table 1. Change in the snow cover of forest territories for the period from 1.10.15 on 12.04.16 G. (city district Ufa)

Month	The average value of the snow cover, centimeter	The maximum value of the snow cover, centimeter	The number of observations of the snow cover
October	1.7	3	9
November	3.8	9	28
December	10.3	21	32
January	29.9	39	32
February	41.9	45	29
March	34.4	46	32
April	2.9	13	10

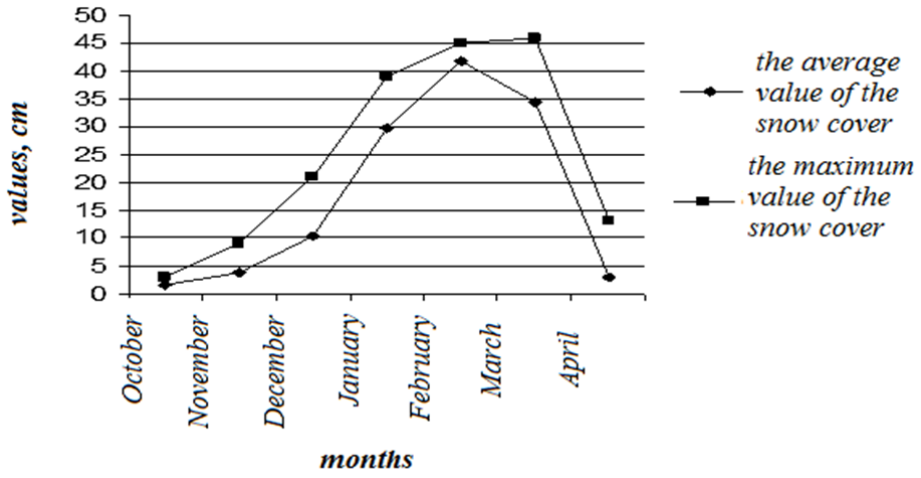

Figure 1. The height of snow cover of forest territories for the period from 1.10.15 on 12.04.16 city city district city of Ufa

It is established that the productivity of pine forests depends on the stock of snow, the more snow, the more the stocks of productive moisture in the soil, where there is more intensive growth of pine plantations. The smallest accumulation of snow is observed in soils formed from smooth terrain, which was the lowest growth pine. Since the terrain is one of the important factors in the formation of moisture reserves in the soil, by us, on gray forest soils in the Ufa district, were carried out field experiments to determine the productive moisture in different relief elements (See Table.2).

Table 2. Soil moisture on gray forest soils (January 2016 Ufa district)

Depth, cm	Moisture content, %	Moisture reserves, t/ha
field without trees		
0-50	25.56	1534
0-100	19.89	2586
Slope with artificial planting of larch		
0-50	23.03	1382
0-100	20.11	2614
smeshannyi the woods (birch, linden, oak, larch)		
0-50	32.39	1943
0-100	21.89	2846
floodplain mixed forest		
0-50	24.36	1482
0-100	18.87	2372

As shown by the results of research in winter, there was a significant accumulation of moisture in the mixed forests. A small range of variation of the moisture content in the field and the slopes associated with less vegetation and evaporation of snow from winds.

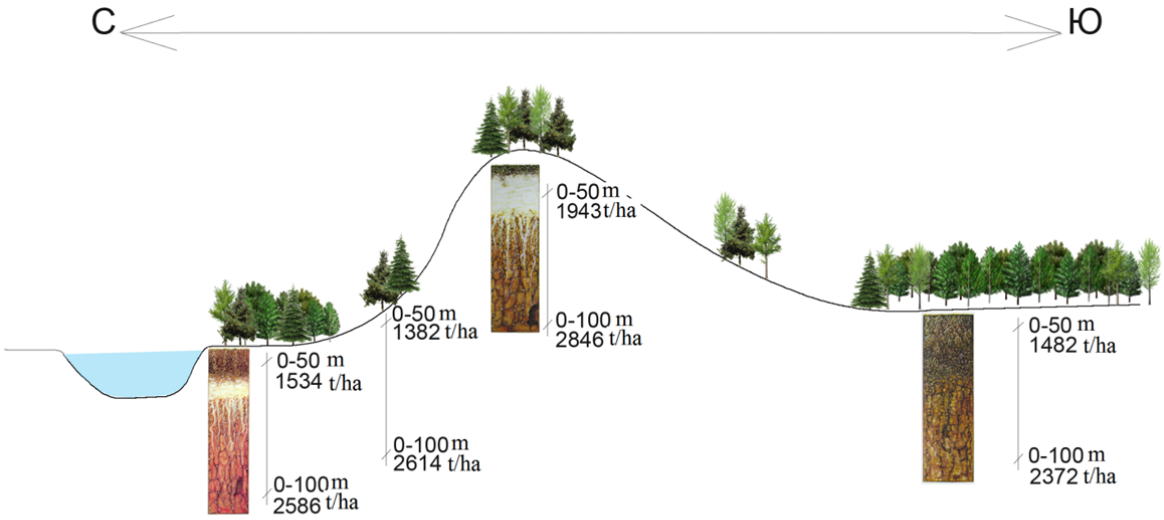

Figure 2. The location of forest plantations on the slopes

With the increase in the atmospheric temperature (average 0C to 4.9 -1,1), which occurs earlier than in the highlands there is an increase in density of snow cover. Measuring the thickness of snow in remote areas in the snow posts manually at the weather station of Belgidromash was not possible to determine the exact inventory of the snow cover, the errors ranged from 0.2 m to 0.31 m [4,5,6]. Aircraft gamma-ray survey showed the exact thickness of the snow cover in the flat terrain, and in remote mountain areas, the application of this method confirmed the accuracy of mm to determine the

thickness of snow. Materials processing software MapInfo 10.5 has proven the reliability of density of snow cover, water.

The total stock of pine plantations in the Republic amounts to more than 3.2 million m3, including mixed forests to 1.2 million m3. The most productive are in the highlands or hills, where 746 thousand m^3 of pine wood. This is confirmed by the fact that at these altitudes the snow reserves is more and more favorable growing conditions. All this allows to conclude that in the lowlands, floodplains, areas with high groundwater level, at altitude less than 200 m pine plantations are characterized by high productivity.

Much productive make up the Western and South-Eastern slopes, due to more suitable conditions for growth of forest stands: a warmer than the Northern and North-Eastern; more moist than the South. Determination of the main characteristics of the snow cover on the landscape elements was carried out on selected and fixed on the ground snow routes. Routes must be characteristic of the surrounding area, in our case, the routes match the conditions of formation of snow cover in the forest.

In forest areas and in areas with smooth topography, in small fields, situated among the woods, chose a field route length of 1000 m. the Forest route was paved at the most typical for this area of the forest areas in the form of a straight length of 500 m. If the forest was dominated by conifers, the route laid among pine trees; if deciduous species among the foliage. The beginning of the forest route was chosen not closer than 100 m from the edge of the forest. At small sizes of the forest area was paved two lines with a total length of 500 m; the first begins at a distance of 100 m from the edge of the forest, and the second parallel to the first at a distance of 25-50 m from it into the forest.

After performing the measurements, summed up the snow density (d, kg/m^3) cover and a supply of water (Z, kg/m^3) in this formula:

$$D = m_{\text{mean value}}/V, \quad (1)$$

where $m_{\text{mean value}}$ - weight of snow, V - volume (negomano).

$$Z = 10^* H_{\text{mean value}} *d, \quad (2)$$

where $H_{\text{mean value}}$ - the average height of the snow cover (m).

Given that we have not performed measurements to determine the mass and volume of snow examined how the density could be snow depending on the atmospheric temperature [7]. Fluffy light snow that fell in the relatively cold weather with temperatures around -10C were the density of the order of from 95 to 100 kg/m3. In late autumn and early winter the weight of snow lying on horizontal and slightly inclined surfaces, usually was 160±40 kg/m^3. In moments of extended thaws the proportion of snow has significantly started to grow (snow "sat" in spring), sometimes reaching values of 700 kg/m^3. Therefore, in warmer areas the density of snow was more than in cold Northern areas. The middle of winter, the snow compacted under the action of the sun, the wind and the pressure of the upper layers of snow on the lower layers. The proportion was equal to 280±70 kg/m^3. By the end of winter under the action of the more intense sun and winds in February the density of the snow crust made equal to 380±110 kg/m^3, sometimes reaching 580 kg/m^3. In spring, the abundant melting of the proportion of "wet" snow amounted to 750±100 kg/m^3, approaching the density of ice is 917 kg/m^3.

According to the above us studies, the weight of the snow cover in the urban district of Ufa averaged about 500 kg/m^3. More detailed indicators are cited in table 3 and figure 3.

Table 3. The density of the snow cover in the forest areas, taking into account the average ambient air temperature

Month	**The temperature of the ambient air, ˚C**	**The density of the snow cover, kg/m^3**
October	-2.2	160
November	-2.6	170
December	-5.5	200
January	-11.7	280
February	-4.6	400
March	-1.1	750
April	+4.9	900

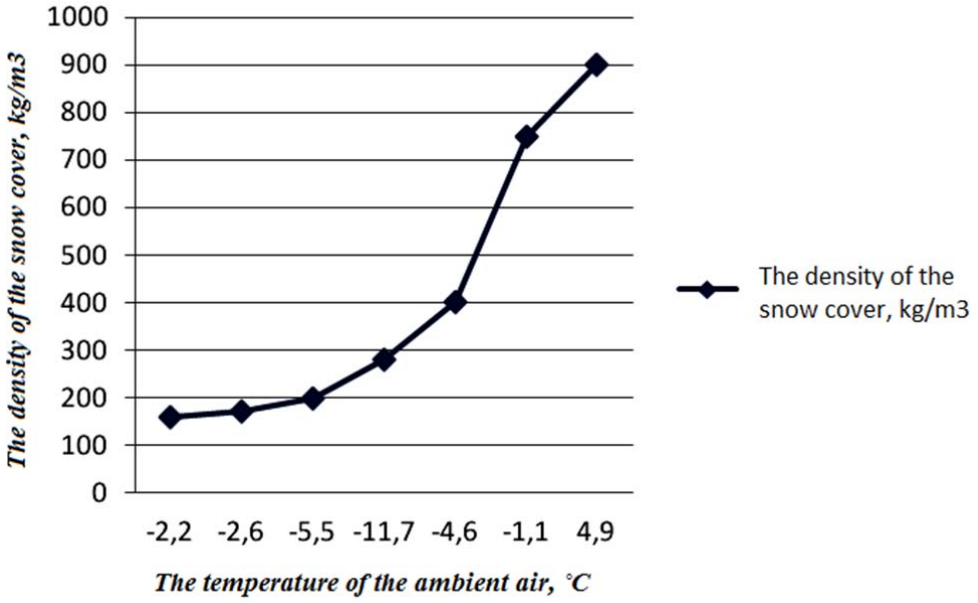

Figure 3. The density of the snow cover in the forest areas

Based on the results, we calculated the water supply by the formula (2) contained in the snow cover during each study month [8,9]. The calculations were carried out on the averages of snow depth:

$Z_o = 10^* 0.017^*160 = 17$ kg/m^3;

$Z_n = 10^* 0.038^*170 = 64{,}6$ kg/m^3;

$Z_d = 10^* 0.103^*200 = 206$ kg/m^3;

$Z_j = 10^* 0.299^*280 = 837{,}2$ kg/m^3;

$Z_f = 10^* 0.419^*400 = 1676$ kg/m^3;

$Z_м = 10^* 0.344^*750 = 2505$ kg/m^3;

$Z_a = 10^* 0.029^*900 = 261$ kg/m^3.

The obtained data systematized in a single table (See Table 4).

Table 4. The results of field and laboratory works on the study of snow cover in the forest areas

Month	The temperature of the ambient air, °C	The average value of the snow cover, m	The density of the snow cover, kg/m^3	Supplies of water, kg/m^3
October	-2.2	1.7	160	17
November	-2.6	3.8	170	64.6
December	-5.5	10.3	200	206
January	-11.7	29.9	280	837.2
February	-4.6	41.9	400	1676
March	-1.1	34.4	750	2505
April	+4.9	2.9	900	261
The average value	-2.26	17.84	408.57	795.26

Further, using the software MapInfo 10.5, made the digitization of the topographic map of unknown scale anchored at UTM WGS 84 to facilitate the transfer of data from GPS [10,11].

After digitizing the map data were exported into ArcGis for further processing. The first step performed interpolation Natural neighbourhood (Natural neighbor), the results of which made up an overview map[12]. Tool 3D Analys built profiles of the routes. In the second stage, based on the obtained data interpolation get a map of angles of slope and exposure of slopes. Also made a TIN model.

4 Conclusion

Snow survey of forest areas is extremely important to study the geomorphological and meteorological processes, as well as determine the productivity of forests. The air temperature for the observation period from 1 October 2015 to 12 April 2016, amounted to -2.26, the average value of the snow supply on the territory of the forest – 17,87 m, the density of the snow cover – 408.57 kg/m^3 and a supply of water contained in the snow – 795.26 kg/m^3. A large part of the forested areas in the research were located on slopes from 1 to 30. With increasing steepness of the terrain, the average productive stock of pine plantations decreased. After analyzing the snow, the snow cover of different research methods allowed us to monitor the stock but also the factors of moisture accumulation and regulation of water regime. The use of GIS technology greatly simplifies the analysis of materials snow surveys, and helped to represent the data in the most visual form.

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LIMITED REAL RIGHTS OVER LANDED PROPERTIES IN THE FOREST TERRITORIES OF THE REPUBLIC OF BULGARIA

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Abstract: Within the meaning of Article 4 of the Forestry Act, the forest territories fulfill the following main functions: protection of soils, water resources and air cleanliness, maintenance of biodiversity of forest ecosystems, timber production, climate regulation, etc. According to the functions of the forest territories, in the legislation of the Republic of Bulgaria they are grouped into three categories: protective, special and economic. Landed property in forest areas - state and municipal property, according to the norm of art. 41, para 1 of the Forestry Act, may be granted for temporary rental or rent. In addition, limited property rights may be imposed on landed properties in forest areas. Who are they? These are the limited property rights regulated in Section Four of Chapter Three of the Forestry Act. In the fourth section there are three legal options for the establishment of limited real rights over land plots in forest areas:

a) right to build on landed properties in forest areas without changing the purpose of the territory;
b) easement on land plots in forest territories;
c) right of use on land plots in forest areas.

The subject of the report is precisely the legal aspects of the limited real rights over the landed properties, according to the current legislation of the Republic of Bulgaria. The subject of consideration is the specifics of individual rights in rem.

Keywords: *forest, forest territory, land property, limited property right, right to build, right of use, easement.*

1 Introduction

According to the norm of the text of Article 7, paragraph 1 of the Spatial Development Act [www.ciela.net], the territories in the Republic of Bulgaria are divided into seven categories.

One of these categories is forest areas. Within the meaning of Article 4 of the Forestry Act [www.ciela.net], the forest territories fulfill the following basic functions:

- protection of soils, water resources and cleanliness of air;
- maintaining the biodiversity of forest ecosystems;
- providing social, educational, scientific, landscape and recreational benefits to society;
- protection of natural and cultural heritage;
- production of wood and non-timber forest products;
- climate regulation and carbon sequestration.

Forests are also grouped into categories. These categories are three and they are depending on their predominant functions:

- protective;
- special;

- economic.

The categorization of the forest territories in the Republic of Bulgaria is done with regional plans for the development of the forest territories and is concretized with plans and programs.

The right to property within the meaning of Article 22 of the Forestry Act belongs to:

- individuals;
- the state;
- municipalities.

According to the wording of Article 41, paragraph 1 of the Forestry Act, landed plots in forest areas - state and municipal property may be granted for temporary rental or lease.

An obligatory condition for renting or renting land properties in forest areas is not to change the functions of the territory, not to prevent other activities on the territory and not to damage the soils.

Landed property rights may be set up on landed properties in forest areas.

These rights are regulated in detail in Section Four of Chapter Three "Ownership" of the Forestry Act.

The subject of the report is some specific legal regulations related and applied in the establishment of limited real rights on the landed properties in the forest territories of the Republic of Bulgaria.

The subject matter of the examination is the legal characteristics of each of the three varieties of restrictive rights in rem: right to build without change of purpose, easement, right of use.

2 Right to build on landed properties in forest areas without changing the purpose of the territory

According to the norm of the text of art. 54, para 1 of the Forestry Act, the right to build on landed properties in forest territories without changing the purpose of the territory is established for a wide range of sites.

This range of objects includes: telecommunication equipment poles, radio and television broadcasting, communication lines, wireless internet and other facilities of the technical infrastructure, buildings and facilities related to the management, reproduction, use and preservation of forests and wildlife, Roads, game farms, zooevaterinary and biotechnical facilities, etc., pipelines and gas pipelines, hydrotechnical facilities, water mains and sewerage with a diameter of over 1500m.

The request for the establishment of a right to build a property in forest areas is preceded by an investor's initiative consisting in making a request for prior consultation to the above-mentioned legal entities.

According to the requirements reflected in the text of Article 55, paragraph 3 of the Forestry Act, the investor's request for preliminary agreement is accompanied by a package of documents, which must contain:

a) sketch of the property or sample for a group of landed properties from the cadastral map;

b) assignment for elaboration of a detailed development plan prepared in accordance with the provisions of the Territorial Planning Act [www.ciela.net];
c) opinion of the relevant Regional Directorate of Forests;
d) Act for the granting of the status of immovable archaeological property under the Cultural Heritage Act [www.ciela.net].

According to the norm in the text of art. 55, para 4 of the Forestry Act, within two months from the receipt of the investor's request, the aforementioned legal entities shall be pronounced with the corresponding reply, which shall be communicated to the interested persons.

According to the wording of Article 54 (2) of the Forestry Act, the right to build is established:

- indefinitely;
- for a fixed period.

The establishment of the right to build is carried out by specific legal entities, depending on the ownership of the landed property, namely:

a) by the Council of Ministers - for land plots in forest territories, which are public state property;
b) by the Minister of Agriculture, Food and Forestry for land plots in forest territories, private state property, when the construction of poles of overhead power lines over 20kv, oil pipelines, oil pipelines, etc.
c) by the Executive Director of the Forestry Executive Agency for land plots in forest areas that are private state property for the construction of road forest roads, farms, information centers for visitors, etc.
d) by the Mayor of the Municipality, following a decision of the Municipal Council, for land plots in forest areas that are municipal property;
e) from other owners or associations of landowners in forest areas for their own properties.

The right to build on landed property in state-owned forest areas is subject to a price fixed by the Ordinance on the assessment of land plots in forest areas [www.ciela.net].

The price for the established real estate right on land plots in forest areas is stated in the act establishing this right.

In addition, this price must be paid within three months of the entry into force of the act.

On the basis of the enacted act for establishment of the right of construction and the payment made, a contract shall be concluded between the applicant and the Executive Director of the Executive Forestry Agency, respectively the Mayor of the municipality.

Contracts shall be entered in the Registry Office where the property is located. A copy of the signed contract is sent to the Regional Forest Directorate.

3 Servicing of land plots in forest areas.

Serving on landed properties in forest areas is a specifically limited property right, which is regulated in detail in the Forestry Act.

For what purposes is servitude established?

According to the text of Article 61, paragraph 1 of the Forestry Act, easement on land plots in forest areas may be established for:

- building;
- serving a wide range of networks and facilities on the technical infrastructure.

Typical of servitudes is that they are established:

- indefinitely;
- for a fixed period.

Authorities that have the right to establish servitudes are detailed in Article 61, paragraph 3 of the Forestry Act.

These are:

a) The Council of Ministers of the Republic of Bulgaria - for land plots in forest areas, which are public state property;
b) The Minister of Agriculture, Food and Forestry - for land plots in forest areas that are private state property;
c) Executive Director of the Forestry Agency - for land plots in forest areas - private state property;
d) The mayor of the municipality after a decision of the municipal council - for land plots in forest territories that are municipal property;
e) The Owner - for the other land plots in forest territories.

The legal and technological procedure for establishing easement on landed properties in forest areas, according to the text of art. 62, par. 1 of the Forestry Act, starts with a request of the investor for preliminary coordination to the above mentioned bodies depending on the ownership of the land Property.

The request for the constitution of the easement must be accompanied by a package of documents which includes:

a) sketch of the property and information from the cadastral map;
b) assignment for elaboration of a detailed development plan;
c) opinion of the Regional Directorate of Forests.

The text of para 4 of art. 62 of the Forestry Act provides for a period of one month from the receipt of the request, during which the respective bodies have to pronounce by decision.

Also in the text of para 6 of art. 62 of the Forestry Act exceptions for preliminary coordination for the establishment of easement are allowed.

Prior arrangement for the establishment of easement on land plots in forest areas is not required for the following types of objects:

a) national sites;
b) municipal sites of paramount importance;
c) objects of the technical infrastructure on the territory of more than one municipality or one area where there is no other technical possibility.

For the establishment of easement on land plots in forest areas an application is submitted to the designated authorities, accompanied by the relevant documents.

The relevant authority shall take a decision on the application within one month of the date of receipt of the application.

For the establishment of easement on land plots in forest territories that are state and municipal property, a price is formed, formed on the basis of Ordinance on assessment of land plots in forest territories.

The cost for the establishment of easement shall be stated in the instrument of incorporation.

The act in force and the payment made are grounds for concluding a contract between the applicant and the Executive Director of the Executive Forest Agency.

The contract shall be entered in the Registry by the person receiving the easement rights.

A copy of the signed contract is sent to the relevant Regional Directorate of Forests.

According to the wording of Article 67 of the Forestry Act, the holder of the servitude is obliged at his own expense to maintain the territory on which the servitude is established.

The aim is to ensure safe operation of the site.

4 Right of use on land plots in forest areas.

As a limited right of property, the right to use landed properties in forest areas, according to the text of Article 69, paragraph 1 of the Forestry Act, may be established:

a) for carrying out activities related to exploration and exploration of underground natural resources - for the duration of the permit;
b) of state bodies which carry out activities for control and protection of the environment - indefinite;
c) of schools, scientific institutes and legal entities conducting training or carrying out scientific work related to forests - indefinitely;
d) for research and conservation of archaeological values- for a period not exceeding three years.

According to the text of art. 69, para 2 of the Forestry Act, the authorities in the Republic of Bulgaria, which may establish a right of use on land plots in forest areas are:

a) The Council of Ministers of the Republic of Bulgaria - for land plots in forest territories that are state-owned;
b) The Executive Director of the Executive Forest Agency - for land plots in forest areas, which are also state-owned;
c) by the Mayor of the municipality after a decision of the Municipal Council - for land plots in forest areas, which are municipal property;
d) by the owner - for a privately owned forest area.

What is the legal technology for establishing the right to use landed property in forest areas?

According to the text of art. 70, para 1 of the Forestry Act, for the establishment of right of use, the legal technology is started by submitting an application to the above mentioned bodies.

The application must be accompanied by an appropriate package of documents containing:

a) sketch of the property and information from the cadastral map;
b) valuation of the property;
c) permit for exploration of underground resources, etc.

The Authority shall rule on the application by establishing a right of use or refusing to grant a right of use.

For establishing a right to use landed property in forest territories that are state and municipal property, a price is paid under Ordinance for assessment of land plots in forest territories.

The price is paid after the act of establishing the right of use enters into force. According to the text of art. 71, para 3 of the Forestry Act, the enacted act on the right of use and the payment made are the grounds for concluding a contract between the applicant and the Executive Director of the Executive Forest Agency or the Mayor of the municipality.

The contract shall be entered by the person in whose favor the right of use is established in the Registry Office. A copy of the contract is sent to the Regional Forestry Agency.

5 Conlusion

From the brief review of the legislation in force in the Republic of Bulgaria dealing with the matter of limited real rights over the landed properties in forest areas, the following conclusions can be drawn:

Firstly, the legal norms in the Forest Act examined reflect the specifics of the limited real rights over land plots in forest areas;

Second, there is a legal logical link between the legal norms in the Forestry Act and other normative acts such as the Spatial Planning Act and others;

Thirdly, the Law on Forests accurately reflects the legal norms of the Administrative Procedure Code;

Fourthly, a precise legal relationship has been made with environmental legislation, and so on.

Judicial practice in the Republic of Bulgaria gives examples of some imperfections in the regulatory field, which need adjustments.

Here are some of them:

a) in the norm of art. 57, para 1 of the Forestry Act, the conditions under which the rights of the person in favor of whom the right to build is established are validated. One of these conditions in item 2 is if the right is not exercised for five years. Reducing this period of up to two years, taking into account force majeure and other circumstances, would stimulate the effective consumption of this limited property right together with the resulting positive results;
b) in the text of art. 71, para 3 of the Forestry Act the requirement for payment of the right to use the right to use is enforced within three months from the entry into force of the act for establishing the right of use.

This time limit may be reduced to one month in accordance with the time limits in the Administrative Procedure Code to speed up the consumption of this property right,

This period may be reduced to one month in accordance with the time-limits in the Administrative Procedure Code to speed up the consumption of this property right and so on.

Reference

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INCREASING RESOURCE EFFICIENCY BY INTEGRATION OF COMBINED HEAT AND POWER, AND BIOFUEL PRODUCTION SYSTEMS

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Abstract: Substituting fossil fuels by renewable biomass and saving of energy are ways to mitigate climate change; however, biomass may need to be converted into biofuels to feasiblysubstitute for fossil fuels. Fast pyrolysis is a method to convert biomass into bio-oil but the method is not energy-efficient and energy is also wasted. Integrating pyrolysis reactor to a combined heat and power plant (CHP) is a way to capture the wasted energy from the pyrolysis reactor, and thus increases the systems' energy-efficiency. This saves energy and fuel(s), and consequently fewer inputs are needed to produce the fuels.Ultimately, environmental performance is improved. We conducted a life cycle assessment of a real-life CHP-pyrolysis integrate located in Finland and analyze the environmental benefits that integrating a fast pyrolysis reactor to a CHP provides. The bio-oil from the pyrolysis reactor is a substitute for heavy fuel oil (HFO). Our assessment shows that the integrated system outperforms the stand-alone alternative. Further, substituting HFO by the bio-oil reduces greatly the amount of (fossil) greenhouse gas emissions. Other environmental loads are also significantly lower for bio-oil than for HFO. Thereby, integrating pyrolysis and CHP works as an upgrade in biofuel production and energy generation. Our study also revealed a risk of misinterpretation of the results if only individual components of the energy system are compared instead of considering the complete systems as a whole. Indicators for energy-efficiency, biogenic carbon and resource use can also show the benefits of the integration and eliminate the risk of favoring less efficient alternatives. Our study is ongoingand its final results and conclusions will be published later.

WHY ARE COMPANIES IMPLEMENTING ISO 14001 – EXAMPLE FROM CROATIA

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Abstract: Due to changes in word economy and bigger impact of environment protection need either from market or institution side, companies are deciding to implement different environment management systems. Many companies worldwide have taken even further steps to be certified in accordance to ISO 14001 international standard. The number of certified companies has been growing significantly in the recent years. Most companies are passing rigorous standard compliances but their reasons for doing this are still not clear. They all have different motives for implementation of ISO 14001 and they see different benefits coming as certification result.

Paper investigates statistical data on ISO 14001 implementation in Europe and Croatia during recent years. As a case study certification in one Croatia company will be examined. We will explore reasons and potential benefits of ISO 14001 implementation in this company and if the implementation of the standard has made effect on the environment and company's competitiveness. Based on research conclusions will be given as well as recommendations for the further research about this environment management system and its influence in Croatia.

Keywords: *ISO 14001, environment management systems, benefits, drawbacks, competitiveness*

1 Introduction

Changes in worldwide economy and global market have made companies to think and act faster, adapt to ongoing changes and look for activities which will make the better, faster, nicer and cheaper to customers – more competitive. Pressures from market is not coming only for business side but from environment as well. Economy crisis followed with issues of use of natural resources and ecology initiated several environment management systems which are companies implementing to create and maintain competitiveness. At the same time companies need to be in line with different environmental regulation to continue with their business. Companies tend to implement different management systems and standards to support their entrances to international markets [1]. One of those management systems is ISO 14001 which was introduced in 1996.

Paper aim is to investigate ISO 14001 implementation in Europe and Croatia. In the first part, we will give basic information about the ISO 14001 series of standards and its history. Benefits and drawbacks of implementation will be presented in the second part of the paper. Next, will give statistical insight about companies which implement this standard, their sectors in the word and in the Croatia. In the fourth part, we will present one example of Croatia company which has implemented ISO 14001 and discuss about effects of implementation. Finally, conclusions will be presented and recommendations for further research about this topic will be given.

2 Environment management systems

Corporations worldwide have been adopting environmental protection programs which were mandated by different national agencies and governments from early 1970-ties. During 1980-ties corporations started with attempts to be ahead of costly and quickly changing different environmental regulations and started adopting processes which were intended to reduce sources of pollution rather than controlling them. Because of those activities, companies started with integrating their environment management activities into more inclusive systems. Different associations, international organizations, and government noticed potential advantages of creating and setting standards – environment management systems (EMS) - which companies could use as guiding principles.

When company implements EMS, it is expected to initiate company's responsiveness to environment issues. EMS is framework for integration of corporate environment protection programs and policies. Practice of implementing EMS is growing rapidly not only in multinational companies but also in national and local companies [2]. EMS usually identifies of company's environmental targets on whose base companies develop their environmental policies. Companies within EMS must identify their impacts on environment and relevant regulations brought by government (local or national). Operational and management control together with different procedures (measurement and monitoring) and programs for impact on environment should be set up. This process is accompanied with employees training and education, documentation and audits (internal and external). EMS can and should be integral *part of the overall management system that includes organizational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the environmental policy* [3]. Although there are several EMS standards present worldwide, three are most important: Eco Management and Audit Scheme (EMAS), BS 7750 and ISO 14001 Standard. All three-mentioned standard are complements to international and national legal regulations. BS 7750 is British standard while EMAS is like ISO 14001 regarding its requirements and components. Main difference is that EMAS in applicable only at site level while ISO 14001 is applicable to different levels – factory, company [4] and that standard has different aims [2]. Both standards are indicators for company's environmental obligation and are a way of developing company's competitiveness.

2.2 ISO 14001 standard

Although there have been many different EMS programs over the years, ISO 14001 is first attempt to create international EMS standard [5]. International standard ISO 14001 was presented for the first time in 1996 and it was an answer to growing need and pressure on companies in relation to their environment. This EMS was supposed to give legality in having ISO certificate on one side and to improve company's environmental performance on the other side [6]. Standard requires structure and set of procedures like typical EMS. It is important to make one strong point and that is main difference between EMS and ISO 14001. Company's own EMS can be completely customized according to the organization's needs but on the other side for company to be certified with ISO 140001 it must be audited by third party company and company should follow all elements of standard. EMS can be defined as an aspect of an organization's environmental policy [7] and has part in defining how companies manage their possible impacts on environment [8]. ISO 14001 is available to all companies (private and public) whichwant to be certified and invest in that process but there is a starting learning curve which should be made in every company [9]. Standard is set of guidelines with which company (whole organization or single site) can set its environmental policy, identify different environmental

aspects of its business, define environmental goals, adopt program to reach environmental goals, measure effectiveness, correct problems and assess its management system to promote continuous improvement [10]. Since this standard is derived from ISO 9001, companies with implemented ISO 9001 will be more inclined toward ISO 14001 certification [11] due to their defined quality management structure and review settings, internal audits, business procedures and procedures how to conduct corrective activities. Standard is voluntary on one side but on the other side it has opportunity for global impact on environmental policy making and is founded upon the idea that EMS can improve performance of the company [12].

Implementation of ISO 14001 proves the activities of organization (private or public) in reducing their potential impact on the human wellbeing and environment while at the same time diminishing potential environmental damage during all stages of their products/services life cycles in accordance to the circular economy[13]. Main goal of the circular economy is reducing landfills, waste and emissions with re-use, recycling, and remanufacturing of materials and at the same time it looks upon different stakeholders [14]. Process of implementing ISO 14001 is based on Plan Check Do Review Improve cycle [11]. In the first phase company makes first actions to be compliant with ISO 14001. Second phase looks over verification and correction of errors in company. In the third phase, company's top management makes overall assessment of complete company's process. Last phase officially never ends since company is constantly trying to find was of further development of their EMS (See Figure 1).

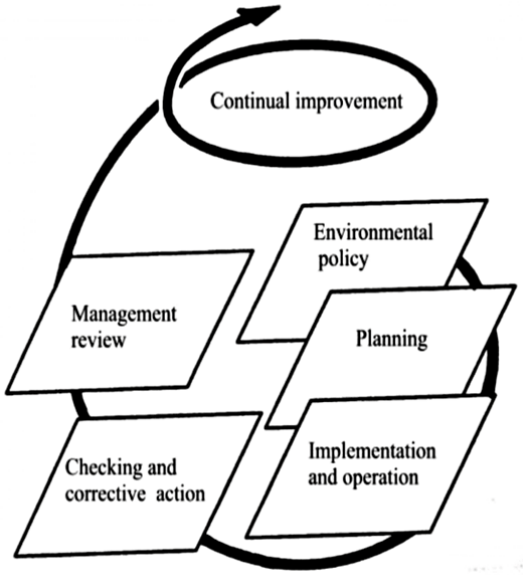

Figure 1. ISO 14001 model (Source: ISO, 2017)

As presented process of implementation and certification in accordance to ISO 14001 ends with company receiving standard and then goes further with continuous improvement. But the question is why companies decide to implement this standard. Whitelaw [15] identified several reasons: (1) gaining and/or retaining market share through green corporate image; (2) reducing insurance risk; (3)

reducing cost; (4) attracting more ethical investments; (5) reducing potential prosecution risks. It is important to state that order of reason according to their importance is not always the same. It is up to the companies to decide which tool will they use to answer one or more identified reasons. All reasons can be placed in one sentence - companies need to control and reduce their impacts on the environment.

During years, ISO 14001 has been changing and there were two revisions of the standard – one in 2004 and latest coming in 2015. Main elements of ISO 14001 are organized in five steps: (1) Environmental policy, (2) Planning; (3) Implementation and operation; (4) Checking and corrective action and (5) Management review [16].

2.2 Benefits and drawbacks

As every process, procedure and activity company can implement into their business, implementation of ISO 14001 standard has benefits and drawbacks for companies.Most of studies about ISO 14001 have been focused on economic benefits and drawbacks implementation can bring to companies. Benefits which ISO 14001 implementation can bring to companies have been extensively studied and examined in academic literature. Tari [17] made analyze of conducted studies and identified 14 different benefits implementations of ISO 14401 is bringing to companies. Some of them include environment protection, profitability, efficiency, improved image, improved customer satisfaction and improvements in employee results. First three mentioned benefits are mainly considered in research since they are presenting the most important standard is bringing to most companies. Grandić [12] stated that companies which implement ISO 14001 have further benefits such as reduction in waste management costs, energy and material consumptions saving. Standard is perfectly designed for proactive executives who understand how EMS can bring return on investment.

One of the studies divided ISO 14001 benefits to external and internal [18]. In internal benefits author placed: organizational, financial and people benefits and in the external: commercial, environmental benefits and supplier relations. Several other researches made different classification of potential benefits for companies implementing ISO 14001 (See Table 1).

Table 1. ISO 140001 benefits classification

Authors	**Benefits classification**
Zeng, Tian and Shi [19]	Internal operations, corporate management, marketing effects, supplier relations
Link and Naveh [20]	Environmental performance, business performance
Gavronski, Ferrer and Palva [21]	Productivity benefits, financial benefits, market benefits, societal benefits.
Poksinska, Dahlgaard and Eklund [22]	Internal performance benefits, external marketing benefits, relations benefits.

Based on Table 1 and all previous research results it is possible to conclude that the implementation of ISO 14001 standard can have significant impact on company's business. It is important to state that some of studies didn't find positive correlation between company's business performance and implementation of ISO 14001 [20].

Despite all previously stated benefits of implementation of ISO 14001, recently there have been studies which are focused on potential drawbacks connected with ISO 14001 adoption. Boiral [23] stated several drawbacks which arise during ISO 14001 implementation and they include risk of bureaucracy during preparation for certification and cost of standard implementation while Heras-

Saizabitoria and Boiral [24] stated limited potential of assessing the improvements and lack of focus and confidence in third-party audits. Potential standard implementation drawbacks can be seen in following categories: (1) inappropriate or excessive documentation; (2) lack of follow-up and system continuity; (3) search for commercial certification; (4) insufficient resources; and (5) externalization of the implementation process [25]. Probably the most important ISO 14001 drawback and criticism referrers to company's potential capacity of reducing negative environmental influences and thus influencing standard assurance as company's environmental behavior.

2.3 Standard statistics

Based on ISO 2016 survey [26] there is a significant growth in number of certificates worldwide. In 2016 there was more than 346.000 certificates implemented in 201 countries (See Figure 1). Although certification in accordance to ISO 140001 is not obligatory in many circumstances, the number of ISO 14001 certificates available through ISO survey 2016 can be a good representation to evaluate the dissemination of this standard [27]. It is also important to state that the increasing number of ISO 14001 standards can be considered as confirmation of previously stated benefits companies have after certification.

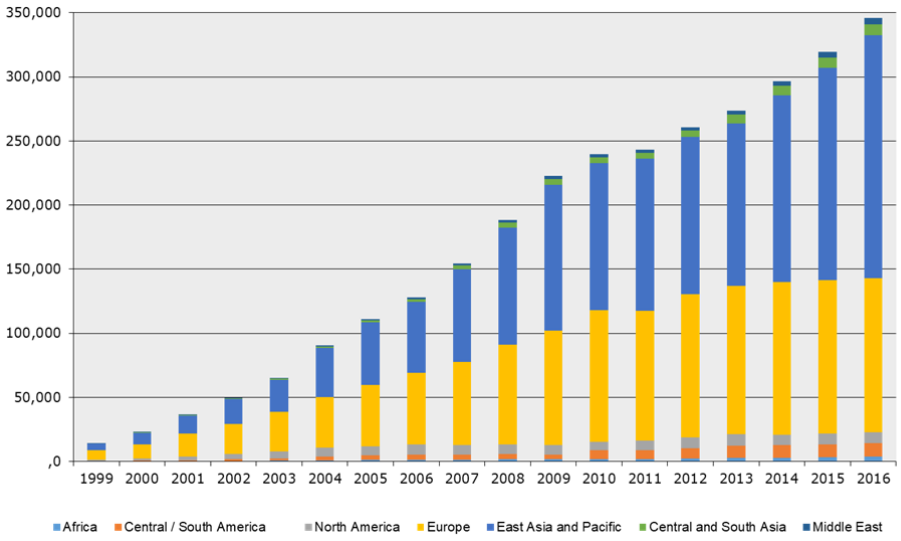

Figure 2. Total number of ISO 14001 certificated worldwide (Source: ISO Survey 2016)

Areas with the most ISO 14001 certificates are East Asia and Pacific (189.505) and Europe (120.595). Average yearly growth in number of certificates is more than 10% and in 2016 there was 17% more certificates in relation to previous year. Country with highest number of certificates is China (137.230) followed by Japan (27.372), Italy (26.655), United Kingdom (16.761), Spain (13.771) and Germany (9.444).

ISO 14001 is implemented in 39 sectors (according to European Accreditation classification code) and five sectors with most ISO 14011 certificates in 2016 were construction, basic and fabricated

metal, electrical and optical production, wholesale and retail trade and other transport equipment (See Figure 3).

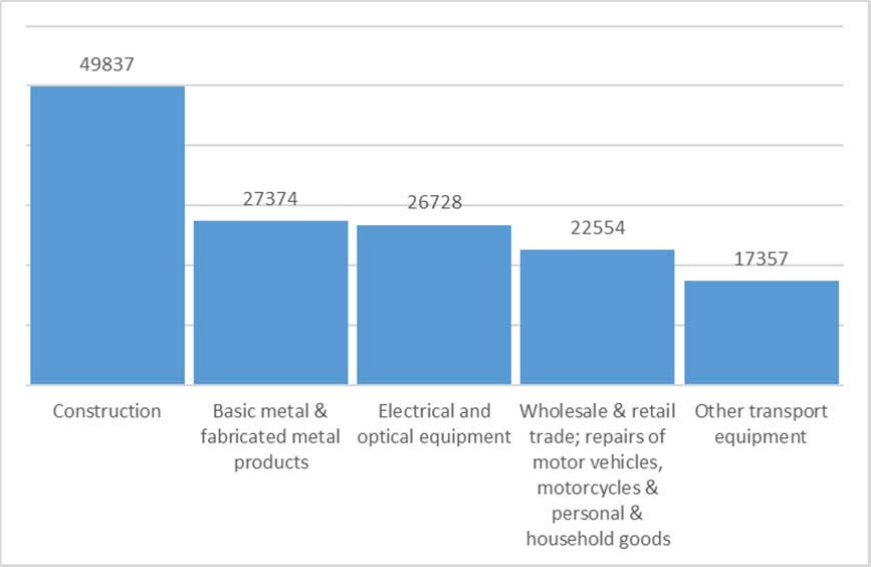

Figure 3. Top five industrial sectors for ISO 14001 certificates 2016 (Source: ISO Survey 2016)

Those five sectors accumulate 45.7% of total ISO 14001 certificates worldwide. During last three years first four sectors have not changed and only fifth sector on the top-five list was changing so in 2014 fifth sector was machinery and equipment and in 2015 rubber and plastic products. Both sectors are still important and they are sixth and eight according to number of ISO 14001 certificates in 2016. This gives good insight for which industrial sectors worldwide ISO 14001 certification is bringing benefits for their businesses.

3 ISO 14001 in Croatia

ISO standard 14001 is present in Croatia from the 1997 when the first companies were certified. By 1999 there was 8 companies with ISO 14001 certificate (See Figure 4).

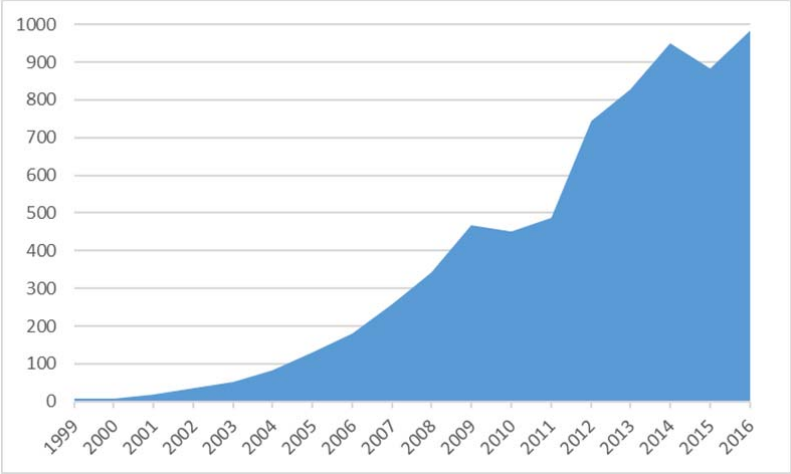

Figure 4. ISO 14001 certificates in Croatia from 1999 to 2016 (Source: ISO Survey 2016)

During period from 1999 to 2016 the number of certificates was growing and in 2016 there was 984 certificates. This number was growing during examined period except during 2015 when the number fallen for almost 10%. In 2016 growth was recorded again with the highest number of certificates. ISO 14001 can be found in 37 different industrial sectors in Croatia (See Figure 5).

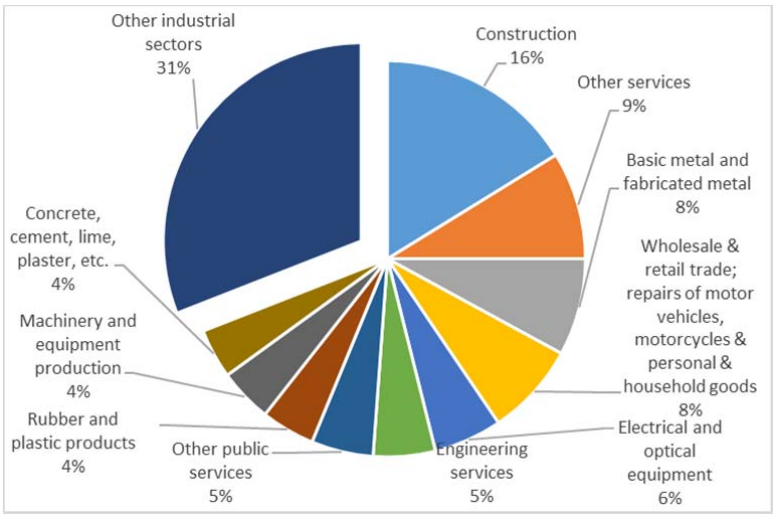

Figure 5. Sectors with ISO 14001 certificates (Source: ISO Survey 2016)

Construction sector in Croatia has the most ISO 14001 certificates and it is followed with other services sector and basic metal and fabricated metal sector. This division between sectors in Croatia is following division of ISO 14001 across sectors worldwide and is showing importance of having ISO 14001 for certain sectors and their businesses.

Main reasons why Croatian companies implement ISO 14001 is not different in relation to world examples and they include following: (1) better performance of the company, (2) improving public image of the company; (3) compliance with regulation; (4) employee involvement [28]. Companies

implement ISO 14001 as a tool for building waste management organization to reduce, re-use and recycle waste on their level. Standard is also important for waste management in municipalities, cities, countries and whole country since it can help in raising awareness about waste and consequently whole environment. In the following part of the paper an example from Croatia will be presented.

3.1 Example from Croatia

Croatian company has a long tradition of production of chemical and cosmetics products. During its existence company has invested in organization and production as well in implementation of ISO 9001 standard. Company is situated in urban part of the city and due to its production, there has been several complaints from the people living nearby regarding possible influence on the environment. In 2004 company started a project of implementation of ISO 14001 standard and first action was to introduce company's policy of environment protection management within company and to present it to all other stakeholders. Company started with assessing status and determining environmental aspects of the company (See Figure 6).

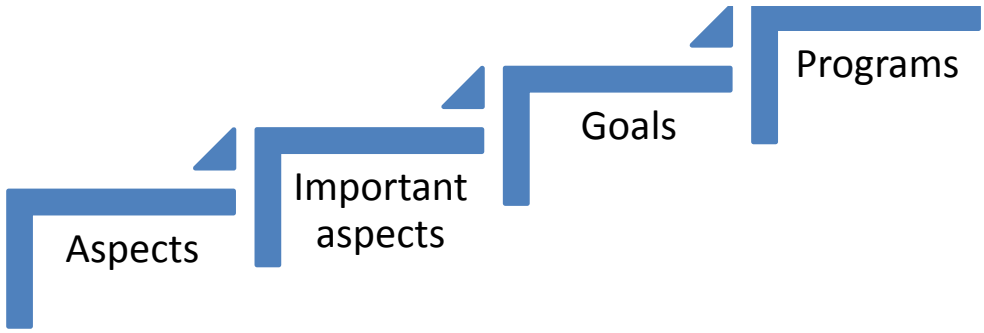

Figure 6. Process from aspects to goals and programs of environment protection

Based on assessment company has determined its environmental aspects which are based on following criteria: legal requirements, local requirements, administration and self-government, environmental protection policy of the company, public influence, technical and technological, financially objectively possible pollution reduction activities.

Company has identified several significant aspects of the environment (13) through crystallization of goals and different programs (23) within which different tasks were assigned (42) for realization. Company has assigned environment protection programs to different employees, set deadlines for realization of programs and financial resources which are analyzed every six months. ISO 14001 shares common management systems principles with ISO 9001 quality standards, and since company has ISO 9001 since 2000 it was much easier during implementation process for the employees to understand process and importance of the certification. Whole ISO 14001 environmental management system is elaborated within integrated system specific elements (13) which are required by ISO 14001 standard.

During process company's environment management system and its functionality were checked and assessed. Different corrective actions are carried out and their results are presented in regular reports (semi-annual, yearly). Twice per year board of director's representative for ISO 14001 presents achieved results which can be environmentally and financially measured. Company presents their

results in reports on their web pages in which they inform stakeholders about what has been achieved. As a part of all activities two programs are worthy of mentioning:

1. Re-use of PET granulate - company is producing their own packaging from PET granules. Because of production of bottles, company has approx. 2% of waste (residue after color or mold changes, inadequate quality bottles) – i.e. 60 tons of material. Based on ISO 14001 procedures company is inspecting waste and almost 40% is put back into production and 60% is sold to certified waste collector. With this procedure company is saving almost 40.000 EUR/year.
2. Collecting of used printer cartridges – due to the legal regulation in Croatia every company should pay certain amount for used printer cartridges (as part of electronic waste management). Company introduced, as part of ISO 14001, procedure for collecting used cartridges and giving the to another company which is using them in process of preparation for re-use of cartridges. In return company is receiving receipt which means that they don't need to pay fee for electronic waste. This is representing way of saving money and protecting environment.

Through ISO 14001 environment management has become important parameter in planning company's environment impact and in today's economy this is not easy to achieve. Because of ISO 14001 implementation company has achieved following results:

1. Environment protection and thinking about it became significant part of company.
2. Company clearly recognized its significant aspects of environment.
3. Company defined goals and aligned them with the national legislation.
4. Company follows systematically program and its realization.
5. Better management of different natural resources was established and through that company achieved significant financial savings.
6. Company enabled better control of costs and activities related to environmental protection.
7. Company improved production technology to reduce environmental pollution.

Above mentioned results helped in improving company's public image as environment friendly company and this is one of the several benefits company received with ISO 14001 certification. It is important to state that besides external benefits for the company, ISO brought change of thinking inside company with employees starting to think about how they can contribute. Several activities brought savings in used resources which led to saving in financial resources thus enabling company to be more competitive on the market.

4 Conclusion

In today's global market condition companies need to look upon every aspect of their business and environment is becoming more important for companies for being more competitive in their business and to take care about environment in which they work.

Although there are several different EMS standards available to companies, ISO 14001 is standard which has gained popularity and is accepted all over the world. During time ISO 14001 has been changing in accordance with changes in world business. Latest version of ISO 14001:2015 standard emphasizes sustainable development and the achievement of the balance between the environment, society and the economy. Key improvements of standard include strategy alignment, increased governance, efficient communication, enhanced environmental protection and environmental problem monitoring during lifecycle of products and services.

Implementation of ISO 14001 brings external and internal benefits to companies which adopt standard and those benefits include among others environment protection, profitability, efficiency, improved image, improved customer satisfaction and improvements in employee results. On the other side, there are drawbacks of ISO 14001 and they include lack of follow-up and system continuity and company's potential capacity of reducing negative environmental influences.

Presented case showed benefits of ISO 14001 for Croatian company which managed to better use resources needed for production and in the same time to save financial resources which were then used for other purposes. Besides this saving company increased its image in local and national environment and is aligned with different national environmental regulation.

Based on literature review, increased number of standards worldwide and benefits found in observed Croatian example further research is proposed:

- examine potential influence of ISO 14001 standard implementation on company's competitiveness on local and domestic markets,
- examine if Croatian companies that have implemented ISO 14001 have reduced their negative impact on environment or not.

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THE IMPACT OF THE COMPANY´S MANAGEMENT ON THE ENVIRONMENT

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Abstract: Enterprise environment management affects planning and control managerial functions. On the other hand, compliance with ISO 14001 and EMA is a competitive advantage for a global enterprise. In the contribution I will appreciate the differences between them. The main objective of the contribution is to evaluate managerial functions planning and control on the impact of environmental development on the internal and external sphere of the company's impact. In particular, within the internal sphere, compliance with standards and rules, on the other hand, from the external sphere of influence of weather forecast. Within the external sphere, this can cause ecological and economic problem. At present we can see the influence of weather forecast by the world powers on the modern "military weapon". In the practical part of the contribution, I will compare the impact of meteorological forecasts on the economic benefit through a correlation analysis. In my opinion, it will have an increasing tendency in terms of significant changes in global climate conditions. In the 27 EU countries, according to the study, they have a total value of 60 billion € per year and are directly proportional to GDP. As industry and building industry represent the largest percentage of investments in the economy of the countries and are to a large extent influenced by weather forecasts. Application benefits for practice will be drawn from conclusions based on the assessment of the company's management of specific managerial planning and control functions in compliance with the standards, rules and influence of the weather from an economic point of view.

Keywords: *control, economic benefit, environment management, meteorological forecasts, planning.*

1 Introduction

In the contribution, we point out the impact of new technology on the organization's management. Climate change that is taking place in the global world and current conditions are grounded in the Paris Climate Agreement. The main objective of the contribution is to evaluate managerial functions planning and control on the impact of environmental development on the internal and external sphere of the company's impact. We will review and analyse the current situation within the contribution. Through correlation analysis, we will analyse the evolution of application usage, namely weather and the use of external financial resources. Data is secondary to application development, but primary data is available for external financial resources. In the second correlation analysis, the effects will not be concretised. We will examine the impact of developments in technology aimed at the environmental department for financial activeness country. Data will have a secondary character. In the correlation analysis we will determine its coefficient based on the formula [1]:

$$k(x,y) = \frac{1}{n-1}\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y}) \quad (1)$$

2 Management of the organization

Within the management of the organization, I will further recover from a theoretical point of view management functions planning and control in which a clear correlation with EMA tools.

The planning function is very important for an organisation, since by its performing the organisation completes the processes and activities, throughout which it realises an opportunity, sets its objectives and missions, vision and strategy, evaluates its plan.

"The word to plan comes from a Latin word planta – a sketch of a building. Hence to plan means to project, draw a scheme how something has to be performed. The opposite of planning is to improvise, to work without a plan, randomly" [2].

Planning is the initial function of management, which affects all managerial functions [3]. The development and the change of a situation and a structure in the organisation are performed through a managerial function of planning.

Problems occurring during planning are, that the organisations understand the given function as a routine activity and premises that are the core of the plans creation are not sufficiently up-to-date, as a result of which the plans are not adapted to the business environment. A major problem is also the inadequate expectation to reach the planned situation.

Analysing the current situation is planning, responds to the questions about where the organisation currently stands, where and how it wants to get there. The basic planning functions include:

- Cognitive function: the aim is to build basic developmental directions by gaining information about the past, presence and the future;
- Decision-making function: priority of the given function is setting the objectives and tasks;
- Programming function: the plans of the organisation are its activities. The business plan is formed by the objectives, measures and tasks that are necessary to perform.

Planning methods in the organisation are to a large extent linked to the individual types of a plan:

- Empiric-intuitive methods are used when setting an objective, determining a mission and a vision (intuition, estimate, brainstorming);
- Heuristic methods are used mainly in strategy formation (SWOT analysis, BCG and GE matrix);
- Mathematical-statistical methods can be used in formation of implementation plans (economic, optimisation, simulation methods).

The basic types of plans include:

- Mission;
- Vision;
- Strategy;

- Implementation plan.

The organisation's mission is documented in its Articles of Association, Trade Certificate, Statute or Organisational Order. The scope of products is expressed in working activities and processes, i.e. organisational mission, philosophy.

The opportunities, goals and mission form the contents of the second planning document, i.e. the organisational vision. It is created as a whole like a mission, with no time limit.

The vision should be mediated and inspiring. The effective vision has to have certain features: leading, reminding, inspiring, indicative and liberating.

In strategy making is necessary to ask the following questions: Where does the organisation want to be in future? How does it want to do that and what is its aim?

Currently, due to the external environment, it is effective for the organisation to have a flexible strategy. Unlike the mission and the vision, the strategy has a time limit.

According to [4], the role of control is the following:

- Monitoring the actual development of a managed object and determining the final result;
- Comparing the actual development with the development determined by the decision of the management body, identification of possible deviations from the determined development as well as their causes.

Control is a very important managerial function, which has to be followed consistently, in order to find out how we have met the planned business objectives. The basic methods of control include the following:

- Preventive;
- Continuous; and
- Follow-up control.

The result of the control process is information on how and to which extent the actual activities differ from the planned ones. The standard expectation is the principle of control and a plan is the tool of control.

2.1 Environment management

The main task of environmental management is the management of corporate assets that relate to the environment.

According to [5], longitudinal data (1997–2001) about 325 publicly traded U.S. firms in polluting industries support the notion that environmental actions help firms gain environmental legitimacy. However, some actions instead can harm this legitimacy if environmental performance deteriorates and the firm is subject to intense scrutiny from nongovernmental organizations.

Also [6], say the following: We are currently experiencing pollution issue and environmental decay that had its origin, however, in the previous centuries.

Currently the organization is largely concerned with the environment. This point of view provides a positive view for both parties, both for the owners and for their clients.

According to the authors [7,8], the impact of proactive environmental management on the competitiveness of a firm and influence of the sources of motivation that lead companies to adopt environmental management systems (EMSs) on the outcomes of these systems.

On the basis of research [9], the concept of eco-innovation has gained an important role implementing environmental measures on labour productivity implementation has evolved during a period of deep economic crisis in all the productive sectors in Spain (2008–2012). For this purpose, the variable i.e. was defined as indicator by which to measure the eco-innovation and was introduced in a standard Cobb–Douglas production function. The two estimates of the production function for 2008 and 2012 show that the introduction of eco-innovative measures had a positive and significant influence on labour productivity, despite the fact of the economic crisis reduced the productivity growth observed for each additional eco-innovative practice implemented by the hotels from 8.15% in 2008–7.45% in 2012.

The China, we [10] find that new ventures respond to a high environmental uncertainty by engaging more in prospector strategy, consequently enhancing the ventures' performance. Moreover, we find that network capabilities significantly moderate these relationships by not only strengthening the relationship between environmental uncertainty and engagement in the prospector strategy (the E–S relationship) but also by enhancing the relationship between engagement in the prospector strategy and new venture performance (the S–P relationship).

2.2 Appraise the differences between ISO 14 001 and EMA

Environmental management within the organization is subject to certain standards and rules that must be respected. Organizations can decide between legislative rules that are intertwined and have certain contexts. We will be more specific about the differences between ISO 14 001 and EMA.

We argue [11] that the concept of environmental management control systems (EMCS) provides a promising approach for integrating presently fragmented lines of inquiry concerning the internal drivers and managerialprocessesthatmayfosterfirms' environmental performance.

In the next lines chapter, I will evaluate the main differences between ISO 14 001 and EMA.

ISO 14 001 [12] is the most widespread international standard that supports organizations in the implementation and maintenance of their Environmental Management Systems (EMS) defining a list of requirements to improve environmental performance. The investigation of the drivers of EMS adoptions still relevant today in the scientific debate.

The findings [13] also indicate that there is a significant relationship between ISO14001 certification and a company's financial performance in an emerging economy context. The reason is the adoption of ISO 14 001 standards does offers many benefits to companies, such as greater reputation and brand awareness on one hand, and higher sales and investors' confidence on the other.

The ISO 14 001 certification helps to develop a better system which leads to costs reduction and revenue increase in the long run. On the other hand [14] the Eco-Management and Audit Scheme (EMAS) was established in 1993 in the European Union as a voluntary instrument facilitating the implementation of organisational environmental policies and management of environmental aspects.

The following table summarizes the differences:

Table 1. Differences between ISO 14 001 and EMA

Range	ISO 14 001	EMA
character	global	European
regulation	voluntary	in accordance with regulation no. 761/2001/EC
input analysis	recommended	obligatory
impact register	recommended	required
environmental statement	not required	obligatory
audit cycle	undetermined	three-year period
termination process management	certification	verification environmental statements

Source: own processing

Within the scope and requirements, the common management system and the validity of the types of activity, namely management is the character of the whole, and in types of activity it is determined for all types.

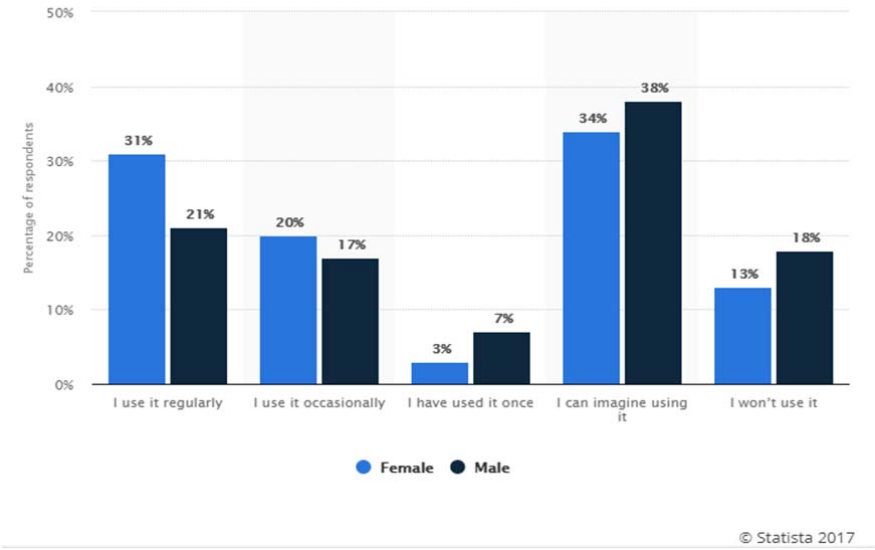
3 Conclusions

We contributed theoretically to environmental management and two managerial functions, namely planning and control. Consequently, we will evaluate the impact of technology on the management of the organization, which has a considerable impact on the finances and management of the organization. In the global context of 2010, there is a worldwide trend in using the smart phone app. In this contributed we will focus and analyses applications for weather.

Based on statistical surveys [15] during Sandy Hurricane in New York City, the use of the application was as follows:

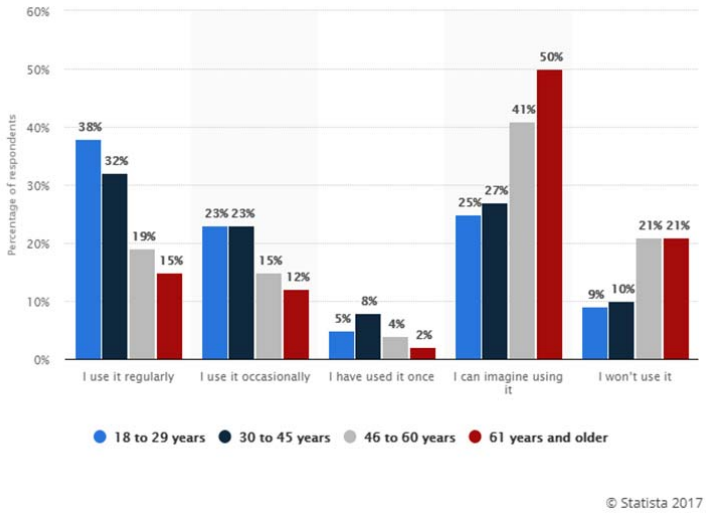
- 104% navigation,
- 74% finance,
- 61% photography,
- 52% news,
- 48% travel,
- 44% music,
- -3% sport
- -64% weather.

The greatest decline has had an application for the weather, because the situation within the weather was irreversible. The weather to humans and the organization is very important. The following graph shows use:



Graph 1. Percentage adults who would use an app to monitor environmental conditions as of 2017, by gender (Source: Statista [16])

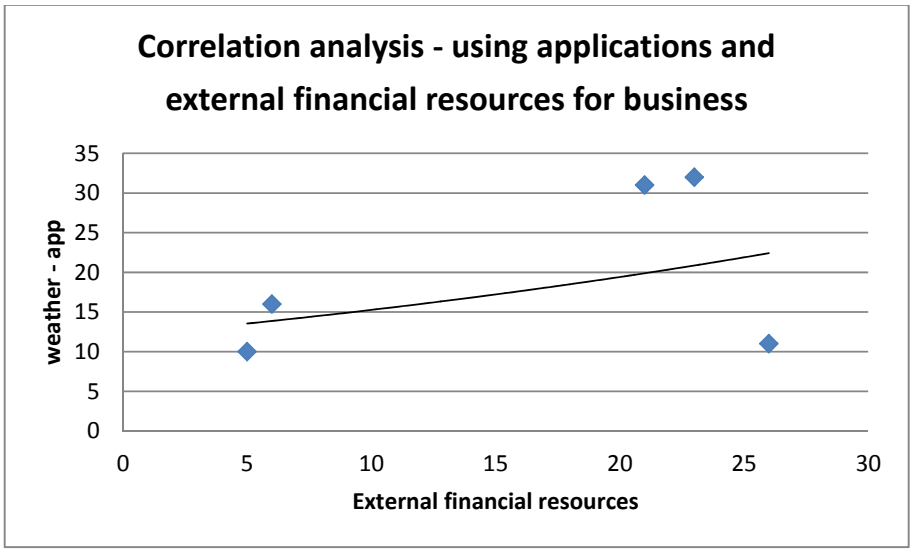
The highest percentages were in the replies "I use it regularly" and "I can use this image". Men, in particular, consider weather applications to be an image; on the other hand, women tend to be more likely to respond to frequency of use. In terms of age category, the following indicators were used:



Graph 2. Percentage adults who would use an app to monitor environmental conditions as of 2017, by age (Source: Statista [17])

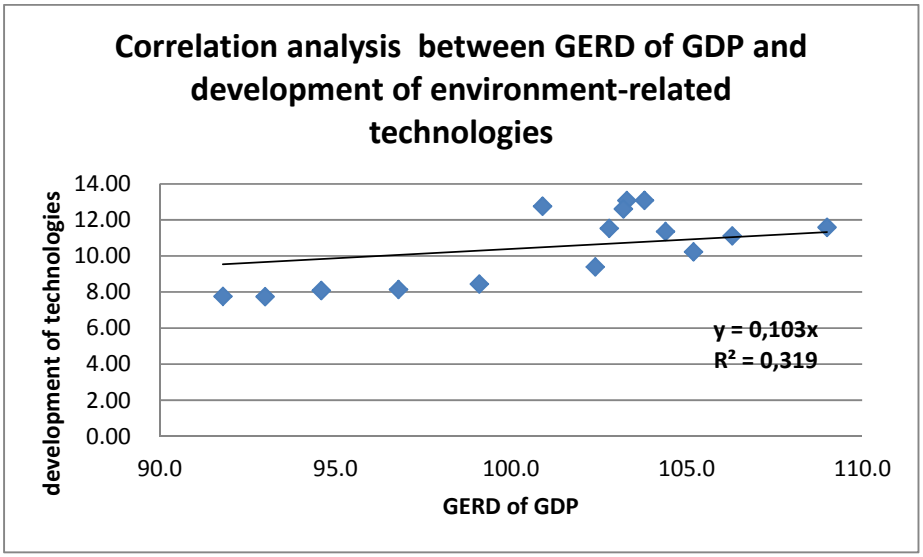
For age divisions in the age of 61 years and older, use of the app is due to the image. Young people determined application usage due to frequency.

Through correlation analysis, we will investigate the dependence between enterprise management and technology. The following graph illustrates the dependency between used weather applications and the use of external financial resources for doing business. Given the analysis, we decided to use external financial resources because the orgnization for their development and growth in use of the funds.



Graph 3. Correlation analysis – using applications and external financial resources for business (Source: own processing on the basis of Statista [18])

The correlation coefficient is *0.465955*, which is the medium value. On the basis of medium dependence, we will investigate the correlation between gross domestic expenditure on R&D of GDP and development of environment-related technologies. The time series is since 2015 till 2016 year.



Graph 4. Correlation analysis between GERD of GDP and development of environment-related technologies (Source: own processing on the basis of OECD [19])

The correlation coefficient for the given analysis represents a higher medium dependence than in the previous correlation analysis. Specifically, it represents *0.752538*. Based on these analyses, we believe that the development of R & D funding has a greater degree of dependence than that of the concretisations, i.e., using the application for finance for business. The time series is since 2005 till 2016 year, the variability of values is 31.90%.

In order for organizations to be competitive, they must have effective environmental management. We recommend the following:

- in the planning managerial function, it is necessary to focus on ISO 14 001, which has a global character,
- as part of the management function of control and if the organization operates in the European area, it is necessary to comply with EMA standards,
- there is a higher medium dependence of interconnection between investment in technology and economic development
- climate and weather developments are turbulent for the country today, so it is necessary to analyse and explore their impact on the company's finances, which is a medium relationship.

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LCA-BASED SELECTION OF CONSTRUCTION MATERIALS

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Abstract: Nowadays, there is an increased concern about the environmental burden of construction sector. A lot of measures are taken to reduce the energy, water and resource demand of buildings throughout their life cycle. Efforts are normally focused on the use stage of a building as it is of longest duration. However efficient this approach, attention need also to be paid to the other life cycle stages, e.g. manufacturing of construction materials and products, processes on the building site and end-of-life stage. Some products are of increased interest, e.g. ETICS (external thermal insulation composite system) due to their contribution to the energy efficiency during the use stage of buildings. The article presents a life-cycle oriented approach to estimate the different variables that have impact on ETICS' environmental footprint. The main environmental impacts of ETICS system using expanded polystyrene (EPS) boards as a thermal insulation are analyzed. The relative share of ETICS components and the contribution of different processes (supply of raw materials, transport, manufacturing, packaging) are assessed. The effect of different thicknesses of EPS and of different renders is also discussed. These issues are actually part of Environmental product declarations (EPDs), which are requested per Regulation 305/2011 for substantiating the sustainable use of construction products. Data from two EPDs based on a detailed life cycle analysis (LCA) for product stage is used. Therefore, LCA can be regarded as an important source for estimating the initial environmental burden of a building and thus, at a design stage, it can serve as a tool for appropriate choice of construction products.

***Keywords*:** *Building Materials, EPD, ETICS, LCA, Sustainable Construction.*

1 Introduction

Nowadays, sustainability of construction sector is among the key fields of industrial innovations. In order to assess the achieved level of sustainability a large number of parameters need to be considered. A modern building is required to provide technically safe, energy efficient and healthy environment at reasonable cost with little or no stress on environment. A variety of evaluating tools, standards and building certification systems are available to assess building's performance with respect to its social and economic dimension as well as ecological impact. The categories under evaluation are differently prioritized depending on regional factors, e.g. availability of resources, industrial and machinery advances, established practices, etc.

Construction products and materials, being an irrevocable part of a building's life cycle, are among the key factors to be analyzed. A building has three interrelated stages of existence: construction, operation and demolition. Construction forms the input flows for the operation stage of the building, operation in turn forms the potential for reuse, recycling and landfill waste. Building materials are part of all three stages; they serve as an input and form the output of a building at the end of life stage.

The sustainable approach for buildings has identified lifecycle-based Environmental product declarations (EPDs) of construction products as an important certificate of their environmental

performance. Despite their voluntary status more and more manufacturers recognize EPDs as a way to improve their products and to declare responsibility for energy and resource efficiency. Moreover, the Regulation 305/2011 on construction products suggest to use EPD (in case no other methods are applied) to substantiate the fulfillment of the 7th essential requirement to construction works,namely sustainable use of resources.

2 Methodology

2.1 Life cycle assessment (LCA) and EPDs of construction products

An EPD is "an independently verified and registered document that communicates transparent and comparable information about the life-cycle environmental impact of products" [1]. There are three types of EPDs:

- Type I – Eco-label approved by a third- party organization (governmental or non-profit organizations) indicating environmental advantages in a common sense based on parameters of the life cycle of products;
- Type II – Self-declared non-verified environmental claims, graphs, symbols by manufacturers used for marketing and advertising purposes;
- Type III – Disclosure of the life cycle environmental performance of products using pre-determined parameters. Type III EPDs are built upon Life cycle assessment and the content and format of EPDs is equivalent for groups of products that fulfil equivalent functions (e.g. 'thermal insulation') are determined by Product Category Rules (PCR). These EPDs are independently verified by third-party experts and can serve as a basis for comparison of construction products in terms of environmental impacts.

Development and publication of Type III EPDs is a subject of a number of CEN standards [2, 3, 4] and ISO standards [5, 6, 7].These standards set the rules and procedures for completeness of collected data and transparent evaluation of the environmental impacts. PCRs are developed by the publishing organization (Program operator) and they aim to ensure verifiable and consistent data about the product, the LCA and the considered scenarios. PCRs serve as a basis for communication of environmental information along with the applicable standards.

The life cycle assessment is a relative quantitative approach for evaluation the environmental impacts of a certain product, process or system. It accounts for all input and output flows and can have different scope (figure 1) depending on the purpose of the study – cradle-to-gate (Product stage), cradle-to-gate with options (Product stage plus modules from the Construction, Use or End-of-life stages), cradle-to-grave (the whole life cycle of the product) and cradle-to-cradle (the whole life cycle plus recovery processes and end-of-waste state).

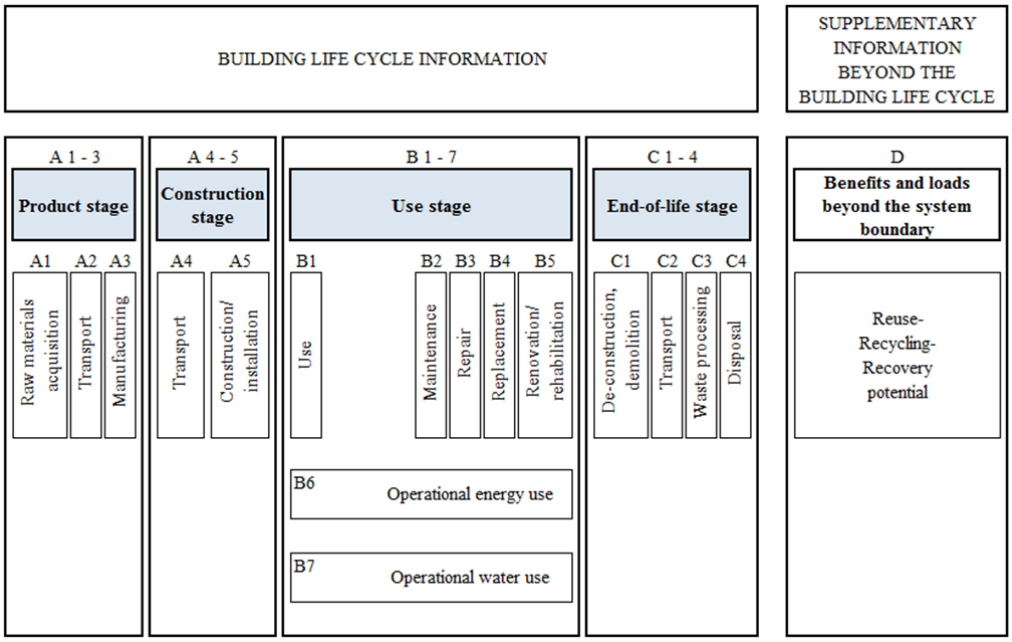

Figure 1. Life cycle stages and modules [2]

Irrespective of the scope, a typical LCA study has the following steps:

- *Goal and scope definition* where general information is presented concerning the purpose of the study, used functional/declared unit, product identification (description and field of use) and system boundary.
- *Life-cycle inventory* (LCI) where all input and output flows (materials and energy resources, water, emissions, etc.) are considered. Calculation procedures and sources of data are also classified and describer in this stage.
- *Life-cycle impact assessment* (LCIA) where the flows from LCI are assessed and impacts of pre-defined environmental categories are calculated.
- *Interpretation* of the results where the results from the study are analyzed and discussed.

2.2 Product description and field of application

This study provides a closer look at the Product stage of an External Thermal Insulation Composite System (ETICS).

The ETICS is intended for installation on external walls of various building types (offices, residential buildings, public and commercial buildings, etc.). It is composed of the following layers: a) Bonding (adhesive) layer, which serves to ensure the adhesion of the thermal insulation (b) to the insulated wall. Usually this mortar is based on cement and polymer-modified cement bonder; b)

Insulation layer is usually of expanded polystyrene (EPS) or mineral wool. Other materials with low thermal conductivity such as cork, expanded polyurethane, etc. can also be applied. The thickness of the thermal insulating layer varies according to the requirements for the thermal conductance coefficient (U-value) of the insulated wall; c) Coating layer is also a cementitous mortar and serves to coat the thermal insulation layer and to receive the (d) reinforcing layer of fibre mesh (typically glass fibre mesh); e) Primer serves to improve the adhesion of the last, finishing layer – the Render (f). Primer is a very thin layer and its chemical composition depends on that of the Render; f) Render can be acrylic, silicate, mineral or silicone. It is a fine grained mortar. It is white, but can be coloured (prior or, rather, after its production) by small amount of pigments. Mechanical fixings as anchors are also used for the attachment of the insulation layer. They are usually plastic or of combination of steel and polymers.

Figure 2 represents the layers/components of the External Thermal Insulation Composite System (ETICS) under study.

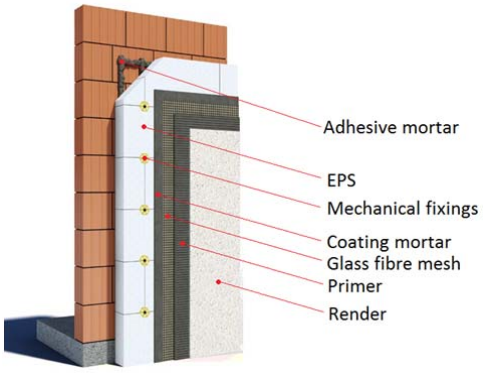

Figure 2. Product scheme of the ETICS

2.3 Case study of External Thermal Insulation Composite System (ETICS)

The study is based on the EPDs of two ETICS systems.

- The first EPD is on a product, offered in Bulgaria by an international company – one of the leaders on the European construction product market. This EPD has been prepared by the authors, but since it has not been published yet, the name of the manufacturer will not be revealed. The system will be referred further as "Local ETICS". The Bulgarian branch of the company is producing the dry mix for the bonding and coating layers. The EPS boards are manufactured and delivered to the ETICS manufacturer by an external company, located in Bulgaria. EPS insulation boards are used in the ETICS without any additional processing by the ETICS manufacturer. The glass fibre mesh is used as a reinforcing layer and it is manufactured by an external factory located in Czech Republic. Mechanical fixings are plastic anchors of low density polyethylene (LDPE). The anchors are manufactured and delivered to the ETICS manufacturer by an external company located in Turkey. The anchors are intended for use in concrete substrate for thickness of the insulation board varying from 55 to 120 mm. The

reference number of anchors for 1m2 of ETICS installed is 6 items. Mechanical fixings are used in the ETICS without any additional processing by the ETICS manufacturer. The priming and rendering layers are also manufactured by an external company located in Serbia and are delivered to the ETICS manufacturer.

- The second EPD is on ETICS-CERESIT CERETHERM CLASSIC issued by the Building Research Institute (ITB), Poland under ref. No. 032/2016. The manufacturer is the Polish branch HENKEL Operations Sp. Z o.o. of another leading construction products producer [8]. The system will be referred further as "Ceretherm Classic". It is also based on EPS boards which thickness varies as 10, 12, 15, 20 and 25 cm respectively. Five types of render have been evaluated – acrylic, silicate, mineral, silicone and silicate-silicone.

Both EPDs are based on LCI and LCIA as described above. The authors performed these LCA steps only for the first "local" system and their results will be interpreted more in detail.

2.4 Goal and scope of the study

The purpose of this study is to present the main environmental impacts of ETICS system using expanded polystyrene (EPS) boards as a thermal insulation and to analyze the relative share of ETICS components on the environmental impacts and the contribution of different processes (supply of raw materials, transport, manufacturing, packaging). The effect of different thicknesses of EPS and of different renders is assessed. Thus, the results can serve for both optimization in the manufacturing/supply/transport processes and for choosing the ETICS products with a lower environmental impact when it is requested.

2.4.1 Declared/functional unit

Declared/functional unit is selected so that the study and the results reflect the field of application of the product and allow for comparisons with other similar products. The input and output flows in LCI and LCIA procedures are calculated for declared unit 1 m^2 of Local ETICS with specified ingredients and technical performance. The same declared unit is used in the EPD of CERETHERM-CEREZIT ETICS.

2.4.2 System boundary

The life cycle analysis of the examined products covers "Product Stage", A1-A3 modules (Cradle to Gate) in accordance with EN 15804+A1 and ITB-PCR A.

Details on CERETHERM-CEREZIT ETICS systems limits are provided in product specific report. All materials and energy consumption inventoried in factory were included in calculation. Office impacts were also taken into consideration. In the assessment, all significant parameters from gathered production data are considered, i.e. all material used per formulation, utilised thermal energy, internal fuel and electric power consumption, direct production waste, and all available emission measurements. This study also takes into account some material flows of less than 1% and energy flows with a proportion of less than 1 %. It can be assumed that the total sum of omitted processes does

not exceed 5% of all impact categories. In accordance with EN 15804, machines and facilities (capital goods) required for and during production are excluded, as is transportation of employees.

The modules included in the LCA for the Local ETICS are in-line with the following table 1:

Table 1. Modules covered in the LCA report for the Local ETICS

Local ETICS elements	Life cycle modules covered in the study		
	A1 Raw materials and pre-products	**A2 Transport to factory**	**A3 Manufacturing (ETICS)**
Bonding (adhesive) mortar	☒	☒	☒
EPS	☒	☒	☒
Coating mortar	☒	☒	☒
Mechanical fixings	☒	☒	☐
Glass fibre mesh	☒	☒	☐
Primer	☐	☒	☐
Render	☒	☒	☐

Since the Bulgarian manufacturer of the Local ETICS has no control and influence on the manufacturing processes of the EPS plates, mechanical fixings, glass fibre mesh, primer and plaster. These constituents are considered in this study by their substantial composition and transport to the Local ETICS manufacturer.

2.5 Life cycle inventory analysis for the Product stage of Local ETICS (A1-A3 modules)

2.5.1 Production process

As presented on figure 1, the Product stage includes modules A1 (Raw material extraction and processing), A2 (transport to the manufacturer) and A3 (Manufacturing of the product) together with all materials, products and energy, packaging processing and its transport, as well as waste processing up to the end-of waste state or disposal of final residues during the product stage.

Figure 3 shows the processes in A1-A3 modules for the bonding and coating mortar.

The ingredients of the Bonding and Coating mortar are delivered in bulk from local suppliers. A polymer additive, as an exception, is delivered from abroad and is delivered in polypropylene (PP) bags. The transportation data is collected and modelled by the authors of the study with the cooperation of the manufacturer. After the quartz sand is dried out, the components of the mortar are dosed and mixed with the prescribed proportions. The dry mix is homogenized in a closed mixer and filled into paper bags for storage and is finally dispatched.

The manufacturing process of the EPS boards is considered in the LCA by using generic data from the ecoinvent v.3.3 database. Transport to the construction site is modelled by using average transportation data provided by the Local ETICS manufacturer.

The glass fibre mesh is considered in the LCA in terms of substantial composition, transport to the Local ETICS manufacturer's factory and generated packaging waste.

The mechanical fixings (anchors) are considered in the LCA in terms of substantial composition, transport to the Local ETICS manufacturer's factory and generated waste from packages.

The primer experiences no further processing except for unpacking. The Primer is considered in the calculations with its impacts from transportation activities and generation of packaging waste.

The render is delivered in plastic buckets (25 kg) and some of the buckets are coloured at the Local ETICS manufacturer's production site. During this process the bucket is opened and a small quantity of respective pigments is added. The render is then mixed and homogenized to the desired colour and its bucket cover is again sealed. During the whole colouring process the render remains and is further dispatched in the same buckets as per delivery, so no waste from buckets is generated. The render is considered in the impacts calculations with it substantial composition, transport to the ETICS manufacturer's site, colouring process (energy consumption) and packaging waste generation.

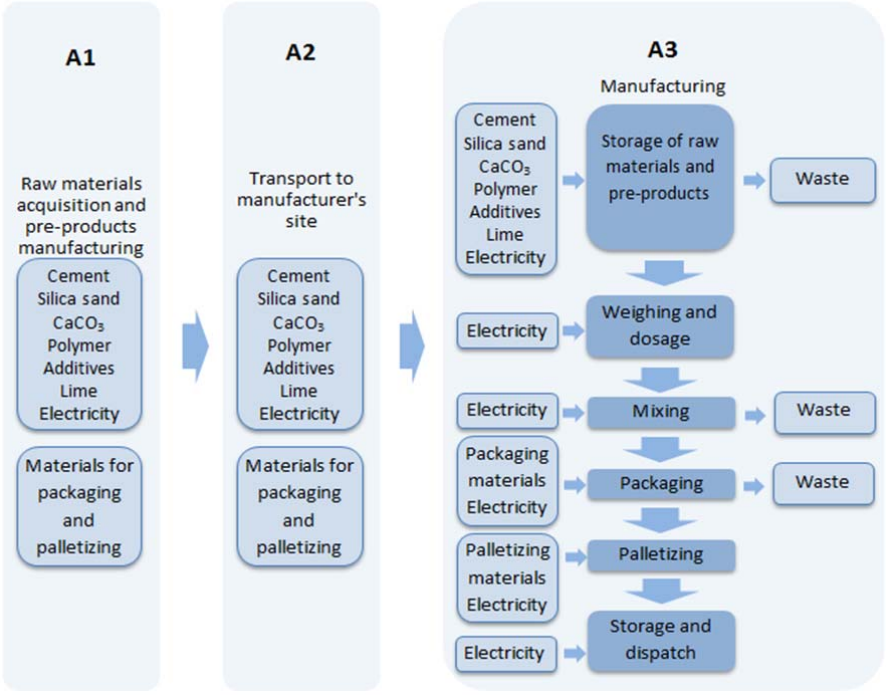

Figure 3. Modules A1-A3 (Product stage) of the bonding and coating mortar at Local ETICS

2.5.2 Data collection and calculation procedures

Data collection and calculation procedures for CERETHERM CEREZIT ETICS are summarized in the EPD [8]. Factory-prefabricated boards made of expanded polystyrene (EPS), mesh glass fibre and anchors are not produced by HENKEL [8]. The impacts of those products were included from databases Ecoinvent, EMPA, Ullmann's, Plastic-Europe, ITB-Data, SPC and CML ver. 4.2 based on EN 15804:2013+A1 version.

For the Local ETICS, all relevant inputs and outputs related to the products or product systems are identified and quantified. Generic data from ecoinvent v.3.3 database is used to model the ETICS components that are delivered by external suppliers and the manufacturer does not have influence on their production processes.

2.6 Life cycle impact assessment

The impact categories assessed in the results are in accordance with the provisions of EN 15804. The herein made analysis includes the impact categories listed in table 2.

From the environmental aspects on resource use as relevant for the study the indicators "Total use of renewable primary energy resources" and the "Total use of non-renewable primary energy resources" have been selected.

The "Hazardous waste disposed" and "Non-hazardous waste disposed" are used as other environmental information describing waste categories.

Table 2. LCA impact categories

Environmental impacts (1m^2 ETICS)	
Global warming potential – GWP	kg CO_2–eq.
Depletion potential of the stratospheric ozone layer – ODP	kg CFC 11–eq.
Acidification potential of soil and water – AP	kg SO_2–eq.
Photochemical ozone creation potential – POCP	kg Ethene–eq.
Eutrophication potential – EP	kg $(PO_4)^{3-}$–eq.
Abiotic depletion potential (ADP-elements) for non-fossil resources	kg Sb–eq.
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	MJ
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) – RPERM	MJ
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) – NPERM	MJ

3 Interpretation of the results

3.1 Local ETICS

The Local ETICS considered in this study differs only in the thickness of the thermal insulation (EPS) layer. The environmental impacts increase with the increase of the EPS thickness (from 8 to 12 cm) as the material quantities are higher and, therefore, form higher environmental impacts – figure 4. The increasing increment varies for the different indicators from less than 1% for ADP-elements to 10-20% for GWP, POCP, ADP-fossil fuels and NRPERM. The increase of ODP, AP, EP and RPERM is on average between 5-10 %. Compared to other available EPDs of ETICS products this system can be considered to have an average environmental impact.

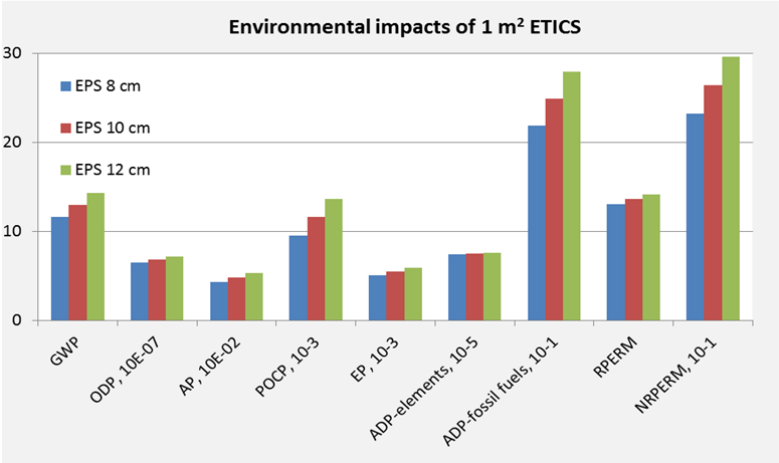

Figure 4. Increase of the environmental impact values of the Local ETICS with increasing the thickness of the EPS board

Some of the impact categories with higher sensitivity to the increase of the thickness of the EPS layer are analyzed below.

The major share of the ETICS's CO_2 emissions originates from the manufacturing of the EPS (the expanding polystyrene process) – around 50% – figure 5. Around 30 % of the GWP comes from the raw materials acquisition and transport of the raw materials for the Bonding mortar. Around 12% of these emissions are due to cement as it has a production process that is highly energy intensive. The acquisition and processing of the other raw materials for the Bonding mortar contribute by almost 5% to the overall CO2 emissions. Manufacturing of packaging materials and transport of raw materials and packages form around 13% of the overall carbon emissions. The Render contributes to the GWP of the ETICS by almost 9%. The shares of CO2 emissions from mechanical fixings is almost 4% and from Glass fibre mesh – around 3%. The transport of primer has a minor contribution.

The major contributor to depletion of the stratospheric ozone layer (ODP) is the manufacturing process of the bonding mortar – almost 60%, mainly resulting from transportation activities and cement. The EPS layer forms around 25 % of the overall ODP. Around 8,5 % of the ODP originates from the render (transport and electricity consumption) and less than 5% of ODP is due to the glass fibre mesh (manufacturing and transport). Mechanical fixings (0,75%) and primer (0,35%) have minor contributions – each of less than 1 % (figure 5).

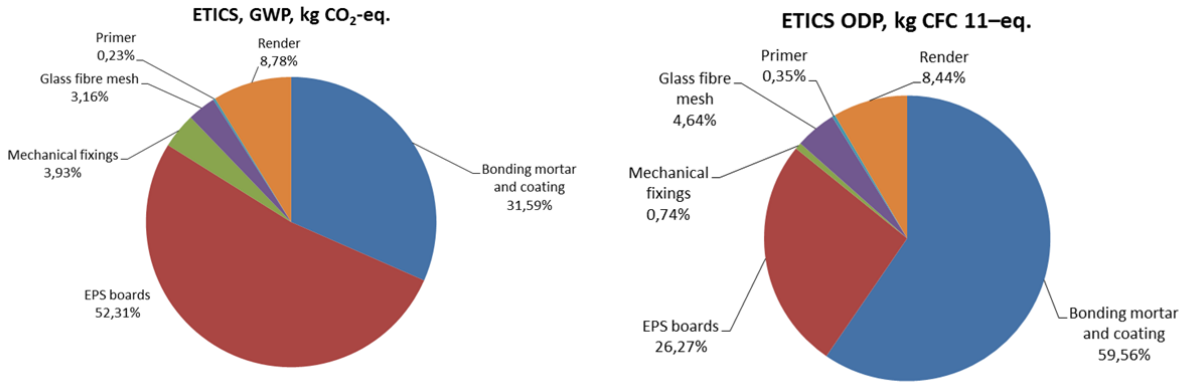

Figure 5. Contributions of different components of the Local ETICS to the Global warming potential (GWP) Depletion of the stratospheric ozone layer (ODP)

Acidification potential increase is around 10-12% per each 2 cm EPS added to the insulation. The EPS and the bonding mortar together form the major share of the acidification impact – more than 80%. The EPS production process contributes to more than half (almost 53%) of the SO2–equivalents and the bonding mortar production forms around 30% of AP major contributors are transport activities and cement. Render (8%), glass fibre mesh (4,6%), mechanical fixings (less than 4%) and primer (less than 1%) account for the minor share of the overall AP (figure 6).

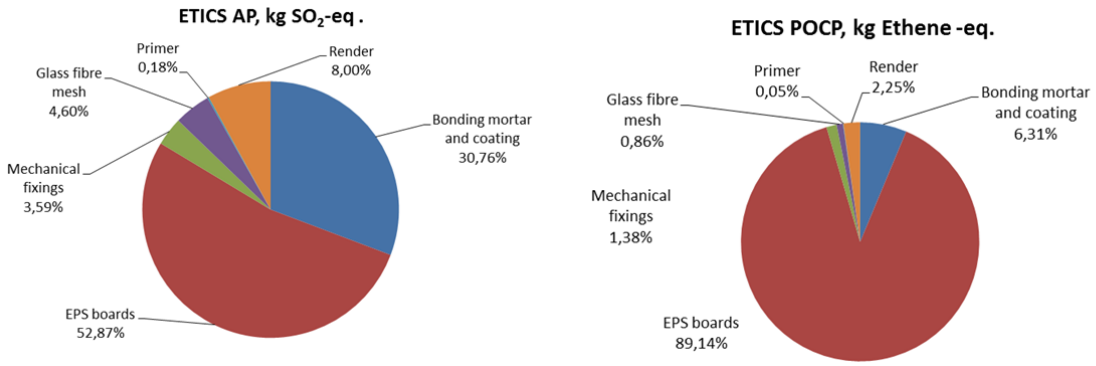

Figure 6. Contributions of Local ETICS components to Acidification potential (AP) and Photochemical ozone creation potential (POCP) of the system

Formation potential of tropospheric ozone (Photochemical ozone creation potential–POCP) increase is around 20% on average per each 2 cm EPS added to the insulation. POCP results almost entirely (almost 90%) from the manufacturing of the EPS – figure 6. Less than 7% of POCP are formed by the bonding mortar production due to transportation and manufacturing of cement and polymer. Render, mechanical fixings, Glass fibre mesh and Primer have minor contributions to the overall POCP of the ETICS.

Abiotic depletion potential (ADP-elements) increase is negligible – around 1% on average per each 2 cm EPS added to the insulation. More than half (56 %) of the Abiotic depletion potential (ADP-elements) for non-fossil resources originates from the manufacturing process of the glass fibre mesh. The main contributor is the boric acid that is used for the production of the glass fibres. 31,5 % of the ADP-elements impact is from the manufacturing of bonding mortar, mainly due to transportation

activities and cement production. Render forms around 8 % of the overall ADP-elements impact, EPS – around 3,5 %, mechanical fixings and primer – less than 1 % (figure 7).

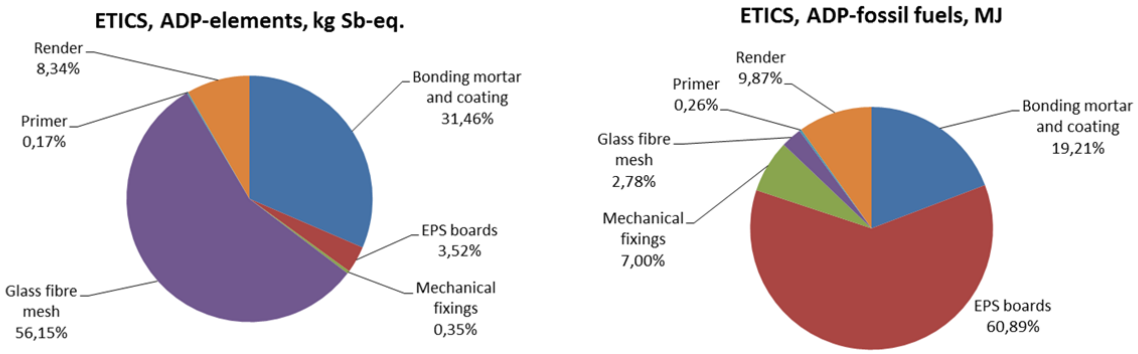

Figure 7. Contributions of Local ETICS components to Abiotic depletion potential (ADP-elements) for non-fossil resources

Abiotic depletion potential for fossil resources increase(ADP-fossil fuels) is around 12-14 % on average per each 2 cm EPS added to the insulation. The impact on abiotic fossil resources (ADP-fuels) is formed mainly the manufacturing of the EPS board (around 60 %) and of the bonding mortar (around 20%). The other components of ETICS have smaller contributions, as follows: render – 10%, mechanical fixings – 7% (mainly due to the long transportation distances), glass fibre mesh – 2-3 % and primer – less than 1% (figure 7).

Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) – RPERM vary from 13,07 MJ for the ETICS with 8 cm EPS to 14,16 MJ for the ETICS with 12 cm EPS. RPERM increase is around 4 % on average per each 2 cm EPS added to the insulation. Figure 8 shows the contributions of the ETICS components to the overall RPERM of the system.

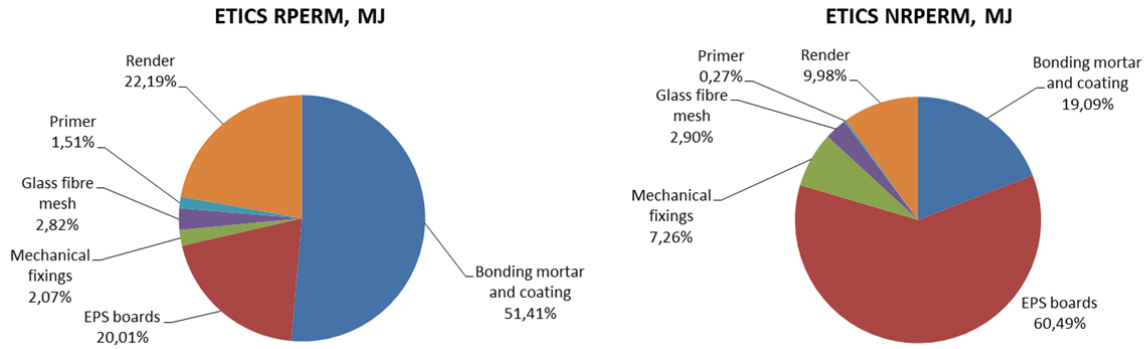

Figure 8. Contributions of Local ETICS components to the total use of renewable primary energy resources (RPERM) and to the total use of non- renewable primary energy resources (NRPERM) of the system

Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) – NRPERM vary from 232,17 MJ for the ETICS with 8 cm EPS to 296,07 MJ for the ETICS with 12 cm EPS.

NRPERM increase is around 12-14 % on average per each 2 cm EPS added to the insulation. Figure 8 shows the contributions of the ETICS components to the overall NRPERM of the system. The manufacturing processes of the EPS boards and Bonding mortar are the major contributors to the energy consumption of the ETICS.

3.2 CERETHERM-CEREZIT ETICS

The great impact of the EPS on the oberall environmental impact of ETICS has been confirmed by the EPD on CERETHERM CEREZIT. A linear relationship can be established between the GWP of the system and the thickness of EPS boards – Figure9. The relationship is similar for all types of renders, because the render itself has a relatively limited contribution to the GWP of the whole system. However, at a constant thickness of EPS (10 cm), the type of Render has a significant effect on the environmental impact of ETICS – the GWP increases by up to 20% when the acrylic render is replaced by a mineral render and by about 10% when silicate, silicone and silicate-silicone are used instead of acrylic – figure 10.

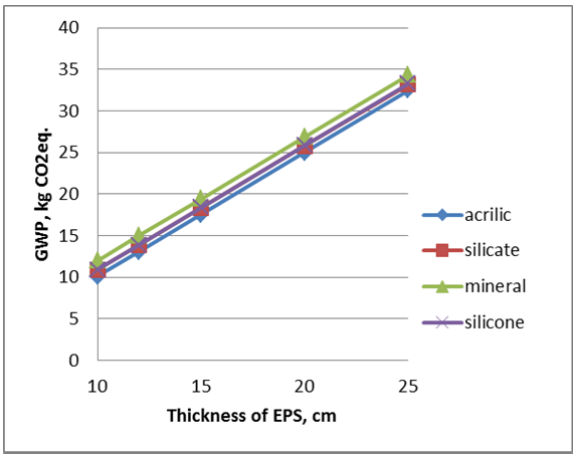

Figure 9. Impact of EPS thickness on the GWP of CEREZIT CERETHERM ETICS

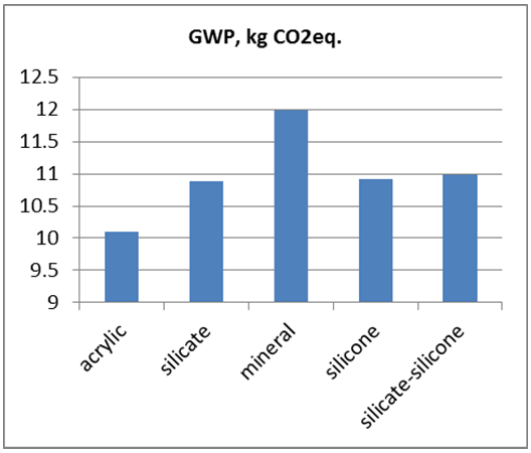

Figure 10. Impact of the Render's type on GWP of CEREZIT CERETHERM ETICS (EPS=10 cm)

As mentioned above, the impact on abiotic fossil resources (ADP-fuels) is formed mainly the manufacturing of the EPS board. It is then expected that the impact of the render's type will be unsignificant – figure 11. However, the impact of mixed silicone-silicate render on ADP-fuels is bigger by approximately 50% compared to the other types of renders.

The range of ETICS in terms of Abiotic depletion potential (ADP-non-fuels) is quite different – the ETICS based on silicate, silicone and silicate-silicone renders have similar environmental impact, the mineral render leads to a greatest impact, while the smalest impact can be identified with acrylic render – figure 12.

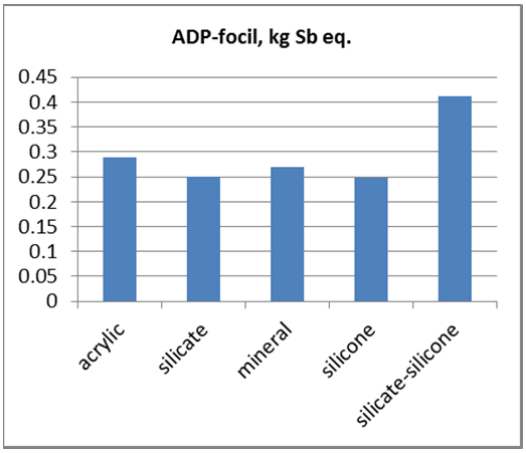

Figure 11. Impact of the Render's type on ADP-fossil of CEREZIT CERETHERM ETICS (EPS=10 cm)

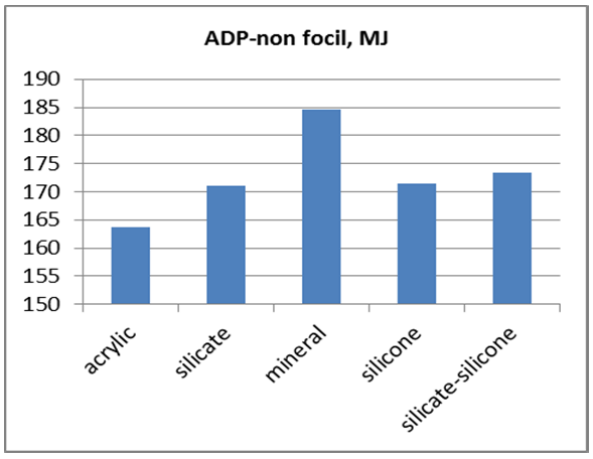

Figure 12. Impact of the Render's type on ADP –non fossil (ADP-elements) of CEREZIT CERETHERM ETICS (EPS=10 cm)

Although a certain difference in renewable primary energy ressources consumption of different ETICS can be identified, the small absolute values do not allow to draw a certain conclusion – figure 13. In terms of non-renewable energy ressources, the use of acrylic render ensures the smallest value of that indicator, while the mineral render involves the biggest ressource consumption – figure 14.

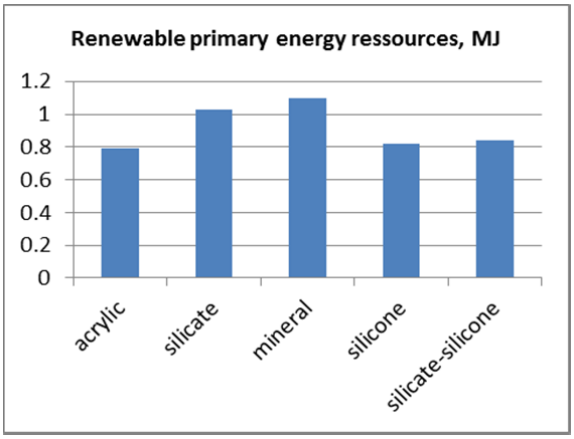

Figure 13. Impact of the Render's type on RPERM of CEREZIT CERETHERM ETICS (EPS=10 cm)

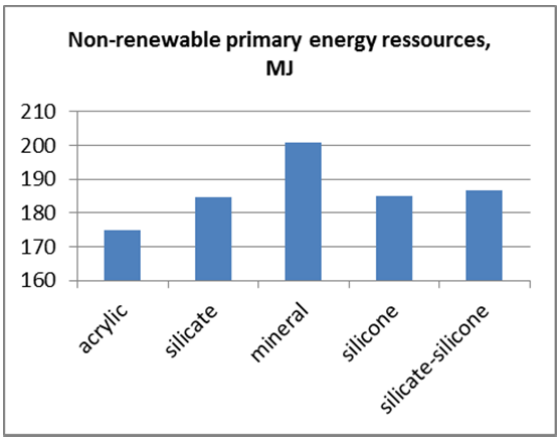

Figure 14. Impact of the Render's type on NPERM of CEREZIT CERETHERM ETICS (EPS=10 cm)

Hazardous waste disposal values are quite small and do not allow to identify a firm trend in the render's influence – figure 15. In regards with the amount of non-hazardous waste to be diposed, the difference between the highest and the smallest value is about 65% - minimum waste is generated by ETICS with a silicone render, while the maximum is for acrylic render – figure 16.

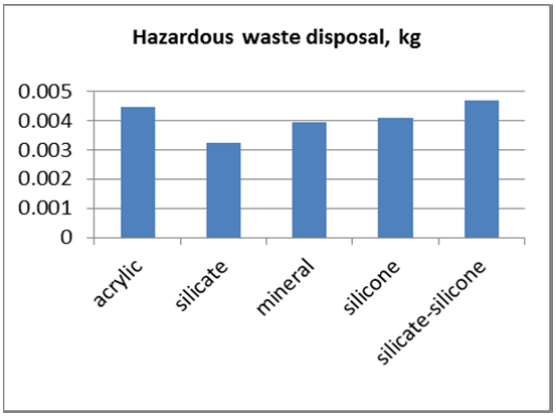

Figure 15. Impact of the Render's type on RPERM of CEREZIT CERETHERM ETICS (EPS=10 cm)

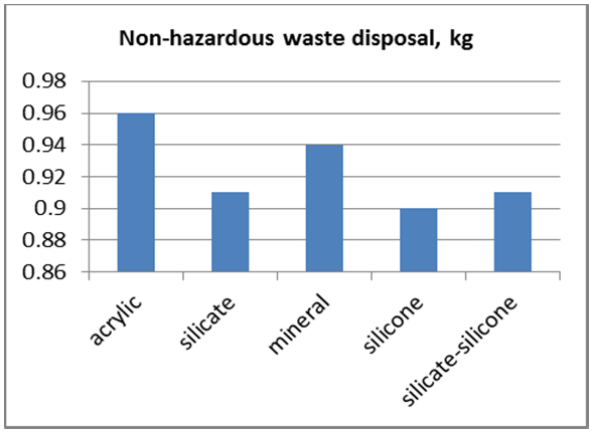

Figure 16. Impact of the Render's type on NPERM of CEREZIT CERETHERM ETICS (EPS=10 cm)

4 Conclusions

The results from the LCA show that the bonding and coating mortar and the EPS boards are the components that have the largest share of the created environmental impacts of the analyzed ETICS. This result is not surprising, because the bonding mortar forms around 65% of the mass of the ETICS. The EPS constitutes only 10-15% of the mass of the ETICS but the production process is energy intensive and the raw material (polystyrene) requires chemical treatment.

The results from this LCA study can serve for a basis of optimizations of the manufacturing of ETICS in terms of factory processes and better supply chain of the products that are delivered by external companies.

At the design stage, the LCA results and the EPD can serve as a practical tool, together with technical and economic criteria, for appropriate choice of products (i.e. ETICS) to be applied in order to reduce the environmental impact of the building and to increase the sustainability of construction.

ACKNOWLEDGEMENTS

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FORECASTING TOTAL MONTHLY RAINFALL AMOUNTS USING MONTE-CARLO METHOD, OF KAVALA CITY, NE GREECE, NE MEDITERRANEAN BASIN

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Abstract: Rainfall is an existing in nature meteorological phenomenon whose accurate forecasting is arduous and requires a lot of effort. Rainfall quantitative forecasting is of paramount importance for water supply management, legal settlements, engineering design, operations (reservoirs, hydropower plants, storm water disposal pipe networks design etc.), assessing impacts (water diversions, changing of land management, climate change monitoring etc.), flood planning (management and warning systems etc.), river stream flow forecasting, water quality monitoring, ecosystem and recreational management etc.. A great number of modeling procedures have been carried out worldwide in order to simulate its configuration behavior employing different manners of doing. Monte-Carlo method is founded on the production of several resolutions of calculations to compute the anticipated value of a random variable. The present study uses Monte-Carlo simulation method to calculate the anticipated artificial values of total monthly rainfall amounts, of Kavala city, Eastern Macedonia and Thrace Prefecture, North Eastern Aegean Sea, North-Eastern Mediterranean Sea, North-Eastern Mediterranean Basin, for the months September, October and December of the calendar year 2017, considering past recorded total monthly rainfall amounts of the same months since calendar year 2006. Then, using the same Monte-Carlo method employs both past recorded total monthly rainfall amounts of the time period January 2006 – August 2017 and predicted total monthly rainfall amounts of the time period September 2017 – December 2017 in order to forecast total monthly rainfall amounts of the future time period January 2018 – December 2018. To accomplish this task, statistical data of total recorded monthly rainfall amounts, concerning a time period of eleven years and eight months, were received from the private meteorological station (the only one existin within the urban area of Kavala city) located at Dexameni residential area, Kavala city, North Eastern Greece and the appropriate rainfall forecasting model is constructed through Monte-Carlo modeling technique. In order to evaluate the model selected, we folloewed the same procedure independently, considering total recorded monthly rainfall for the calendar years range 2006-2016, forecasting the respective values for the time period January 2017 – August 2017, whereas, several statistical criteria between observed and fitted values, concerning this period, were calculated, including discrepancy ratio performance metric accompanied by a log-log scale chart depicting the degree of agreement among recorded and predicted values.

Keywords: *Rainfall forecasting, total monthly rainfall time series, Monte-Carlo simulation method, artificial time series, discrepancy ratio*

MODERN GEODETIC METHODS WITH APPLICATION IN THE ENVIRONMENTAL MANAGEMENT AND ITS PROTECTION

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Abstract: A huge number of surveying methods have found application in collecting data on the state of the earth and the environment, as well as their preservation. Laser scanning - LIDAR (Light Detection and Ranging) and UAV (Unmanned Aerial Vehicle) are the most advanced methods of surveying measurements using laser time-tracking technology. With this information, a huge number of geodetic basis and different views on the current state of the environment and the analysis of potential natural disasters and their effects can be created, as well as various estimations of potential damage to the most-endangered areas. As a result, there has been a tendency to gather data as quickly as possible and with as little effort as possible, where the quality of final surveying products would satisfy the needs of future users. In addition to time savings, the corresponding level of data accuracy, which is related to the resolution of the collected data, is therefore required. Resolution enhancement was achieved through a significantly higher data density compared to conventional surveying methods. It also seeks to develop the devices and platforms that collect raw spatial data. Namely, their characteristics are getting better, the devices are becoming smaller and more compact, and in the end, cheaper, making them more accessible and more attractive to users. In this paper bases of LIDAR and UAV systems, surveying products and examples of their applications in the areas of floods, landslides, design of road infrastructure and inventory of forest areas are presented.

***Keywords*:** *laser scanning, UAV, LiDAR, application*

1 Introduction

In a number of applications which involve different ways of environment managment, it is necessary to collect spatial data about the location being analyzed and perform the processing of such data. On the basis of these data, terrain models and geodetic bases are created, and further analyzes are made - images of the most endangered areas due to various disasters, damage analyzes, calculations, etc. In order to perform the analyzes in a quality and safe manner, the necessary preconditionare high quality spatial data.

Since environmental management analyses are carried out mainly in larger areas, it is necessary to use spatial data acquisition technologies that can provide quality data for less time than would be required by conventional surveying methods. As a result, LIDAR surveying technology, as well as the unmanned aerial surveying has become more and more important in the last few years and show a wide range of applications.

Of course, it is also necessary to emphasize the important role of the software, by which 2D and 3D views of the collected data became significantly better, with more information and possibilities. It is possible to extract digital terrain and surfaces modelsfrom raw data. By using tools, if the surveying was done in an appropriate manner, the vegetation can be eliminated and the model of the field itself can be obtained.

The paper presents the basics of laser scanning and surveying technology using unmanned aircraft, as well as final scanning products. Examples of the application of these technologies in the

field of surveying of urban areas, roads, inventory of forest areas, flood protection and landslides are given.

2 Laser scanning

Light Detection and Ranging (LIDAR) is an accepted method for generating precise and directly georeferenced spatial data about the characteristics of the Earth's surface. This method enables data that are more accurate, precise and dense [1]. What makes LIDAR particularly attractive is the high spatial and temporal data resolution, as well as the ability to observe the atmosphere and cover the altitude from the ground to more than 100 km [2]. LIDAR instruments collect land surface data at frequency of about 150 kHz (150000 pulses per second). The resulting product is a dense network of georeferenced points, called the point cloud [1].

The LIDAR method can be classified as active data collection method, since it does not use solar light, but the LIDAR system itself is the source of the laser light pulse. This feature allows data to be collected at night, when air is cleaner and less polluted by traffic than during the day. In fact, most of the LIDAR data is collected at night because, unlike radars, the laser beams used by LIDAR can not penetrate through clouds, rain or dense fog, so the surveying must be done during clear weather.

One of the main advantages of the LIDAR system is the ability to register multiple reflections of the emited laser beams. Namely, once the laser beam comes to the first obstacle, one part reflects, while the other part continues to the next obstacle. In this way different elements can be registered on the terrain surface, such as: vegetation, artificial objects, terrain area, etc. The lack of LIDAR method is that huge amounts of data are generated while surveying, so the appropriate resources to handle this data and their processing are needed. Also, in the areas of dense and low vegetation, the method becomes less reliable - the last return may be incorrectly classified as a land [3].

LIDAR data can be collected from the air, from the airplane platform that passes the area of interest, which for a short time collects a large amount of data. Also, LIDAR data can be collected from the Earth surface, where the platform can be static or mobile [1].

In the case of the air laser scanning, a mobile platform is used, usually a plane or helicopter, on which a laser scanner is mounted in order to survey, whereby a platform position is required. With that goal, the LIDAR system integrates with other technologies and sensors, such as Global Positioning System (GPS), Gyroscopes and Inertial Measuring Units (IMU) [1].

The TLS (Terrestrial Laser Scanner) method enables fast, remote measurement of hundreds of millions of points without the need for their signaling, providing a large amount of spatial data for a short time [5]. The flaw of TLS is that the process of scanning should be made from the location as close to the object as possible to achieve the highest precision and density of measuring points, which implies that the ground around the object is stable during that time [6].

The implementation of laser scanning technology combined with a high precision navigation system enables 3D scanning of roads, buildings and trees on the move (MLS - Mobile Laser Scanning). The system uses several laser scanners, where each performs about 10000 measurements per second [4].

MLS mapping systems provide a three-dimensional objects point cloud. Recording is done by moving the vehicle on the ground, the laser scanner collects data about the environment, and the navigation system based on GPS and IMU tracks the vehicle trajectory [6]. It has to be pointed out significantly lower costs of realizing the MLS system when compared to the air laser scanning. This system is particularly applicable in projects involving smaller areas and specific tasks [7]. With the appropriate software solutions, MLS can automate key processes such as: creating or extracting surface models, road signs, urban trackers, curbstones, peacock transitions, and track geometry, and increase the cost-effectiveness of the mapping process.

3 UAV

Unmanned aerial vehicles (UAV) are an important data source for monitoring, mapping and 3D modeling. These devices are light, mobile and fully automated, enabling their passage even in the most inaccessible terrain parts. They are also extremely easy to use [4]. UAV provides an alternative acquisition of semi-aero-photogrammetric basis corresponding to a relatively small area of interest (<5000 ha) [8]. The surveying result using the UAV system is dense point cloud.

Before the surveying realization itself, it is necessary to make a flight plan in the laboratory using the appropriate software. It is necessary to define the area of interest (AOI), the UAV height and the parameters of the digital camera, which is also equipped with the GPS and INS device. Flight and landing operations are controlled by the pilot on the ground, using the remote control. During the flight, the platform is viewed by a control station displaying data such as position, speed, altitude, GNSS observation, battery and fuel status. Most systems allow images collection following the calculated control points, but cheaper systems collect images according to the appropriate time interval [9].

Camera calibration and image orientation are two fundamental operations for any image reconstruction. Basically, these two processes are performed separately from each other. Camera calibration is mainly done in the laboratory, and sometimes during the flight. These operations require the extraction of common features visible to as many images as possible [9].

In the last few years there is a growing use of UAV in geodesy. The greatest advantage of UAV compared to manual systems is that UAV can fly and then survey in inaccessible areas such as mountains, deserts, earthquakes, volcanoes, floods, and warships. When flying up to 200 m from the recording surface, there is no need for certain weather conditions (clouds will not prevent the mission) [10].

4 Creation of the projecting basis

Based on the collected raw data, i.e. point cloud, processing is done and digital models are produced. The digital terrain model (DTM) is a statistical performance of continuous surface of terrain, with a large number of selected points with known X, Y and Z coordinates in the specified coordinate system [11]. For DTM obtaining, it is necessary to classify the points into three categories using intelligent algorithms. The each point belongs to the Earth's surface, object or vegetation. Without much further detail, the classification principle follows [12]:

- identify the points by principle of the first and the last of the similar by height. Based on identified points polygons are created;
- all the points of the last echo falling into detected polygons and having a similar height in the first and last echo are most likely to belong to the object;
- All the points of the first echo falling into the detected polygons and having a significantly different height from the last echo most probably belong to vegetation.

Based on the points that are classified as terrain points, the DTM is created. One of the software tools that can be used for processing point clouds is MicroSurvey CAD. The point cloud can be displayed in different ways, including the "elevation mapping" that expresses the heights in the point cloud (Figure 1) [13]. The digital model surface (DMS) can be created through a combination of TIN and GRID structure, whereby the model as in Figure 2 is obtained [13].

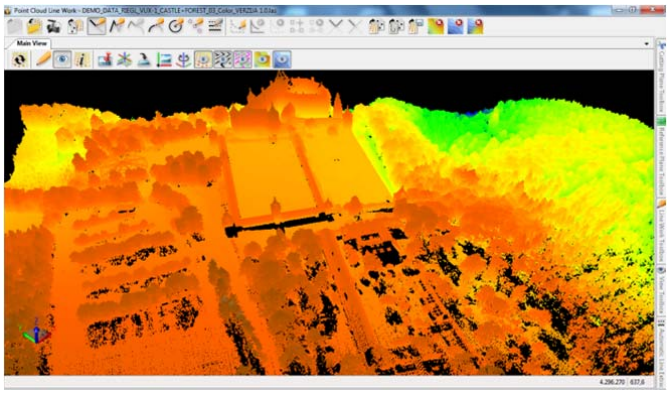

Figure 1. Point cloud showed by option "elevation mapping" [13]

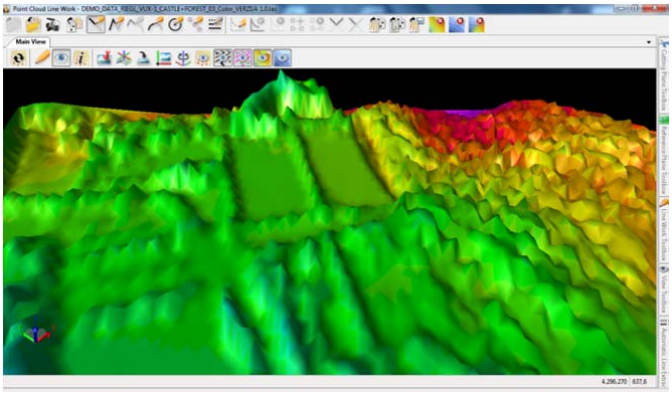

Figure 2. Surface model through combination of the TIN and GRID structure[13]

4.1 Methods of point cloud classification

Techniques used in point cloud classification require regular data (grid cloud point structure) or improperly distributed raw data. The advantage of applying grid-based techniques is the ability to apply

image-processing methods. However, these methods result in loss of points, especially those belonging to vegetation and buildings, and loss of altitude accuracy. In order to overcome disadvantages of such methods, algorithms of point classification based on raw and irregular cloud data are more frequently applied. In each of these methods, each point is attributed to an appropriate class based on features such as multiple reflections, height, intensity, scanning angle, etc. Since manual classification methods cost a lot and require a lot of time, the automation of the classification process is more than needed.

The method of points automatic classification is described in paper [14] and is based on two approaches. Both approaches were tested in the area of Istanbul, which included open areas, forest areas and various types of buildings. The first approach implied the use of spatial and echo characteristics while in the second approach only spatial characteristics were used. Both approaches successfully generated classes of earth, buildings and vegetation that were quite similar, although approaches based on different characteristics were used [14].

5 Application of modern methods for data collection

5.1 The road corridor surveying

Spatial data collected by geodetic methods can be used to detect carriageways damages, debris, ground inclines, etc.

The railroad project to determine the maximum dimensions of a railway vehicle in relation to vertical and horizontal environmental constraints as well as vegetation control is presented in this paper [16]. Figure 3a shows the point cloud and dimensions of the vehicle that fit in relative to the vertical limitations, while Figure 3b shows a potential vehicle contact platform with the required modifications.

Object-Based Image Analysis (OBIA) can be expanded and applied in the classification of 3D point clouds. This modified method is called OBPCA (Object Based Point Cloud Analysis) and consists of three steps. In the first step, the point cloud is classified to the points that belong and do not belong to the earth. Then points that do not belong to the earth are classified into segments, using the cluster and the RANSAC segmentation. The object's point coherence is determined based on the concept that close adjacent points have greater connectivity, while far neighboring points imply lesser connectivity. Based on this, objects are identified and extraction of their characteristics is performed. Finally, in order to perform automatic classification, it is necessary to find the characteristics of the object that are suitable for the classification. Based on the selected characteristics, decision rules and boundary value, automatic classification is performed [15].

By comparing the results of the OBPCA method with the LASTOOL tool, which is a point-based classification method, it can be seen that the OBPCA method gives much less unclassified points. Also, OBPCA can classify structures that are under shadow from some higher layers because it also considers the internal geometry of an object. Thus, the OBPCA method can improve the rationality and completeness of the classification effects by determining spatial characteristics of cluster points to help interpret the points [15].

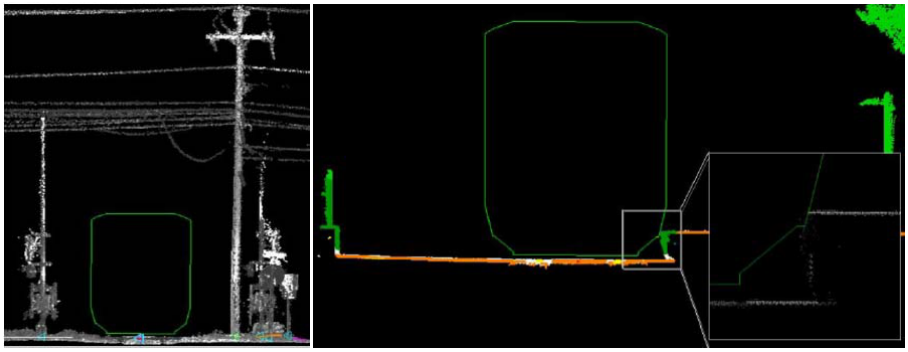

Figure 3. Point cloud and the vehicle dimensions in relation to a) vertical and b) horizontal limitations [16]

By terrain surveyng, the LIDAR system can provide accurate information on the slip, its dimensions and position and whether it may endanger the traffic flow (Figure 4).

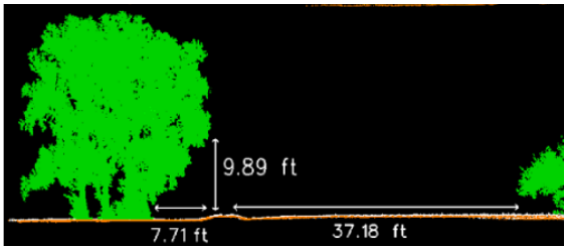

Figure 4. Tree height and distance from the road center to the tree [16]

The US Department of Transportation has funded the road mapping project near the Rapid City of South Dakota. The tracking strategy is a combination of surveying road conditions using the UAV system and Predictive Road Condition Modeling (PRCM). The UAV system collects high resolution photographs and evaluates road conditions through image processing algorithms. In PRCM, road condition data are derived by creating a robust road model based on satellite data of environments and other data. In the case of unpaved roads, it is important to monitor the existence of the trap. The clusters of these traps make characteristic shapes on UAV images as close reefs and valleys at approximately equal intervals that are perpendicular to the traffic direction. Consequently, these deformations can be detected by characteristic shapes and photograph classification. The described road deformities are shown in Figure 5 in red color [17].

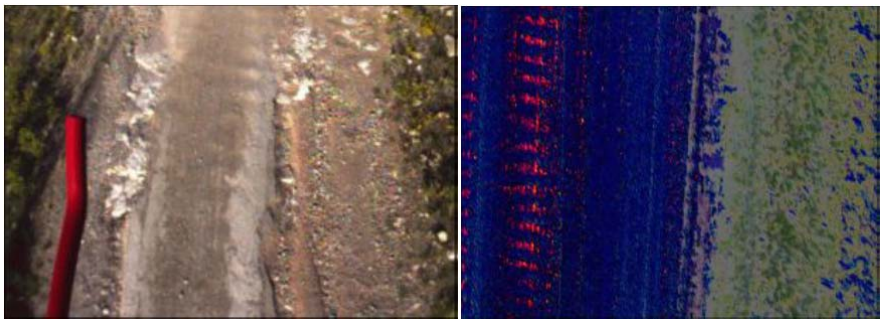

Figure 5. Image of road deformation and their representation on the terrain model (red color) [17]

5.2 Inventory of forest areas

The micro UAV and LIDAR system with four discrete layers was developed in paper [19]. In order to achieve an appropriate level of accuracy and to overcome limitations due to the use of miniature sensors, when processing data Kalman's filter was used. The appropriateness of applying this platform for forest monitoring has been confirmed by determining accuracy of this system, which is in the range of accuracy of the Australian inter government Committee for Recording and Maping (ICSM) standards. The example of the collected point cloud is given in Figure 6 [18].

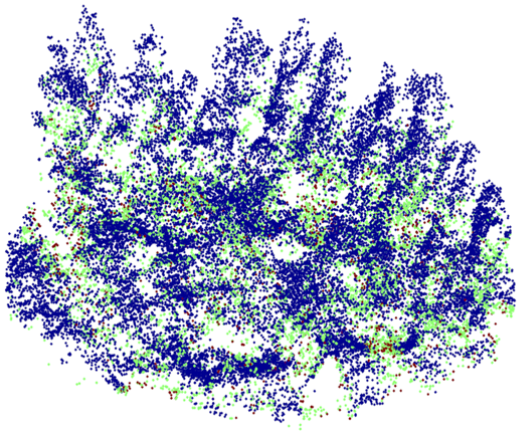

Figure 6. The example of the point cloud generated at a mean height of 48.32 m - first (blue), second (green), third (red) reflection [18]

The emphasis on the use of the combination of UAV system and the SfM method is mentioned in paper [19], as well as LIDAR technology in order to model forests based on the low-altitude aero surveying. A free photogrametric tool MICMAC (Multi Image Matches for Auto Correlation Methods) for forming a digital model of deciduous forests and determine the vegetation height was used. Figure 7 shows the height of treetops obtained on the basis of LIDAR and UAV data. Smaller cavities and tree peaks are better shown on the LIDAR model, treetops are generally wider and poorly defined on the UAV model. The visual quality of the UAV model depends on the tree species and density. What is interesting is that larger errors (black areas) appeared in certain areas, ie where there is not objects continuation and where the trees are cutted during the interval between the surveyings [19].

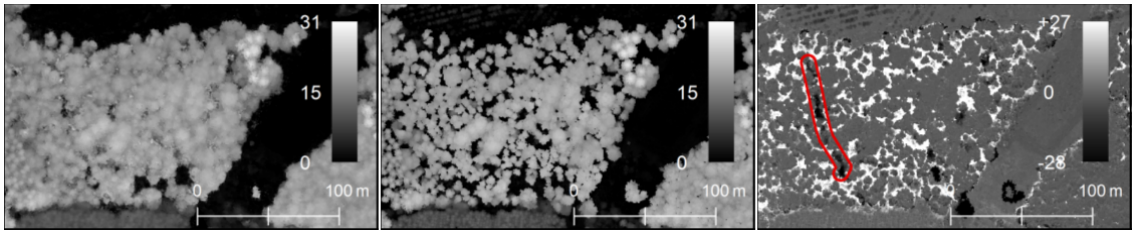

Figure 7. Model of treetops height based on UAV and LIDAR data; Height difference of the previous two models [19]

5.3 Flood protection

Floods represent frequent natural disasters that are a threat to human lives. UAVs and laser scanning systems enable high resolution data with the ability to quickly and accurately detect flooded areas.

In central Japan in September 2015, on the river *Kinu*, a catastrophic ice crack was formed. That crack, its spreading and accompanying modifications are documented using multitemporal digital surface models (DSM). DSM were created based on LIDAR data pre-flood (resolution 2 m) and post-flood (resolution 1 m) from January 2007 to September 2015. The photogrammetric data of the moving structure – SFM of the 3.8 cm resolution are derived from the UAV surveyings in December 2015. After the elimination of systemic errors, the differential DSM was created by subtracting the previous surface models, where are detected topographic changes with 0.1 m accuracy. The changes included the vegetation growth, the disappearance of flood waters, restoration and reconstruction works derived from the people. The results (Figure 8) have shown that DSMs of different resolutions created using the combination of UAV-SFM and LIDAR data can be used for quick and detailed topographic changes classification due to floods. A great advantage is also the possibility of use in urban areas. Combinations of SFM technology and UAV photography, which are quite cost-effective, can also be used successfully in cases of catastrophic events such as earthquakes, volcanic eruptions, landslides, etc. [20].

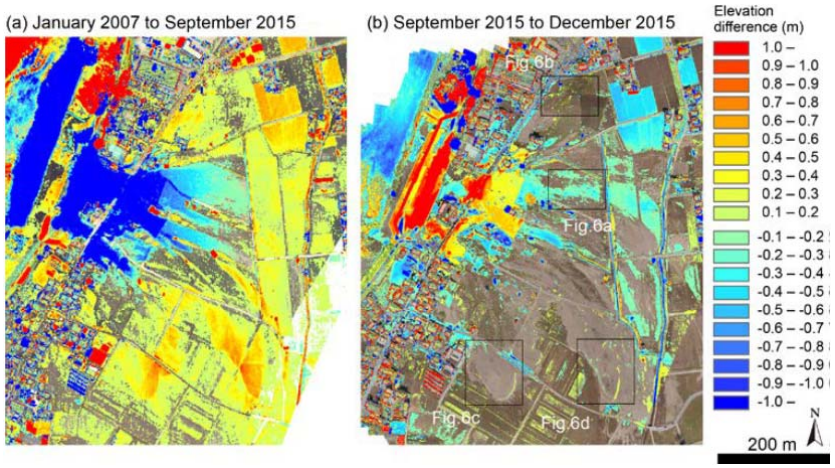

Figure 8. Differential raster showing the difference in height of two successive data sets. It can be noticed that erosion near the damaged embankment is greater than 1 m [20]

The methodology for the high resolution digital models creation of riverbedsand floods was applied in the area of river *Pulmanka* in Finland in the *Lapland* region. Measurements of UAV technology and a mobile laser scanner (MLS) have been combined to create a digital batimetric model and a DTM. A comparative analysis of the accuracy of these methods and the terrestrial laser scanner was performed. Based on this, the differences that occurred during the one-year period were determined [21]. The TLS point cloud gives the best quality land representation because it is the same level of accuracy as the target points measured by the RTK GPS used for georeferencing. The MLS collected data with an RMS error of less than 2 cm. UAV data have different accuracy. The DTM was created by combining MLS data in the dry part and bathymetric model obtained from the UAV image. In the resulting map, which contains a combination of models created over two years and changes over time, the scope of accuracy is anticipated

by significant changes detection (LoD). This parameter is based on the standard deviations of the data set being compared. MLS data have a LoD parameter of 0.0453 m; UAV-batimetry 0.4343 m and UAV-photogrammetric data 0.4728 m. The obtained map of differences is shown in Figure 9. The orange and red colors indicate deposition areas, while green and blue color in erosion areas [21].

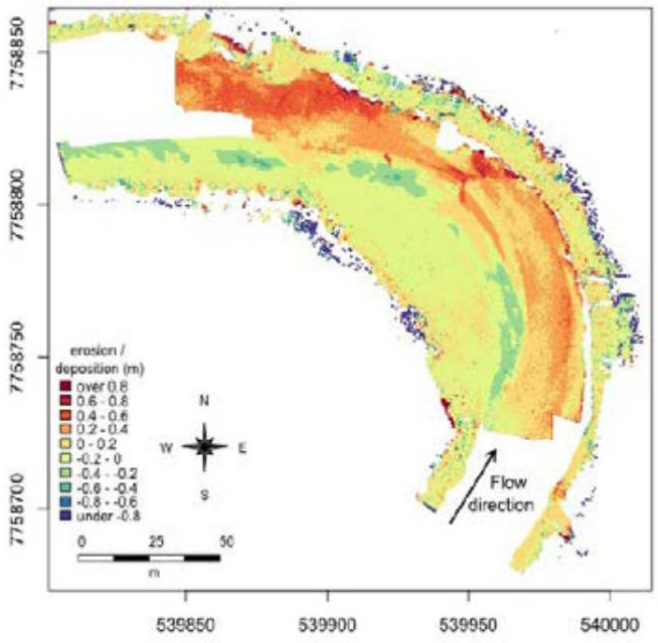

Figure 9. Map of the differences recorded in 2010 and 2011 [21]

5.4 Protection and repair of landslides

In the western part of the city *Zengcheng* in China, landslides mapping and damage analysis was done. A high resolution digital elevation model was created based on LIDAR data. UAV images were used to identify the objects on the ground. The LIDAR point clouds and the obtained mosaics were combined to generate distribution benefit maps through several factors analyzes, such as slope gradient, slope aspect, site data analysis, and so on. The maps then can be used to analyze the potential risks of landslides and estimate the level of risk around individual buildings. The experiments have shown that the LIDAR and UAV-based method can quickly and accurately capture the terrain and provide useful information on architectural design. In Figure 10 is shown in yellow color that some of the built up regions can be under the threat of landslides. When heavy rain falls, it is necessary to pay attention to these areas and eventually to evacuate people [22].

Figure 10. Built areas under threat of earthquake [22]

In France, the field strucked by landslide *Super-Sayze* was surveyed. With UAV system, images were collected and a high-resolution orthomosaic of the entire landslide was created as well as the DTMs. For the *Super-Sayze* landslide a horizontal displacement of 7 to 55 m is measured, based on the orthophotos of May 2007 and the orthomosaics obtained by the UAV system of October 2008, which gives a daily displacement of about 0.1 to 0.01 m. Areas of persistent deformations are identified. Horizontal displacements are determined by identifying the appropriate characteristics on both images such as stones, rocks, vegetation, etc. - Figure 11 [23].

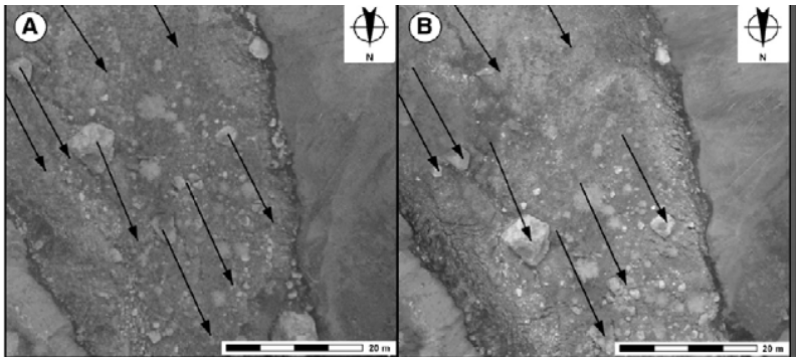

Figure 11. Analysis of horizontal measurements 2007-2008 [23]

6 Conclusion

The choice of data collection methods is based on the needs of the user, the requirement of accuracy, the level of detail, the time interval in which should appropriate product be created, the economic possibilities and the available resources. The process of realizing a geodetic product requires that it must be created at the time, in accordance with the budget, to meet the needs for which it is intended and, of course, to have the appropriate quality. In the modern ages, intensive technology and software development enables experts to adequately respond on tasks. Of course, great progress has been made through data integration and database development. This allows the joint use of data collected through different methods and the collection of the much better quality required data. Today, the efficiency of modern methods has reached such a degree that a larger amount of data can be collected for a shorter time, which, by applying

conventional methods, is unavailable. Also, data processing, analysis and interpretation itself has become digitized, allowing experts to simplify data processing procedures. LIDAR and UAV technology certainly represent contemporary achievements that are more and more important. The UAV provides a high level of automatic operations. Great attention is paid to these techologies due to their economics and high speed of digital data production. As a result, it is suitable for applications in a number of risky situations where rapid response is required. A great advantage has also been achieved through the ability to use it in inaccessible areas. The paper presents the basics of the above-mentioned modern technologies, different ways of collected data displaying, as well as the examples of the application of these technologies and their possibilities in applications that are in relations with environmental management.

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INVESTIGATING FACTOR INTERACTIONS IN FORMALIZING THE PROCESS OF DEVELOPING NEW PRODUCTS

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Abstract: The creation of new product development programs (NPDPs) in industrial organizations, as a process involves a system of activities for defining, planning and implementing projects, with a view to successful market realization. The success of a program and its associated projects is not unambiguous (depends to some extent on the participants' point of view) and can be related to the achievement of predetermined goals and constraints, customer satisfaction, organizational knowledge, etc. For the respective industrial company, the planning process is more important than the plan itself, because hypotheses are checked; comparing alternatives are analyzed; the future consequences of one or other of today's decisions are looked for; the necessary changes to the prerequisites are made.

The survey was conducted in 560 medium and large enterprises operating in the manufacturing industry of Bulgaria and engaged in the production of machinery and equipment, general and special purpose; Food and Woodworking Industry; Products of paper, rubber and plastics.

The aim is to establish independent factor variables and their value impacts on the effective management of the process of developing new products related to the dependent variable "formalization or use of officially documented procedures describing the NPD process".

In order to meet the target, a quantitative study was carried out by applying a correlation and regression analysis to search for relationships and dependences between the variables examined. A regression model is presented for the studied dependent variable.

The results and recommendations obtained can be used to improve the management of the product innovation process.

Keywords: *innovation process, new products development, formalization of NPD, factor analysis*

IMPROVEMENT OF TRIBOLOGICAL CHARACTERISTICS BY REDUCING THE RISK OF SUBSTANCES IN PRODUCTION PROCESSES

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Abstract: Management of the metalworking process faces environmental requirements, and demands for quality and competitiveness. Cutting technology and its mechanisms represent a basic opportunity to increase the eco-efficiency of the process. Changing the tribological characteristics of the cooling and lubricating agent and the introduction of new synthetic can affect the reduction of the dynamics of the establishment of wear mechanisms and at the same time improve the processing parameters. Reducing the amount of coolant (SHP), and using synthetic biodegradable agents make the cutting process environmentally acceptable. This paper demonstrates the possibilities of improving the steel processing parameters by drilling with a spiral bolt, and the possibility of replacing mineral oil for cutting with synthetic oils, making the process more environmentally acceptable.

Keywords: *drilling, processability, process management, eco-efficiency, synthetic coolant and lubricant, tribological characteristics.*

1 Access to research

In order for the manager to manage the business process, the technologist has to project and embed "new solutions in response to" new "requirements. The technologist is the bearer of the changes in production and are now facing more demanding tasks. The study of processing parameters as outputs in the processing process under changed conditions is a direct contribution to the formation of new technological bases. Old mineral-based cooling and annealing agents (SHP-s) become ecologically unacceptable due to the long decommissioning period, making management of the environment a bit difficult.

Under standard metalworking conditions, cutting oils or cutting emulsions are used, which are, in principle, mineral oils with or without additives.

Mineral oil with chlorinated paraffin 5em, which will be observed in the research, besides its poor EP characteristics has good lubricating properties. The advantage of chlorine is that it protects the tool surfaces by slowing down the development of tribological processes and preventing the formation of deposits at low cutting temperatures. However, the environmental parameters of this oil are unsatisfactory. Semi-synthetic agents, which are basically a combination of oil emulsions and chemical agents, have the following additional characteristics: lower oil content (10-40%) than oil emulsions; higher content of emulsifiers or surface active molecules than chemical agents, resulting in drop in droplets, improved tribological characteristics and increased eco-efficiency.

2 Research results

Experimental research showed the results, which are shown by the diagrams of the dependence of the quality parameter of the treated surface "Ra" of the cutting regime shown in Figure 1.

The dependence of the roughness parameter Ra of the cutting regime, when drilling with a bend barrel in steel Č.1530, with the use of biodegradable oil, is in the form of a form (1):

$$Ra = 0.0035 * v^{1.3719} * s^{-0.2059} \; I\mu mI \quad (1)$$

Dependency of the Ra parameter of the cutting regime, when drilling with a bend barrel in steel Č.1530, using mineral oil for cutting 5em, in real form (2):

$$Ra = 1.2644 * v^{-0.1858} * s^{-0.4591} \; I\mu mI \quad (2)$$

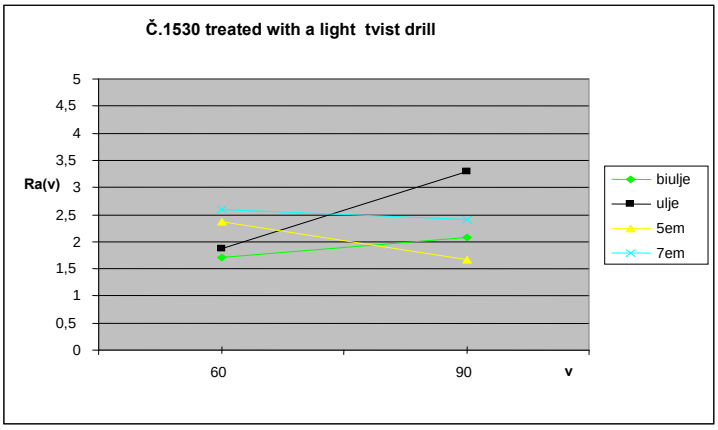

Figure 1. Dependence of the treated surface area (Ra) of the cutting speed

3. Analisys

When investigating the substitution of mineral oil with biodegradable media, it became known that this input material exerts an overwhelming environmental impact and the production system is incompatible with the environment. The research required a technological response to the requirements placed in front of the production system whose gradualness is visible in Figure 2.

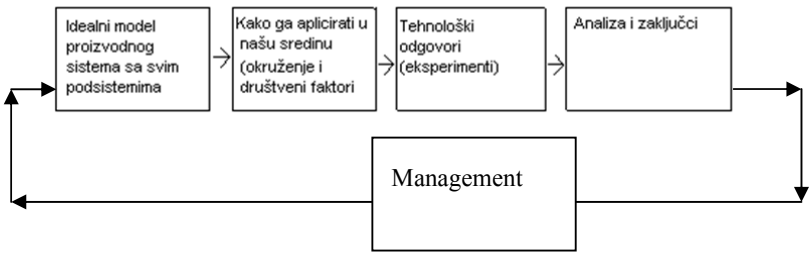

Figure 2. Technological innovations to an environmentally acceptable mode

4 Conclusion

The results indicate the possibility of substitution of mineral oil for cutting under observation processing conditions. On the diagrams showing the quality of the treated surface, expressed through the parameter "Ra", of the cutting regime "v - cutting speed" in steel Č.1530, it is obvious that the synthetic means showed better results in the upper area of the speed range used. This means their lubricants are more robust at higher speeds. This confirms the assumption that their higher content of emulsifiers and surface-active molecules causes drop in droplets to protect the cutting surface from the establishment of tribological processes. It implies that at increased pressures and temperatures it avoids the formation of deposits on the chest surface, which is the major cause of the low level of surface quality parameters and the worst tribological properties of the emulsion used for cooling.

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QUALITY SYSTEM AS A GENERATOR ADDITIONAL ACTIVITIES ON THE MARKET

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Abstract: Improving business efficiency and improving the quality of products and processes are on the agenda of managerial review and adoption of plans. This means that action must be taken to establish the complementarity of the business cycle cells by performing all phases of the Quality System: Planning, Implementation, Measurement, Corrective Action. Every business cycle will then enter the upward spiral matrix, which, taking into account innovation and increased value, aims to achieve excellence. This is achieved through patient planning "step by step", a systematic approach to making quality improvement programs at all levels of management.

This review gives the effects of the introduction of the Quality System and their impact on the establishment of additional market activities. The basic steps will be shown in the introduction of System Quality, Quality Management Tasks and Quality Improvement, quality analyzed through its characteristics, the internal and external aspects of quality, and the evaluation of quality systems in the light of increasing market activity.

Keywords: *Quality, quality system, market activity, system upgrading, change management, organizational efficiency, managerial management, quality culture.*

1 Introduction

The concept of quality is explained in various ways and there is no clear definition. From the point of view of the consumer, it is associated with the usefulness or price, it is connected with the design of the product from the manufacturer's point of view. In the 1920s, it meant inspection, for the 1940s it received a statistical connotation, and in the 1960s it was expanding to the concept of full quality control. Complete control means that the whole organization is involved in the process of making a quality product. The generally accepted definition of quality is: quality is a measure or an indicator of the volume or amount of the usable value of a product or service to satisfy a precisely determined need at a particular place and at a particular time, when that product and that service in the social process of exchange are certified as commodities.

Official definition according to the norms BAS ISO 8402: quality is the totality of the properties of the real ethnity which makes it capable of satisfying expressed or presumed needs. After the 2000 revision, according to the ISO 9000: 2000 standard, the quality is the degree to which the set of inherent characteristics meets the requirements, so two remarks are given:

1. The concept of quality can be used with attributes: insufficient, good, excellent,

2. Self means existence in something, a permanent feature of official definition.

The new definition did not add anything new except that a few altered explanations of quality determine the suitability of the product so consumers can use it and only the customer can determine it. Consumer satisfaction is a relative term and each person defines quality in relation to his or her needs.

This transparent work will present the elements of the quality system from the aspect of characteristics and measurement, ie quality assessment, internal and external aspects of quality, the effects of the introduction of the Quality System from the aspect of increased activities on the market.

2 Characteristics of quality

Quality is unreasonable size, so it needs to be explained on features. Quality characteristics are measurable through their indicators or quality parameters that can be measured or evaluated. Quality characteristics and criteria for assessing quality levels are:

1. compliance with the norms - the product must conform to the set standards,
2. compliance with the properties specified in the product documents,
3. reliability - a significant benchmark for products that need to be regularly maintained during use,
4. environmental acceptability - products must not disturb the natural environment,
5. contemporary and aesthetic appearance of the product,
6. servicing and supplying spare parts,
7. sales and transport packaging,
8. appearance or protection during transport.

The company will be successful only if it can offer the customer products and services that satisfy it with quality.

3 Internal and external aspects of quality

As the enterprise lives on profit, it is in the forefront of management to make profits. With the falling degree of profit orientation, the problems of evaluating the success of the company are growing. A particular problem is the unexpected expectations or the vague customer's return to the product or service. Systemic correspondence with customers is needed, to understand the expectations and to be internally implemented in usable substrates for installation of the Quality System.

Examples of expectations are:

- in the tourist office ....kindness
- in hospital ..... patient treatment
- from the bank ..... kindly counseling
- from electric power supply ..... power supply
- from power distribution ..... stability
- from car service ..... quick help, car rental
- from the construction firm ..... adhering to the deadlines, the promised effects

In practice, two aspects of quality meet, in terms of expectations and results, as well:

- external aspects of quality,
- internal aspects of quality.

3.1 External aspects of quality

At today's stage of development of science and market conditions, the quality of products and the quality of services, as well as adherence to deadlines, employee access, and overall picture of the company are becoming increasingly important. Management must present itself to the customer as he seeks it, not as the management suits. This means that the demand for the product and its characteristics actually dictate the market, not what the company has to offer. External aspects of quality are presented in Figure 1.

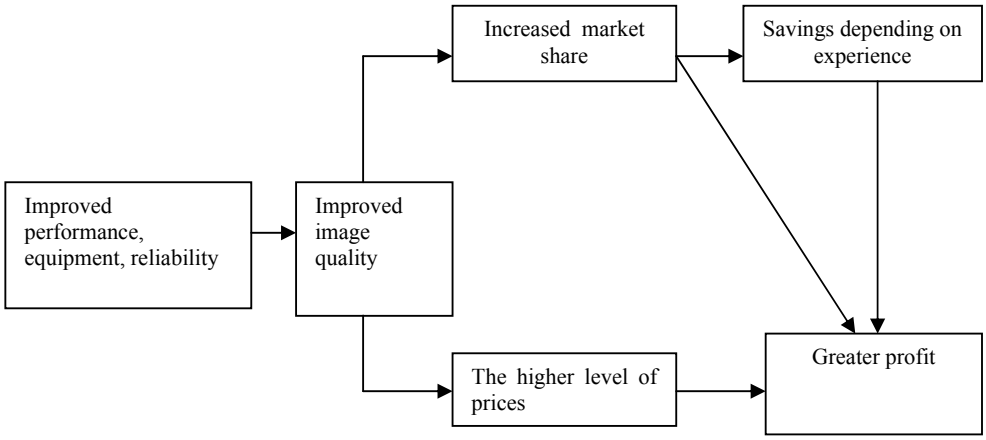

Figure 1. External aspects of quality enhancing market activities

The first question that the customer asks is:

1. "What are the costs of purchasing a product?"
2. "What are the effects of this procurement?"

The required criteria for the purchase decision are shown in Table1.

Table 1. A table for the purchase decision

ECONOMIC REASONABLE?		**ENVIRONMENTALLY REASONABLE?**
During purchase ativities	When it is used	After use
Purchase price	Service	Disposal
Star-up	Maintance	Ability to process
Side costs	Reliability	Environmental tolerance
Funding assistance	Repairs	
Respecting deadlines	Energy consuption	

Purchasing costs are added to the costs of drives, services and special costs, when the buyer is responsible for it. These costs are considered as costs of the buyer or the owner of the product. A favorable price today is not a sufficient criterion for success, because it is only one of the quality characteristics. It is also often not sufficient to satisfy all the wishes of the buyer; On the contrary it is necessary to achieve additional activity on the market. This is accomplished by offering unexpected, but for the customer's welcome additional perfromance products. This can in particular be:

- Declarations and letters for special products;
- Congratulations on the holiday, the customer's birthday;
- Extension of the warranty period;
- Information on new and innovative products.

3.2 External aspects of quality

The other side of the quality requires that the continuous improvement of the process in the enterprise. From the point of view of the company, the cost perspective is primarily important. It is not just about production and related costs (development, marketing, sales, management), but also about time-distance possible costs (service, environmental protection, safety, health of manufacturers and users) to which the manufacturer must respond more and more . The diagram of the internal aspects of quality is shown in Figure 2.

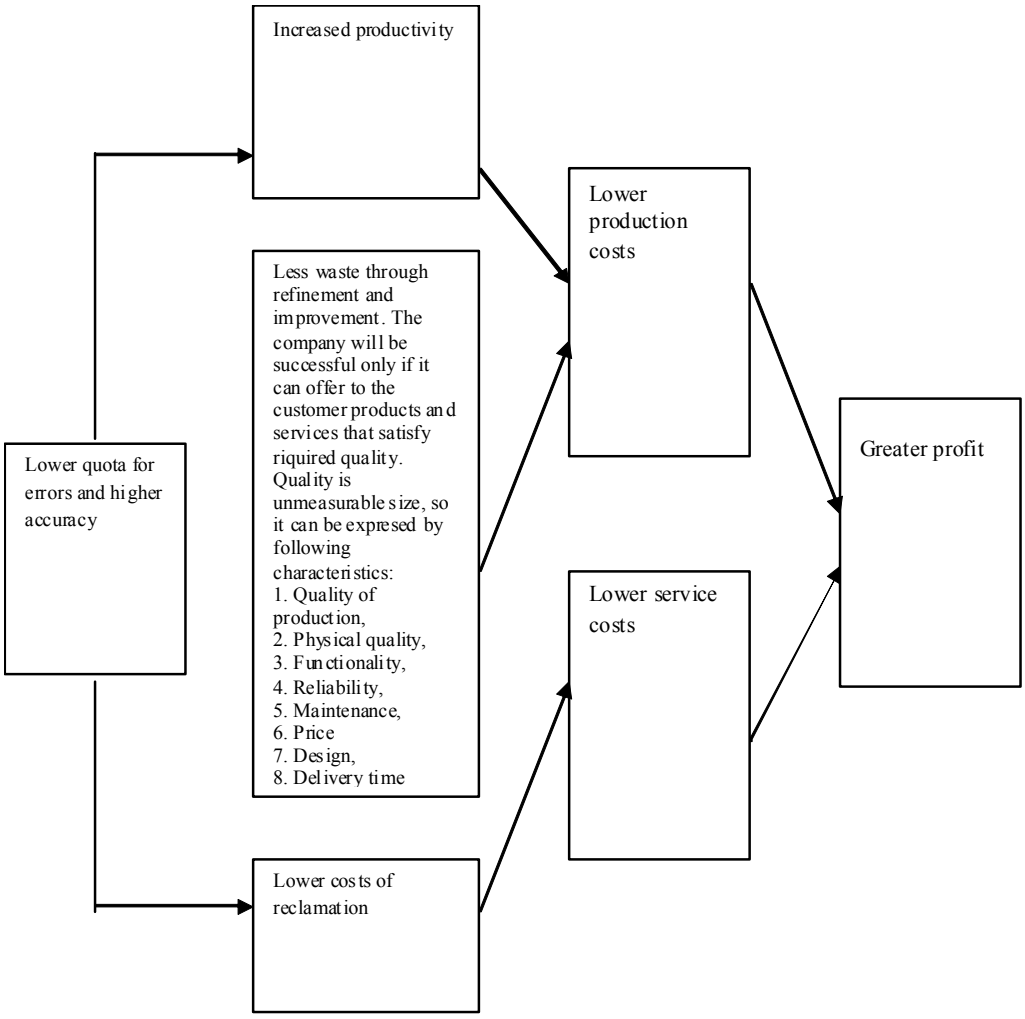

Figure 2. Internal aspects of quality enhancing market activities

In order to assess performance, management should have an insight into the state of the market activity, complemented by a quality assessment. If reporting on market activities and on quality is established, the cost-effectiveness of improving quality can be demonstrated and analyzed.

In principle, with the rising costs of the integrated quality system, the quality (for compliance) increases the level of product quality parameters. In Figure 3 it can be seen that there are cases in which the minimum total cost appears at a lower quality level.

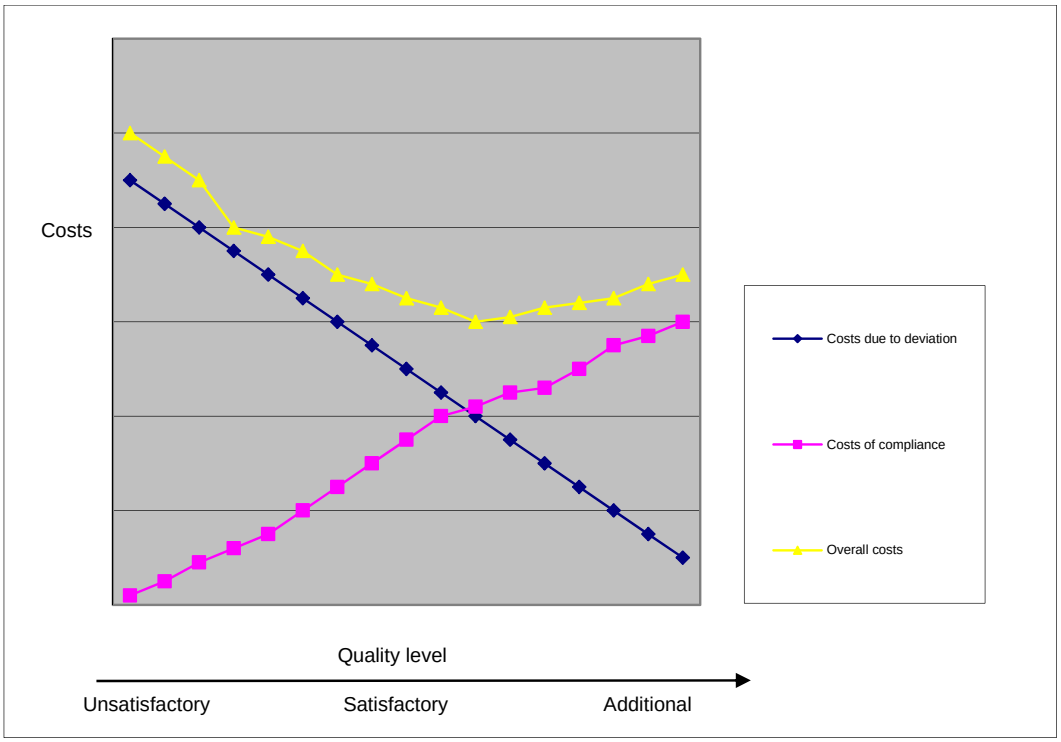

Figure 3. Quality and cost step

The most common practice cases are that management knows that it meets market requirements, but does not know how much the total costs are. Therefore, it is useful to apply quality information system (IQ - System), which, in addition to quality data, also reflects the costs for securing existing or required higher levels of quality parameters. It is indisputable that at a lower level of quality, increasing the costs of control and prevention, with the growth of the overall cost, will increase the level of quality and, consequently, the level of activity on the market after a certain period of time.

4 Evaluation of the quality system from the aspect of increasing market activities

Each organization exists to increase value, increase market activity, and gain new revenue for that new value. This work is done using a number of subsystems of the business system. The structure of these systems is usually not simply structured, but sometimes, very complex. The problem arises when it has to be managed with multiple systems and their mutual relations, especially when it comes to large and complex enterprises, which usually involve more fines, and all together should form a single system.

The quality system consists of the following factors:

1. Organizational structure,
2. Responsibility,
3. Documentation,

4. Processes,
5. Resources,
6. Personnel training.

By acting together, these factors ensure the realization of the planned quality, and the buyer and the management of the organization make sure that the raised schedules will be respected on the market. This practically means the normal work of all employees in an organization that implies the necessary efficiency and the ability to improve. In order to achieve an upward spiral of internal organizational efficiency, the quality system must be defined, documented, consistently implemented, supervised, and continuously reconsidered. When evaluating the Quality System from the aspect of increasing the market activity, it is necessary to answer three essential questions:

1. Are processes clearly defined and are they documented?
2. Are the processes completely classified according to the assumed responsibility and are they carried out as prescribed in the accompanying documents?
3. Are the processes expected results on the market?

Answers to these questions will determine the degree of efficiency of the quality system. Assessing the quality system, by the scale of the actions and activities performed, can vary significantly from one to the other, depending on the size of the organization and the complexity of its system.

One of the most important management activities is to regularly and systematically assess the situation and review the quality system's compliance, including with the quality policy and business policy. In addition to management, the buyers of this independent institution / institution also play an important role in assessing the state of the quality system.

5 Conclusion

Improving business efficiency and improving the quality of products and processes of the Sun and the agenda of managerial reviews and making plans. This means that it must act to establish the complementarity of the business cycle stations, by performing all the phases of the Quality System: Planning, Implementation, Measurement, Corrective Action. Thus each business cycle will enter the matrix of the upward spiral, which, taking into account innovation and increased added value, aims at achieving excellence. This can all be achieved by patiently planning "step by step", a systematic approach in making quality improvement programs at all levels of management. The basic areas on which programs of continuous improvement of quality are based:

1. Quality relation, quality culture;
2. Quality planning,
3. Permanent finishing the quality system (processes as basic cells for weight reduction),
4. Methods and techniques for ensuring the quality of products and processes,
5. Organizational efficiency,
6. Managing change,
7. Market analysis by cooperation with customers and users of products and services.

The change in quality attitudes must be based on the top management, and implemented top-down diachronics at the lower levels to the ultimate executives in all segments of the enterprise.

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SUSTAINABLE AGRICULTURAL DEVELOPMENT IN MODERN CONDITIONS

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***Abstract*:** Sustainable development is most commonly defined as development that meets the needs of the present without compromising the ability of future generations to meet their own needs, where the emphasis is on harmonization of environmental, economic, social and institutional components, as key pillars of sustainable development. In modern environment, due to the growing global problems, much attention is focused on the concept of sustainable development, which is supported by numerous documents and activities implemented by international organizations and institutions. In terms of agriculture, the concept of sustainable development is much thought about, because agriculture and sectors related to agriculture, in relation to the agribusiness systems, face a number of challenges (production of healthy and safe food in sufficient quantities, lower prices for consumers, higher profits for producers, reducing the negative impact on the environment and etc.). Given the complexity of the world economy, the place and the significance of agriculture in it, as well as numerous other economic and non-economic factors that impact development (climate change, political factors, international conflicts, regional integration, population migration, international capital flows, monopolies, etc.) it is very important to ensure the development of agriculture on a sustainable basis. This is a very difficult task to achieve, due to a number of internal and external factors, whose impact can hardly be foreseen. Therefore, this paper points to the necessity to invest efforts at all levels and opt for the most suitable development model, in order to most efficiently address the requirements made by the world market and the global policy. In this respect, it is important to underline that taking into account the interests of local farmers and food consumers is an important determinant of future survival and development of both national and agrarian economy.

Keywords*:sustainable development, agriculture, global trends*.

1 Introduction

Sustainable development is a considerably complex process, as it involves balancing the economic, environmental and social goals, at the same time requiring major institutional support and the support of other relevant stakeholders in the economy and society and considering the needs of the present generations without compromising the capacity of future ones to meet their own needs. Bearing in mind the relevance and importance of the concept of sustainable development and the fact that it has been given significant attention over the last decades by scientific experts, the media, business and social elite, both at the national and at the global level, this paper focuses on the key issues of agricultural development in the context of global sustainable development, since the future goals of agricultural development are among the key issues of the world economy, due to the strategic importance of food and natural resources for the survival and progress of humanity.

In accordance with the defined research objective, this paper aims to determine whether the agricultural development in all world countries can fit into a contemporary and very demanding

concept of sustainable development, which currently, at the global level, implies meeting very complex and ambitious goals, and as such is extremely difficult to implement.

The key hypothesis the paper builds on is that sustainable agricultural development worldwide depends on the actions of all key stakeholders involved in the process and the adequate management at the international level, thus making a unique framework that does not allow singling out or observing one country separately from other countries.

The initial hypothesis is tested by taking into account the results of previous research on sustainable development at the global level, official documents in this field, that is, scientific literature, publications and statistical indicators, as well as other relevant available sources. Due to the nature of the subject of the research, research methodology includes the following: historical method, descriptive study, comparative method and content analysis.

2 Sustainable development – concept, significance and global trends

There is no single definition of sustainable development, however, a great number of definitions share same basic ideas, such as the importance of maintaining the long-term ecological balance, meeting the key socio-economic needs of the people and promoting the intergenerational and intra-generational solidarity in order to create a favorable environment for improving the quality of life on the planet. The literature describes sustainable development as a long-term process that promotes a more balanced relationship between man and nature. It also stresses the importance to keep anthropogenic activities and impact on the natural environment within acceptable limits, so as not to degrade the basic ecosystem functions vital for supporting life on the planet.

In 1987, the report entitled "Our Common Future" was published by the Brundtland Commission (World Commission on Environment and Development). The report defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" [1] and this definition is currently the most commonly used and the most frequently quoted definition of sustainable development. Despite its wide acceptance, this definition is criticized because it does not precisely says what are the needs that are implied, it does not offer guidance on how to determine different people's levels of need satisfaction and because it is virtually impossible to predict the needs of future generations.

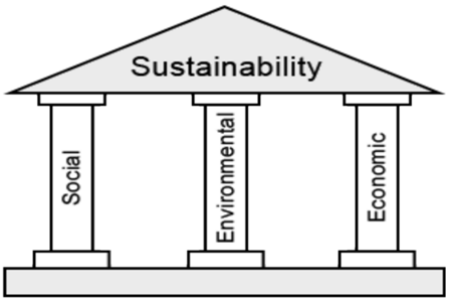

Figure 1. The key pillars of sustainability [2]

The concept of sustainable development is based on three interdependent pillars (Figure 1): economy, environment and society. The economic pillar emphasizes that the in the process of ensuring the long-term generation of income, the adverse impact on the environment must be limited. The environmental pillar focuses on the environmental responsibility. The social pillar emphasizes the importance of human health, education, living standard and fighting poverty and unemployment. In broader terms, the concept of sustainable development includes the institutional dimension and other related components.

Sustainable development has been steadily gaining in importance since the rise of concerns that the limited availability of natural resources will hinder economic growth and that the world, as a result, will face hunger, health risks, water scarcity, environmental pollution and international conflicts. In this context, sustainable development is recognized as a potential solution for the numerous socio-economic and environmental issues.

In terms of developing countries, sustainable development is an essential instrument in fighting poverty, unemployment, migration and related problems, while in developed countries sustainable development matters since it addresses the issues, such as overexploitation of natural resources, climate change, population expansion, maintaining a leading position in the global market and the like.

Implementation of the sustainable development concept is a result of numerous scientific and professional, political and other aspirations, and therefore different stakes, however, the UN initiatives still have a leading role in this process (Table 1). Although many international documents, conferences and the World Summits on Sustainable Development promote global implementation of sustainable development goals (SDGs) as a road to success, in reality, many countries have not yet experienced all of these positive effects, especially the developing countries. Supporters of the concept of sustainable development, however, point out that it has multiple benefits for both developed and developing countries, while the opponents point out that it represents one of the instruments of major global powerholders to achieve their economic and political goals, therefore, this concept is not truly designed to actually help developing countries to overcome their problems; in this context the realization of the SDGs by developed countries can be achieved at the expense of the developing ones [3].

Table 1: Major international conferences and documents relating to sustainable development [4]

Year	Major conferences and documents relating to sustainable development
1961	The International Union for Conservation of Nature (IUCN) established in 1948 - publishes UN List of National Parks and Protected Areas
1964	IUCN publishes IUCN Red List of Threatened Species
1970	The British economist, Barbara Mary Ward, pioneers the sustainable development concept
1972	The Club of Rome publishes the report "Limits to Growth"; The United Nations Conference on the Human Environment, Stockholm – Stockholm Declaration
1982	Nairobi Earth Summit – Nairobi Declaration
1987	World Commission on Environment and Development (Brundtland Commission) - Our Common Future
1992	United Nations Conference on Environment and Development, Rio de Janeiro- the Rio Declaration on Environment and Development, the United Nations Framework Convention on Climate Change, the United Nations Convention on Biological Diversity, the Statement of Forest Principles, Agenda 21
1997	UN Earth Summit +5 - Programme for the Further Implementation of Agenda 21 adopted by the UN General Assembly
1997	The Kyoto Conference on Climate Change – Kyoto Protocol
1997	The EU Intergovernmental Conference, Amsterdam – The Treaty of Amsterdam
2000	Millennium Summit, New York – Millennium Declaration – Millennium Development Goals
2001	The EU Summit 2001, Gothenburg – The EU sustainable development strategy
2002	The World Summit on Sustainable Development, Johannesburg - The Johannesburg Declaration on Sustainable Development
2012	The United Nations Conference on Sustainable Development, Rio+20 - "The Future We Want"
2015	The UN Sustainable Development Summit, New York – UN Agenda 2030

The 2030 Agenda for Sustainable Development was adopted at the UN Sustainability Summit in New York on 25 September 2015.This Agenda is a plan of action for people, planet and prosperity. It also seeks to strengthen universal peace in larger freedom. *United Nations*recognise that eradicating poverty in all its forms and dimensions, including extreme poverty, is the greatest global challenge and an indispensable requirement for sustainable development. All countries and all stakeholders, acting in collaborative partnership, should implement this plan. UN are resolved to free the human race from the tyranny of poverty and want and to heal and secure our planet. *United Nations* are determined to take the bold and transformative steps which are urgently needed to shift the world onto a sustainable and resilient path. The 17 Sustainable Development Goals(Table 2)and 169 targets which UN announced demonstrate the scale and ambition of this new Agenda. They seek to build on the Millennium Development Goals and complete what these did not achieve. They seek to realize the human rights of all and to achieve gender equality and the empowerment of all women and girls. They are integrated and indivisible and balance the three dimensions of sustainable development: the economic, social and environmental[5].Despite the commitment and support of the UN to make it possible to achieve the SDGs, there are many doubts, criticism and negative opinions on Agenda 2030, among which the most common are: the problem of funding, economic and political weaknesses of some countries and excessive influence of powerholders (countries, groups or corporations) on the progress of sustainable development, overambitious Agenda 2030 targets, complexity, lack of transparency, unrealistic goals, unpredictability of the outcomes, as well as the numerous risks and potential adverse impacts, especially when it comes to developing countries. Agenda 2030 initiated numerous debates, primarily about the responsibility of the developed countries which determine the starting point of all other participants in the development process, especially the poorest ones, thus placing them into a very unfavorable position, both in terms of their current status and the opportunities for future development [3].

There are a numerous limitations and obstacles in terms of implementation of the new sustainable development concept, because it is a global process which involves great multitude of actors. However, the majority of these actors do not share same goals and aspirations and have quite different interests. Developed countries are generally in better position than developing and underdeveloped ones, which points to the necessity of creating and implementing much more balanced and informed sustainable development policy at the global level. It is important that the developing and underdeveloped countries harmonize their national development policies with their real capacities and international circumstances, primarily by implementing institutional reform and improving international cooperation.

Table 2: Sustainable Development Goals (SDGs) of the Agenda 2030 [5]

Sustainable Development Goals (SDGs) of the Agenda 2030
Goal 1. End poverty in all its forms everywhere
Goal 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture
Goal 3. Ensure healthy lives and promote well-being for all at all ages
Goal 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
Goal 5. Achieve gender equality and empower all women and girls
Goal 6. Ensure availability and sustainable management of water and sanitation for all
Goal 7 Ensure access to affordable, reliable, sustainable and modern energy for all
Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
Goal 10. Reduce inequality within and among countries
Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable
Goal 12. Ensure sustainable consumption and production patterns
Goal 13. Take urgent action to combat climate change and its impacts
Goal 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development
Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
Goal 16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
Goal 17. Strengthen the means of implementation and revitalize the Global Partnership for SD

The establishment of an adequate institutional and financial framework for the implementation of sustainable development at the national level requires, not only commitment of the state (i.e. government), but also participation of many professionals and experts from academic, commercial, non-governmental and cultural institutions. It is important to consolidate and coordinate the activities of all relevant stakeholders at the national level and proactively react to any external challenges, taking into account, above all, one's national interests.

3 Contemporary challenges to sustainable agricultural development in the world

Nowadays, agriculture, all over the world, faces numerous challenges: global competition, expansion of industrialized agriculture, immense power and influence of leading corporations in the field of food production, emergence of monopolies, formation of big food supply chains, membership in the WTO and relevant regional integrations and organizations, achieving and maintaining a competitive position in the market, climate change, limited natural resources, reduction of the negative impact on the environment, production of sufficient food quantities for a growing world population, growing number of risks brought about by development of biotechnology, genetic engineering and other new technologies, production of high-quality, healthy and safe food, integrated rural development, providing logistical support to the agricultural sector, productivity growth, ensuring lower prices for consumers and higher income for producers and etc.

The traditional, mono-functional agriculture is still dominant form of agricultural production in developing and underdeveloped countries; however, this type of agriculture is not highly productive and competitive one, even in cases where the agricultural sector rests on abundant natural resources, long-standing farming tradition and its importance for the national economy. In developed countries, farmers are also facing challenges. However, this is mitigated by an adequate institutional, organizational and economic environment and a significantly higher level of technical and technological development, which is a great advantage [6].

Climate change is considered one of the most important contemporary challenges to agricultural development in the world, as agriculture is vulnerable to weather changes. The effects of climate change are becoming more pronounced and are largely attributed to human activities that adversely affect natural processes. Adverse effects of climate change are experienced in all parts of the world, however, in some countries they have devastating consequences, which could become a major threat to world food security in the future and also have a severe impact on food production and distribution, as well as other socio-economic processes, such as migrations, social unrest and etc. It is expected that in the future, if the necessary measures are not implemented at the global level, the effects of climate change will become even more devastating, which will influence food shortages and water scarcity; natural disasters will become more frequent, public health will be endangered, certain plant and animal species will disappear and ecosystems will be destroyed or degraded. Global warming will cause average temperatures to rise all over the world, causing changes in the quantity and distribution of rainfall, as well as contributing to climate variability and extreme weather [7]. Therefore, mitigation, i.e. reducing climate change, requires a comprehensive and inclusive approach, which involves participation of international organizations, all world countries, politics, science, businesses and civil society in addressing the problem. Adaptation to climate change requires changes in agricultural policy and agricultural practices, in order to prevent or reduce losses, and even turning climate change disadvantages into an advantage by implementing "climate-smart agriculture"[8]. Adaptation measures that do not require large investments are more suitable for developing countries.

Globalization, as a multidimensional process, affects many areas of the economy and society. Although proponents of globalization stress that this process aims to create a single global market, the opponents are of the opinion that globalization has many negative effects, especially in terms of the developing countries. Of all negative aspects of globalization, the most serious complaint concerns the gap between the rich and the poor, because the developed countries, in many areas, have imposed

themselves as the leaders and powerholders, as well as the creators of the future of the entire world. Stiglitz points out that in order to fully understand the problems of globalization, it is important to observe the main international institutions that govern this process [9]. He stresses that globalization may have adverse, even destructive effects on developing countries, especially the poor people, despite the fact that this process was initially conceived as the removal of barriers to free trade and a stronger integration of national economies, a new power that would benefit all, especially the poor, which would impartially address all problems. Anti-globalization movement points to the huge inequalities in the world, the importance to challenge the policies of certain international institutions and countries that are the centers of power and wealth [10]. It is believed that no country will be able to distance itself, nor develop its agricultural sector, regardless of the international situation. The process of globalization brought about fundamental changes in agricultural sector, offering some opportunities, but also introducing numerous risks; therefore, developing countries must manage these changes in agriculture very carefully. The role of agricultural policy, in such conditions, is very complex and difficult, because it requires a solid institutional and financial base, competent staff and effective market performance, as well as addressing global challenges in a proactive manner.

Joining the international economic trends by membership in the World Trade Organization (WTO) is important for agriculture in all world countries, because of the possibility to access the benefits that WTO grants its members and the fact that, in modern world, being a member of certain political and economic integrations is important for the stability of the country, sustainability and predictability of its agricultural, as well as overall development. Some of the most frequently mentioned important benefits of WTO membership are [11]:

- equal access to international markets;
- assurance to the foreign investors on the stability and predictability of the economic system;
- implementation of internationally agreed rules;
- international dispute settling mechanism;
- trade without discrimination - Most-favored-nation (MFN) principle and etc.

Joining the WTO, in addition to benefits, produces some adverse effects on agriculture, which can be reversed by modernizing agricultural policy. Certain countries even filed requests for the review of their obligations. Although some countries received some of the benefits of WTO membership in terms of foreign investment and technological progress, they also faced serious international competition, which resulted in increased imports of agricultural and food products, thus causing a decline in domestic production. Late entry of some countries in the WTO enabled them to learn from the experiences of others, and to be much more careful when negotiating the obligations, they were expected to assume. Instead of reducing the budgetary support, they retained or increased government funding of agriculture by avoiding the direct WTO bans and increasing funding for "Green Box" programmes, which are not prohibited by the WTO. In addition, some countries reduced or revoked import duties at the request of the WTO, but at the same time managed to prohibit import of certain products under the pretext of health safety and quality, which is a strategy still widely implemented by the countries that founded the WTO. Thanks to a well-designed agricultural policy, agriculture in some countries did not experience many adverse effects from joining the WTO [12]. Experts are of the opinion that the positive effects of the WTO membership on agriculture cannot be felt right away, but rather require longer period of time, which in terms of the agricultural sector in the developing

countries represents a problem, because such conditions reduce their chances for development. Nonetheless, WTO membership is deemed necessary, for several reasons and this requires a solid institutional framework and better solutions in the field of agriculture, as well as better cooperation with other countries [7].

EU's Common Agricultural Policy (CAP), which has been offering support to EU farmers for decades [13], is a good example of striving towards sustainable agricultural development in modern conditions (Figure 2). Sustainable agricultural development 2014-2020 of the CAP addressing the following common EU priorities [14]:

- fostering knowledge transfer and innovation in agriculture, forestry and rural areas;
- enhancing the viability and competitiveness of all types of agriculture, promoting innovative farm technologies and sustainable forest management;
- promoting food chain organisation, animal welfare and risk management in agriculture;
- restoring, preserving and enhancing ecosystems related to agriculture and forestry;
- promoting resource efficiency and supporting the shift toward a low-carbon and climate-resilient economy in the agriculture, food and forestry sectors;
- promoting social inclusion, poverty reduction and economic development in rural areas.

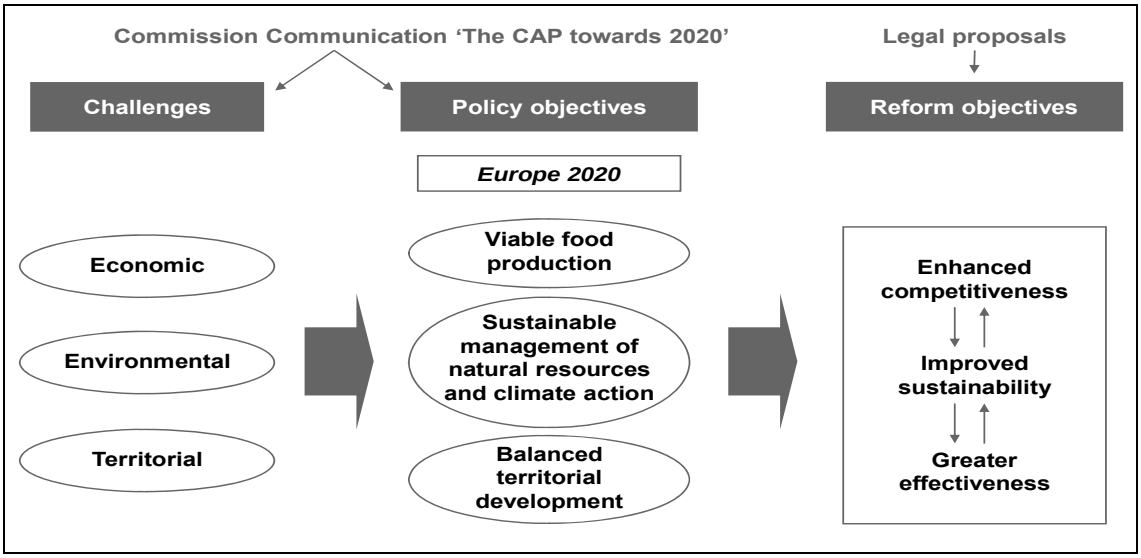

Figure 2. The EU - a good example of striving towards sustainable agricultural development in modern conditions [15]

All modern challenges to agricultural development require effective measures of agricultural policy. Each country has an obligation and a delicate task to define a framework of political and institutional structures that will contribute to more efficient development of agriculture, in accordance with international circumstances, taking into account the relations with other countries, as well as one's own national interests.

4 Sustainable agriculture – possible directions for the future

Sustainable agriculture does not degrade the environment. It adapts to natural conditions and is economically and socially acceptable. Sustainable agricultural production responsibly uses natural resources, thus meeting the needs of present and future generations. Implementation of such a concept is necessary, due to the emergence and rapid transfer of new technologies that are introduced in the agri-food sector, and which could be questionable in terms of their socio-economic and environmental impact.

Conventional agriculture implies extensive use of agricultural land, synthetic chemical fertilizers and other continual inputs, in order to secure a higher yield and generate greater profit. It ensures higher production volume and earns more profit, however in the long term this form of agricultural production is unsustainable, due to the adverse impact on the environment and natural resources, so in its original form it cannot be fitted into the concept of sustainable development.

One of the most controversial issues in agriculture is the production and use of GMOs (genetically modified organisms). In addition to efforts of certain countries to prove that GM crops pose a threat to human health and biodiversity, some countries call upon the objectives of environmental and agricultural policy, ethical, socio-economic and other impacts of GMOs in order to prohibit or ban the cultivation of GM plants. This raises the numerous issues, such as: putting a smaller number of companies in control of the production and distribution of food, the emergence of monopolies, the issue of preserving national sovereignty, international trade in food and the like. While proponents of GMO technology expect that this technology will bring many positive changes, critics openly express their fears of the possible consequences of the transfer of genes from one organism to the other. According to the first, it is a revolutionary step for the good of humanity, in the sense that GMO food is of great importance in the fight against hunger in terms of growing human population. They also point out that the GMOs are resistant to pests and diseases, they have high yields, improved nutritional features and etc. On the other hand, GMO opponents see this technology as a real danger, which is not only a serious threat to the environment, but can also result in creating "monstrous" organisms and cause other unforeseeable adverse consequences. They consider that GMO foods are insufficiently tested and perfected in terms of the impact on human health and the environment, and emphasize the danger of playing with the limits set by natural creation. GMOs are, therefore, a major challenge for agriculture and require extensive research and the efforts of all world countries. The proper and responsible use of technology is of paramount importance for sustainable development [16].

Integral production of agricultural products does not rises major dilemmas, because it implies the use of balanced farming methods which take into account economic, ecological and toxicological factors, and where in case of equal economic performance, priority is given to the environmentally friendly and toxicologically acceptable measures. It puts the emphasis on the cultivation of crops with the least possible disruption of agri-environmental system and controls pests and diseases by using biological means, i.e. other organisms. Therefore, this form of agricultural production is considered as one of the possible directions of future development of sustainable agriculture.

Contemporary business environment requires the introduction of new technological solutions in crop cultivation. Such solutions require more flexible farming methods that would fuse conventional farming with modern technologies. A number of problems that agricultural sector is about to face are the reason for promoting various environmental trends and introduction of eco-tractors, environmentally friendly pumps and irrigation systems that consume less power and are computer-controlled, flame weeders (organic weed control), solar powered food trailers (for storing and keeping

fruits and vegetables fresh), hydroponic food production systems and etc. Mentioned devices and systems are in line with the concept of sustainable development and their future use is highly recommended.

In light of the numerous controversies in terms of food quality and safety, organic farming, as a distinctive sector of agricultural production is significantly gaining in importance at a global level. Not only that organic farming is in harmony with the natural processes and principles, it is also sustainable.Organic farming differs from other farming systems in many ways. Itfavors the renewable resources and eco-friendly processes that do notharm the environment, human health or animal health and welfare andbans the use of synthetic compounds and genetic engineering [17].

However, despite a number of apparent advantages over theconventional and genetically modified products, organic products are stillunderrepresented in the international market of agricultural products,primarily for economic reasons. On the other hand, there is an increase inthe demand for organic food, as well as other non-food organic products(clothes, shoes, toys, cosmetics, medicines and etc.).Given the manifold significance of the production and consumption oforganic products, this topic increasingly grows in popularity amongproducers, consumers and scientists. Namely, many authorsare giving their attention to the study of thekey determinants of the organic sector development [18].The organic sector is the subject of interest of manyinternational and national organizations and institutions. Some of the world's largest agribusiness conglomerates involved in theconventional agricultural production closely monitor the trends in the organic sector, primarily in order to maintain market position[19].Organic farming is not highly productive and profitable as the conventional agriculture, therefore, the producers are reluctant to opt for it; furthermore, it is not supported by a great number of buyers, primarily because of the high prices of organic products. However, based on the key characteristics of organic farming, this form of agricultural production best fits to the concept of sustainable development compared to all other forms of agriculture. Although there are many theoretical and practical solutions, professionals are still searching for a new model of agricultural development that will allow the environmental and economic sustainability of agriculture by combining elements of conventional and organic farming, as well as its acceptability in social terms.

With the introduction of cutting-edge information and communication technologies in agriculture, where the particular emphasis is on GPS technology, i.e., the guidance of agricultural vehicles using satellite-based positioning equipment, the basic prerequisites for the development of precision agriculture are created. Precision agriculture is based on high technological capabilities and it represents a good mix of modern technology and natural processes, so it is recommended in terms of sustainable development. Drones are being more frequently used for monitoring crops, while the scientists are experimenting with new robotic technologies to be used in farming domestic livestock animals. Robots are used in agriculture for: milking cows, livestock handling, picking and counting fruit, planting and etc. The more intensive application of robotics in agriculture requires providing greater access to farmers to modern technologies and large investments; therefore, it is much more realistic to implement these new autonomous farm technologies in developed countries. The use of modern technology in agriculture in developing countries is very modest and this is usually explained by the economic issues, namely, the lack of funds. Agricultural producers rather opt for the traditional production structure, simpler methods of production and application of reasonably priced inputs. Although they are aware that the implementation of new technologies in agriculture is the future and

the basis for profitable business, farmers do not have sufficient resources, motives and assurance to opt for modern technologies, due to a number of risks and limitations ranging from national to global ones.

In increasingly complex economic conditions, sustainable development of agriculture is a very difficult task to achieve. However, proper management of agricultural sector can mitigate numerous risks and uncertainties which farmers face. The creation of stimulating institutional environment for the sustainable development of agriculture is of exceptional importance.

The choice of a model for future development of agriculture depends on a number of factors. In order to efficiently address issues related to sustainable agricultural development, a global perspective and transparency is required. This is especially important for developing countries in order to timely design and implement appropriate measures, i.e., make financial and other relevant arrangements, as well as make preparations for the implementation of the selected realistic development models which will provide sustainable solutions. In addition to implementation of international initiatives and government measures, sustainable development of agriculture requires inclusion and support of the private sector, scientific institutions and civil society.

5 Sustainable agriculture in the EU – a cross-country comparison

Based on the statistical data and relevant agricultural development indicators (Agriculture - value added, Cereal yield, Improved sanitation facilities and Improved water source) published by the World Bank and the Figures 3 and 4, which are given below, the rankings of the most successful EU countries in terms of agricultural development can be seen.

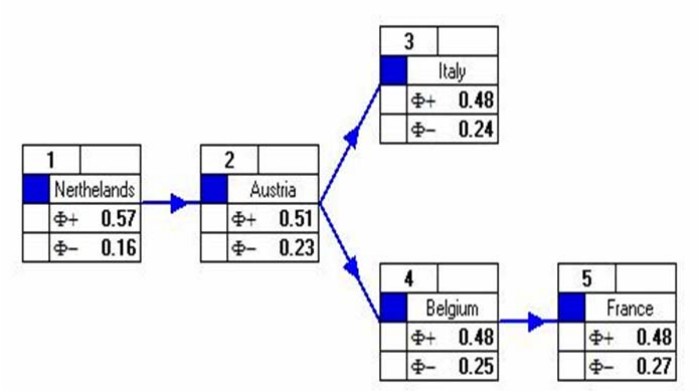

Figure 3. Results for PROMETHEE 1 Partial ranking of sustainable agriculture in EU

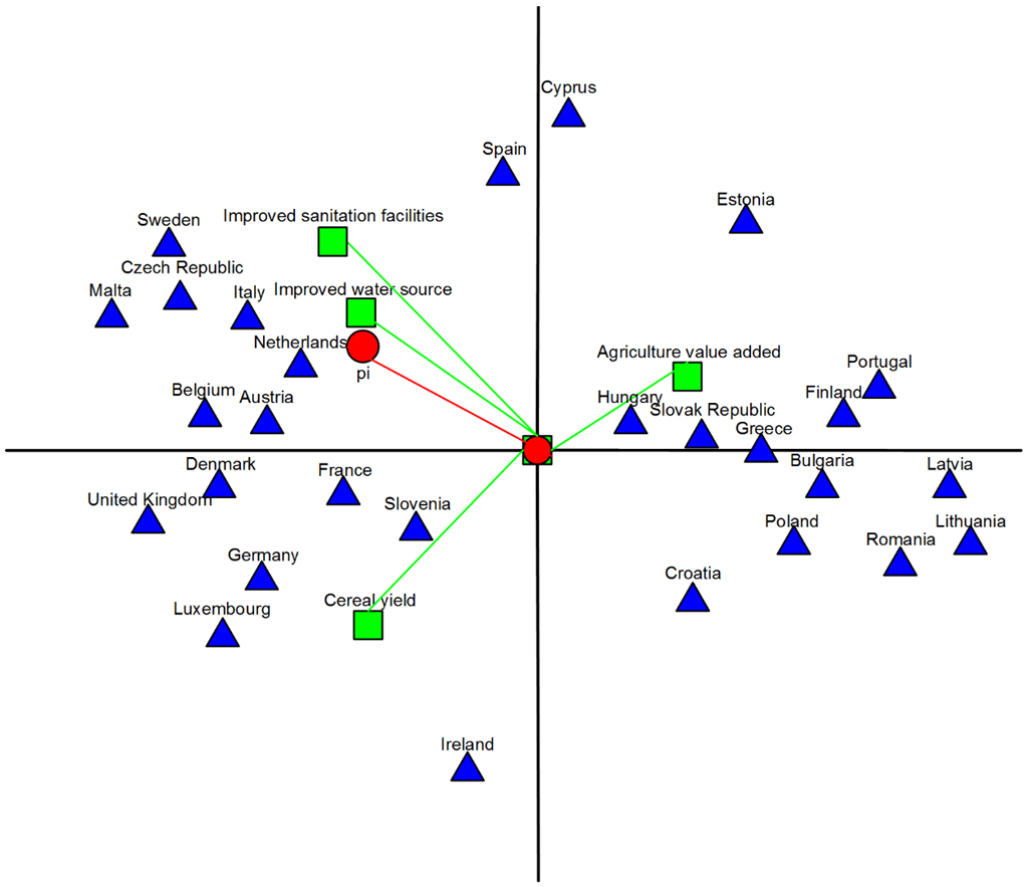

Figure 4. GAIA Planes biplot presentation of sustainable agriculture in EU

The Netherlands, certainly, comes first due to the sustainable development measures that this country successfully implements, especially the construction of wind farms. It is a paragon and a true example of sustainability. The Netherland's government actively promotes sustainable development initiatives and provides support to the policy of sustainable development in different ways [20]. The country managed to learn from its past mistakes related to the environment and succeeded in establishing a flexible and sustainable economic system [21]. Belgium, with a high share of agricultural land in total land area (27% of total land, 2014) and improved conditions in rural areas is also in the top-five ranked countries. In addition, cereal yield in 2014 in this country was the highest one in the entire EU (9539 kg per hectare). The results are not surprising given the fact that six EU countries (Germany, Spain, France, Greece, the Netherlands and the UK) make 50% of the agricultural population in the EU and have rich experience in this field [22]. Italy and France managed to significantly reduce primary energy consumption which has significantly affected the sustainability and thus the ranking of the two countries among the most successful EU countries. Countries that recently joined the EU, i.e. the new EU member states, had the lowest rankings due to the time lag in terms of the implementation of the EU' sustainable development strategy. Among the lowest ranked countries are the Baltic countries, Romania and Poland, as economies in transition.

6 Conclusions

Although the international community has been dealing with the issues of sustainable development for several decades, balanced development at the global level has not yet been achieved. Actually, situation differs from one country to another, which is further confirmed by sustainable development indicators within the respective headline themes. In this respect, it is evident that more effective measures, that will be able to identify actual problems and deal with them in a proper manner, should be implemented in the future. The international organizations and institutions have a crucial role in this process, since they determine the models and direction of global sustainable development, however, the capability of each country to address relevant issues and meet contemporary challenges should not be overlooked.

All countries, i.e., economies and their citizens, have the right to use natural and other available resources, but in a responsible manner. In this regard, international cooperation is an imperative in terms of sustainable development.

Basically, UN Agenda 2030 builds on the global SDGs. However, there are concerns that developing and underdeveloped countries will not feel the positive effects of the implementation of these goals and that global development policy does not sincerely take into account the major problems in these countries - poverty reduction, unemployment and conflicts. The previous global development programme did not solve the majority of the world's problems, and chances are that the same thing would happen with the new one. It is believed that the countries are not equally prepared for the realization of the global goals of sustainable development. The least developed countries have the poorest capacities and implementation infrastructure, due to the insufficiency of financial resources and lack of development of institutional capacities for sustainable development implementation, as well as a number of external pressures and constraints. Despite a number of limitations, it is considered that it is important to strive towards creating and implementing a sustainable development model, since, in the long term, it produces multiple benefits.

Efficient institutions committed to achieving the goals of sustainable development of agriculture are crucial. At the national level, in addition to the crucial role of the public sector and its irreplaceable role, effective international cooperation and inclusion of all relevant actors in the economy and society in the realization of the SDGs is important and this complex process requires restructuring at all levels. The adoption of a sustainable development strategy is one of the important pillars in implementing necessary reforms and addressing global challenges.

Sustainable agricultural development, in modern conditions, is an imperative, because of the strategic importance of food. This is supported by the actions of many developed countries which achieved remarkable results by investing in sustainable agriculture, thus producing multiplicative positive effects in other areas, directly or indirectly associated with the agricultural sector.

Contemporary environment constantly introduces new challenges; therefore, sustainable agricultural development can only be achieved by investing sufficient financial resources and establishing adequate institutional framework capable to address global challenges. Bearing in mind the difficult business conditions the modern agriculture encounters, it is important to provide monetary and non-monetary inputs to support the sustainable development of agriculture. The future prospects of agriculture are therefore, to a large extent, determined by the availability of resources and commitment to sustainable development. Global challenges introduced fundamental changes in agriculture, thus creating new business environment and calling for an adequate response at all levels. Although the

institutional framework and investment in the implementation of sustainable development concept are of crucial importance at the national level, the key player at the global level is the international community, i.e. the global framework created by key international organizations and institutions in this field which determines the future direction of sustainable development in the world, as well as the activities of each country.

The hypothesis this paper builds upon is thus confirmed, as it can be concluded that the sustainable agricultural development in the world, by all means, depends on the activities of all stakeholders in this process, especially the management practices at the global level, thus, no country can be singled out or observed separately from other countries or outside the global framework.

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ECO AND TECHNICAL INFLUENCE OF CLF BY MACHINING

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Abstract*:* By machining, one of very important mater, which has also influence on environment, is CLF (Cooling Lubricant Fluid). Nevertheless, it has also significant influence on machining. In many cases, we must use it, but after life cycle of using we have to change CLF and at this moment, we have also influence how to minimize effect to keep clean environment. Paper will introduce classical and modern types of CLF, technical characteristics, influence on workers and nature and how to recycling it. The case is interesting from more sides; actually, CLF is not users and nature friendly by waste management, but from other side is big save of energy effect by cutting forces and power consumption. Sliding coefficients reduce forces; improve surface roughness on machined workpieces, to improve chips formation etc. Preparing CLF is also very important. In many factories, they have huge problems with pH of water, which cause negative effects on machining, machine tool and workers by machine. Health care is also important, especially by using synthetically base CLF.s

Keywords: *machining, CLF, cooling, lubricating, HPJAM, cryo cooling, health care, eco care*

1 Introduction

We have today by huge production many workers employed in metal machining companies. Practically all of these use metalworking fluids (MWFs) in their metal machining processes (e.g. drilling, milling, grinding, and broaching). There are two generic classes of MWFs: (1) neat oils made up of largely mineral oil and (2) water-mix metalworking fluids (typically 5% emulsions).Different types of MWFs are currently in use throughout the EU and worldwide (e.g. macro-emulsions, semi-synthetics, synthetic) and companies can produce varied volumes of waste according to the size of their operations. Treatment and disposal options applicable to water-mix MWFs depend on type and volume of waste, so treatment solutions are often difficult to determine.

Various types of treatment optionscan be divided, as follows:

- Primary treatment: Pre-treatment options to remove separated oil (tramp oil) and particulates. These include gravitation, filtration, flotation and centrifugation.
- Secondary treatment: Treatment options to separate or "treat" the emulsified fluid by ultrafil- tration, chemical separation, evaporation or biological treatment. These are the four established treatment options for MWFs.
- Tertiary treatment: Further polishing/cleaning of the recovered phases from secondary treatment.

1.1 What are water-mix metalworking fluids?

MWFs are complex mixtures of oils, detergents, surfactants, biocides and anti-corrosion agents. They are widely used as coolants, lubricants, and swarf or metal chip removers during machining operations. They also help to prevent surface corrosion of the machined parts and prolong the life of machine cutting tools.

Water-mix MWFs are supplied as concentrates and are diluted with water before use to produce an emulsion of (generally) 2 -10% by volume oil in water.MWFs come in three primary types, as shown in the table below.

Table 1. Type and composition of water-mix metalworking fluids

Type of MWF	**Mineral Oil in Concentrate**	**Appearance of Dilutions**
Macro-emulsions	55 – 80%	Opaque, milky
Semi-synthetic fluid	10 – 55%	Opaque to transparent
Synthetic fluid	No mineral oil	Transparent

1.2 Managing metalworking fluids

Regular monitoring and attention is essential to keep MWFs in good condition. Tests for concentration, pH, biocide level and microbial activity are common on the shop floor and are often backed up by laboratory tests. Information from these tests will allow the operator or workshop manager to determine if top-ups of MWF concentrate or biocide are needed. The test results may also be used to determine if the MWF is spent.Even with the best fluid management procedures, water-mix MWFs will not last indefinitely and have a lifetime of, typically, nine to twelve months. Most dump, clean and recharge decisions are made for the following (very subjective) reasons: (a) excessive contamination (oil, dirt, metals, etc.) and (b) rancid odours. Controls that are more sophisticated can be used where the decision is made based on testing such as pH, concentration, bacteria counts, oil contamination, or other measurements. Whatever the criteria, the user will be faced with a decision of how and when to treat and dispose of the spent MWFs.

1.3 Discharge limits for trade effluent

Discharges to surface waters and of point source sewage effluent to ground/groundwater are subject to the Environmental Permitting Regulations and form part of the Environmental Permitting (EP) Charging Scheme 2010/11.

Main point for discussion are: (1) volume of waste for disposal, (2) Chemical Oxygen Demand (COD), (3) Biological Oxygen Demand (BOD) and (4) Total Suspended Solids (TSS). Volume will obviously depend on the size of your plant and the volume of waste MWF generated. This can be greatly influenced by careful fluid management.COD is a measure of contamination of water by MWFs, tramp oils and many other chemical compounds such as detergents, surfactants, biocides and anti-corrosion agents found in MWFs.BOD is a measure of how quickly microorganisms use up the oxygen in water. It is another standard test for assaying the contamination level of water.TSS is a measure of suspended solids in water, which include a wide variety of particles from the work pieces

found in waste MWFs. There may also be solids from other stray objects, which sometimes find their way into machine sumps.

If you are going to make a discharge to surface water (for example a river, stream, estuary or the sea), or to groundwater (including via an infiltration system) then you may need to apply for an environmental permit to make that discharge. Discharges to surface waters and ground waters can be very harmful to the environment if they are not carefully managed. To avoid this happening, the Environment Agency regulates such discharges through a system of permits.

1.4 Waste treatment options

1.4.1 No treatment (disposal of one hazardous waste stream)

The simplest option for disposal of spent MWFs is not to treat the waste at all, but to have it hauled away by a specialized contractor. There are three factors influencing the cost of Hazardous Waste disposal: (1) type of waste and concentration, (2) volume of waste to be hauled and (3) distance - the further to the disposal site the greater the haulage charges.The cost of removing hazardous waste can be expensive and is rising. Charges vary significantly from contractor to contractor - so shop around for a good price. For small quantity generators of spent MWFs, typically contract hauling is the most effective and economical disposal method. There are national, regional and local contract haulers.

1.4.2 Primary treatment (disposal of two waste streams categorized by hazard level)

The purpose of primary treatment is to separate your waste MWFs into two waste streams, categorized by hazard level. Removal of tramp oil and suspended solids will result in a waste stream which is less hazardous and therefore cheaper to dispose of or easier to treat downstream. The tramp oil and removed solids will make up a more hazardous waste stream but at a greatly reduced volume. Below are listed some familiar methods for the removal of oil and other contaminants from MWFs. Some of these methods are also commonly used to keep your MWFs in top condition and may also be used as preliminary treatment techniques.The best method for your particular circumstances can be determined from the nature of the contaminant and the cost of the treatment. All of these treatment options are suitable for macro- emulsions, semi-synthetic and fully synthetic fluids.As Table 2 shows, a chemical coalescing agent may be the most suitable primary treatment method for most MWF disposal applications where tramp oil and metal particulates are the main contaminants.

Table 2. Methods for the removal of oil and other contaminants from MWFs

Type of equipment	**Contaminant removed**	**Type of spent MWFs**	**Relative Cost**
Skimmers	Floating tramp oil	All	Low
Oil absorbent pillows	Dispersed tramp oil	All	Medium
Settling tanks	Metal and high-density particulates	All	Low
Magnetic separators	Ferrous metal particulates from 50 – 100 μm	All	Medium
Hydro cyclones	All particulates from 50-100 μm	All	Medium
Microfiltration equipment	All particulates from 50-100 μm	All	Medium
Chemical coalescing agents	Dispersed/semi-emulsified Tramp oil + all particulates from 50-100 μm	All	Low
Flotation (air induced)	Floating tramp oil + less-dense particulates from 50-100 μm	All	Medium
Centrifuges	Tramp oil + particulates	All	Medium

1.4.3 Secondary treatment (disposal of water and oil separately)

Secondary treatment methods involve separation of the emulsified oil from the spent MWFs. This has the effect of significantly reducing the COD and may reduce the BOD of the water component. If the TSS, COD and BOD are within acceptable levels it may be possible to dispose of the water component as waste water with correspondingly low charges. The oil component will be typically only 5% of the original waste volume (depending on the initial concentration of the MWF) and so will leave a much smaller volume to be disposed of as hazardous waste.

Details of the currently available techniques for the treatment of MWF are:

- Chemical treatment: Suitable for macro-emulsions and semi-synthetic fluids. A chemical agent is used to split the emulsion into oil and water phases. The recovered water may be acceptable for discharge as trade effluent and the oil phase is disposed of by licensed contractor as hazardous waste. Notes: The type of chemical agents and amounts required depend on your waste stream and may add to the cost of disposal. Ask suppliers of MWF and treatment equipment for advice.
- Evaporation: Suitable for all types of water-mix MWFs. Spent MWF is heated in special evaporating vessels to drive off water, leaving a reduced volume for disposal as hazardous waste. Notes: Evaporation is unaffected by fluid variations and contaminants. However, it is essential to consider carefully the energy cost. Any volatile organic compounds (VOCs) present in the waste stream may violate clean air regulations.
- Ultrafiltration: Suitable for macro-emulsions and semi-synthetic fluids. MWF is passed through a membrane under pressure. Tiny pores in the membrane allow water through but oil and surfactants are retained. Notes: Membranes have a working life typically between 1.5 to 3 years. The performance of membranes may be affected by constituents

of the spent MWF. Some chemicals, cleaning agents and dissolved metals can pass through membranes. Ask the suppliers of the MWF and treatment equipment for advice.

- Biological treatment: Suitable for macro-emulsions and semi-synthetic fluids. Micro-organisms are added to a bioreactor containing spent MWFs to reduce organic and inorganic materials. The treated water may be acceptable for discharge as trade effluent and the sludge by-product is re-used in the process. Excess sludge must be disposed of periodically.

Options for treatment (see Table 3) of excess sludge include stabilization, thickening, dewatering, drying and incineration. The latter is most costly, because fuel is needed and air pollution control requires extensive treatment of the combustion gases. It can be used when the sludge is heavily contaminated with heavy metals or other undesirable pollutants.

Notes: Biological treatment can only be carried out as a continuous process and is slow compared to chemical treatment or filtration. It is most economical for large users (more than 15,000 litres of waste p.a.). The biological treatment process is susceptible to toxic and non- biodegradable substances.

Table 3. Advantages and disadvantages of the major disposal options for spent MWFs

Technique	**Advantages**	**Disadvantages**
Off-site disposal	No need for expensive treatment plant, not labour intensive	Expensive for large volumes (>10,000 litres) of waste, Stricter controls may increase costs Waste awaiting collection requires proper storage
Chemical treatment	Relatively low capital investment, Effective for macro emulsions and semi-synthetic fluids	By-products require disposal, Requires consumables and hazardous chemicals, Payback is unacceptable for small volume users, Not suitable for synthetic fluids
Evaporation	Effective for all types of MWFs: macro emulsions, semi-syntheticand synthetic fluids, unaffected by fluid variationsand contaminants Quick results, and paybacktime is typically less than two years	Volatile organic compounds presentin the waste stream may violate cleanair regulations Foaming may occur during processing
Ultrafiltration	Easy to use Effective for macro emulsions and semi-synthetic fluids Long membrane life Low maintenance	Unsuitable for treating synthetic fluids Oil concentrate requires off-site disposal Fouling of membranes
Biological treatment	Final effluent of high quality is produced, no hazardous chemicals are used	Only suitable for large users, as it requires continuous feed Requires disposal of biomass Susceptible to toxic and non- biodegradable substances (shock) Slow treatment rate

2 Tool wear and tool-life

2.1 Effect of cutting edge radius

How different ways of preparing the cutting edges and consequently, the different radius on the cutting edge, affect the tool-life is shown on the figure below.Cutting edges were prepared in several different ways: grinding, three different brushes (different brushing times: B1, B2, B3) and three different polishing (different polishing times: P1, P2, P3) of the cutting edges. Experiments showed longest tool-life of 215 min with the tool with grinded cutting edges [2].

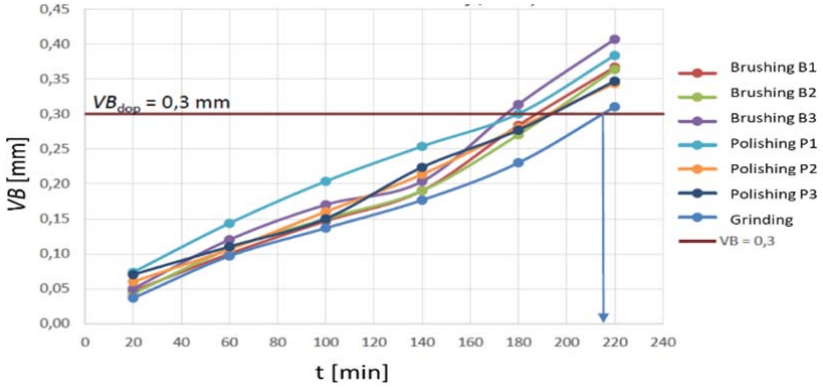

Figure 1. Tool-life of the ball end milling tools with different cutting edge preparation [2]

2.2 Case study of 3D tool-wear

Measurement of typical wear patterns, according to ISO 3685, on a cross section profile, 0.6 mm from secondary flank face after 5 min of cutting.Chipping, crater wear and cross sections profiles parallel to secondary flank face after 5 min of cutting (Figure 2)[3].

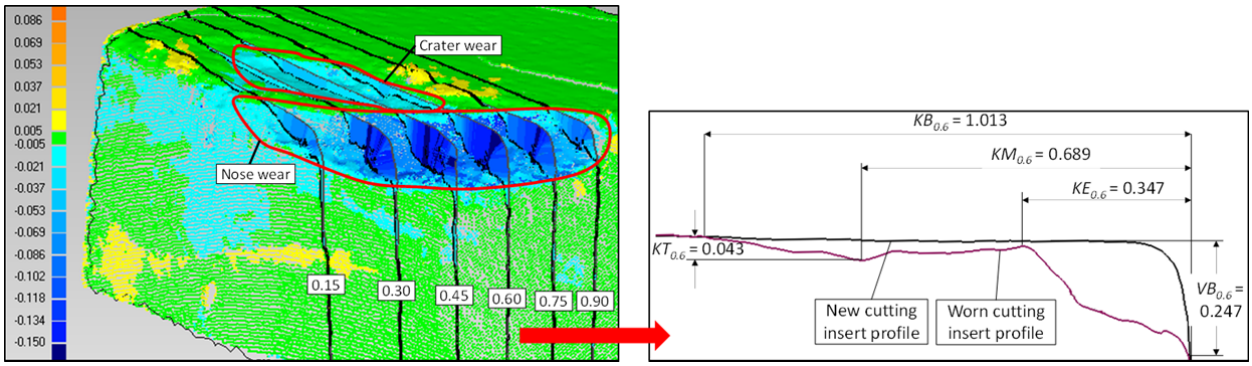

Figure 2. Tool-wear [3]

Measurement results of different wear patterns according to ISO 3685 after 5 min of cutting are presented in the table below.

Table 4. Tool-wear measurements

Profile	**0.15**	**0.30**	**0.45**	**0.60**	**0.75**	**0.90**
VB [mm]	0.089	0.206	0.203	0.247	0.210	0.146
KE [mm]	0.406	0.360	0.362	0.347	0.324	0.296
KT [mm]	/	0.041	0.041	0.043	/	/
KB [mm]	/	1.055	1.089	1.013	/	/
KM [mm]	/	/	/	0.689	/	/

3 Grinding of workpiece and cutter

3.1 Cutting edge preparationsand cutting edge radius

Figure below shows different radius preparations effect on cutting edge radius. Measurements of the cutting edge radius is given in the table below [4].

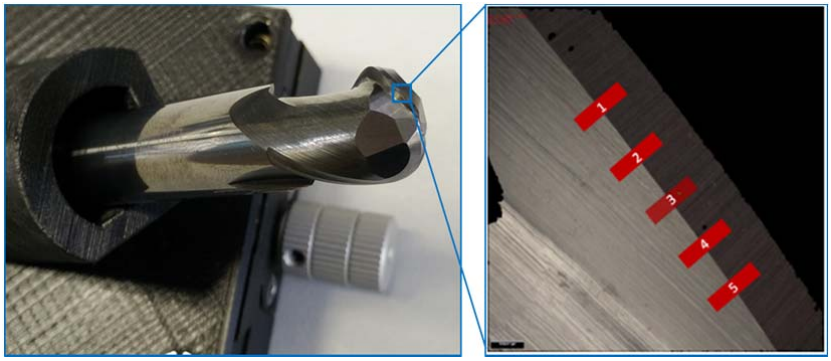

Figure 3. Cutting edge radius measurement

*Table 5. Cutting edge radius measurement results (*average of 1-5)*

	***r_e [µm]**
Grinding	5,7
Brushing B1	15,6
Brushing B2	20,3
Brushing B3	24,7
Polishing P1	13,0
Polishing P2	22,0
Polishing P3	18,6

3.2 Is your coolant in range?

Each coolant needs to work in specific range. The coolant concentration and the PH-level are indicators to verify if your coolant is in range[5].

Effects of to low concentration are shorter tool-life, bad surface finish, rusty machine and parts. Effects of to lean concentration are reduced coolant capacity, foam building, throw money for coolant away.

You need the refractometer (Figure 4) to create new coolant batch or to check the coolant after refilling with water that disappears constantly by evaporation.Without a refractometer, it is impossible to verify if your coolant concentration is in the range of 6-10%. This is for most coolant but depending to the coolant suppliers specification.

Figure 4. Refractometer

3.2.1 Water quality test strips to measure pH-level and water hardness [6]

Test strips are made to check the PH-level and the water hardness (Figure 5). Generally PH-levels 8-10 are acceptable. PH-Level below 7 are indicators that the coolant level is weak and increases the chance of corrosion and bacterial contamination. Water hardness between 150 – 400 ppm CaCO3 are ok, more than 400 are critical.

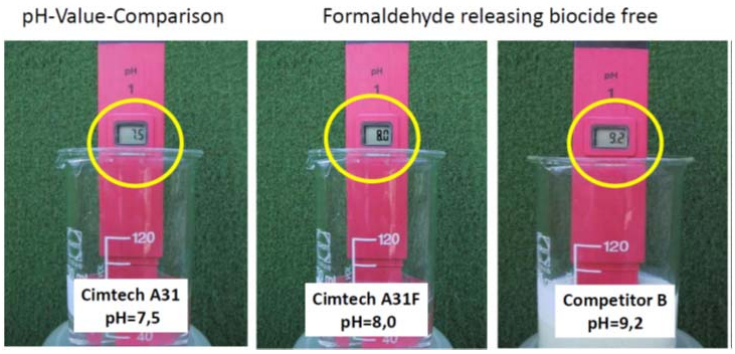

Figure 5. Checking pH-level.

4 Sustainable machining

Figure below represents all benefits of High Pressure Jet Assisted Machining (HPJAM), i.e. longer tool-life, temperature reduction in the cutting zone, roughness improvement, BUE reduction, better chip control, etc. [7, 8].

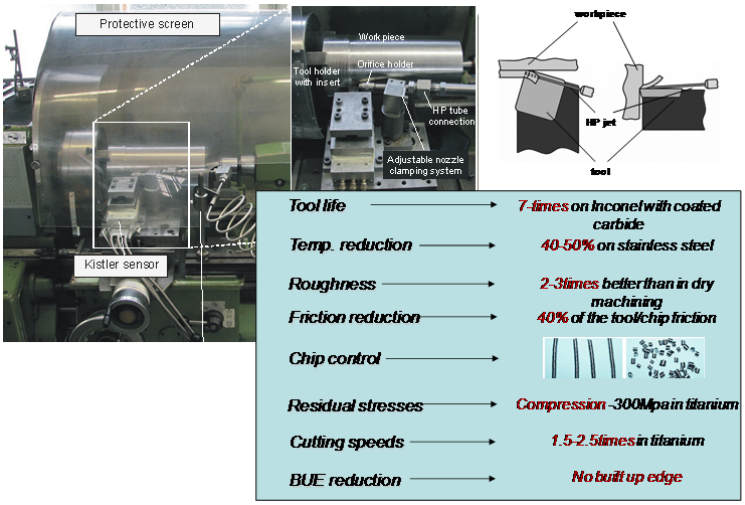

Figure 6. HPJAM benefits[7]

Comparison between HPJAM and typical machining with flooding is given below. Results shows that tool is worn for less than 2 min using conventional flooding for the selected criteria VB_k=0,1 mm, but for HPJAM tool is worn for about 10 min.

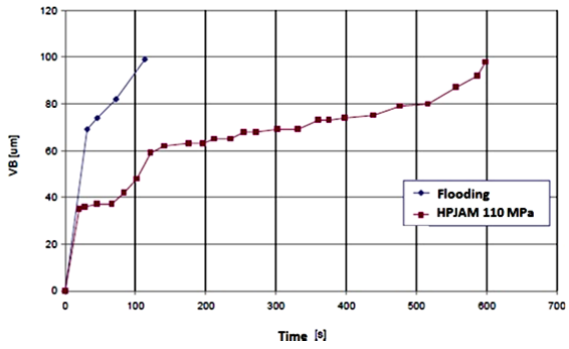

Figure 7. HPJAM vs. flooding[7]

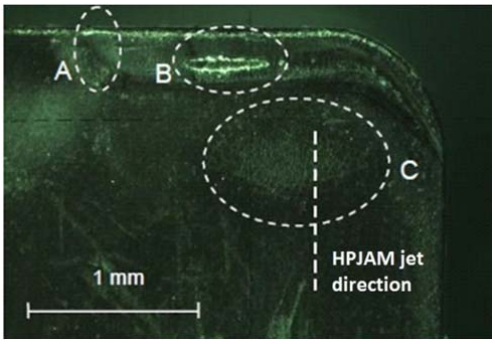

Figure 8. Types of tool wear in turning Ck45 (58HRc) with HPJAM, p = 110 MPa: zone A – notch wear, zone B - crater wear on the rake face, zone C - erosion wear in the area where the jet strikes the surface of the tool [7]

Second sustainable machining option is cryogenic machining (Figure 9). Usually nitrogen in liquid state is used as a cryogenic medium. Nitrogen represents 78% of the air that we breathe. At the room temperature is in gas state and is: N2 is safe, noncombustible, noncorrosive, colorless, odorless and tasteless gas.

Benefits in cryogenic machining:

- Sustainable machining methods (cleaner, safer, non-residual, environment friendly, more health acceptable, etc.),
- Increase of material removal rate without increase in tool-wear and tool change over costs – increase of productivity,
- Part quality improvement by preventing mechanical and chemical degradation of machined surface.

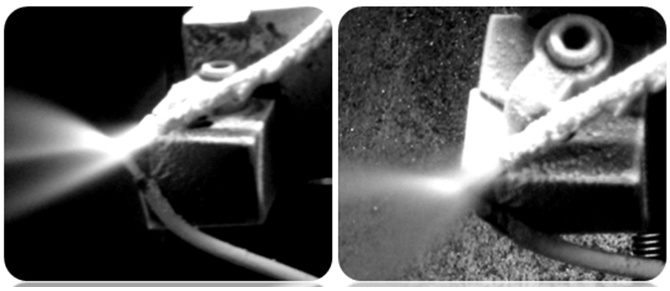

Figure 9. Cryogenic machining [8]

5 Conclusion

Flood applied cutting fluid technology has developed significantly since the days of basic 'Suds' and 'Coolants'…. when operators worked with these potentially hazardous, often microbiologically contaminated fluids to cool the tool, reduce friction and remove swarf from the cutting edge. The overall industry trend has been away from soluble oils through semi-synthetics to clean, high efficiency water extendable fully synthetics. Soluble oils worked satisfactorily well in traditional applications with free cutting steels but these are rapidly being replaced by new, lighter materials in a wide variety of

applications - e.g. for power train components in theautomotive industry. It is in the machining of these new and exotic alloys with high performance synthetic fluids. In the quest forever greater manufacturing efficiency, machine tools have become faster and many now have multiple operation production capabilities, yet the requirements for increased accuracy and improved surface finish are unceasing. Combine this with the increasing proliferation of centralised 'coolant' systems and it will come as no surprise that the cutting fluids themselves now need to have universal performance characteristics… a fundamental feature of the new high performance fluids. It is also essential that the cutting fluid also has a long in-use life to help maximise machine 'up-time' and all this has now to be achieved without the use of traditional chlorinated Extreme Pressure additives, nitrites, secondary amines, NPEs or any other chemicals that raise potential environmental or health and safety concerns.Multi-task production eliminating skin problems is only one facet of developing a leading fluid for future production requirements. Will these 'safer' fluids work equally well with both traditional metals and exotics, composites, aluminium alloys and even ceramics? These 'new' materials have different machining and grinding characteristics, but moreover, how does the metalworking fluid perform in a cycle that involves chip forming and grinding, very high speeds and high nozzle pressure, and even mixed cutting media? Tool life needs to be maintained to prevent unplanned downtime, so fluids must be formulated for multi-task production applications. With smaller sumps in recirculating systems and high-pressure delivery, today's fluids are given severe punishment.Less fluid is now expected to do more work. The fluid must protect the tool from friction and heat and reduce wear; it must be low foaming, low misting and stable – and give long life, easy care without constant monitoring and biocide treatments. It must be clean, easily filtered and non-gumming, and provide corrosion protection to machines and components. It also has to be non-staining, particularly important where aluminium chips are recycled and where impurities could stain secondary melt metal. Overall, the fluid must give cost-effective use.What of the future for metalworking fluids if the trend is for minimal, less aggressive product at the cutting edge? There will always be applications that require little or no lubrication, depending on the tool or the material being machined. Where mist lubrication is utilized, waste is reduced and finish quality is good but the lubricant must be formulated to give maximum performance using minimal product at the cutting edge – normal products are likely to fail.Machine design is also a major consideration. Speeds, tool changes and operation specific need to be taken into account. Paperless filtration systems may become clogged by traditional fluids, which produce residues; pipes and filters can become blocked by coolants with gumming tendencies. Traditional soluble oils have become unacceptable in many parts of the industry. The company sees high performance semi synthetics and water extendible synthetic fluids as the logical route to satisfying the markets' needs in the future [9].

Eco care predict minimizing of CLF, it is possible with alternatives cooling technology as they are high-pressure jet assisted cooling and cryogenical cooling with CO_2 or LN_2. It is not only useful from eco-point, is also very effective by machining of significant material as Ti, Ni alloys are. Sustainable production must going on all field of machining by using one of mentioned CLF.

The future for metal cutting lubricants is also in balancing cost & performance with health safety & environment.

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CONVERGENCE OF EU COUNTRIES IN MEETING THE EUROPE 2020 STRATEGY GOALS

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Abstract: In a contemporary conditions characterized by intense globalization, frequent economic crises and ecological disasters with increasing scope, ensuring long-term sustainable development becomes an imperative for all economies. In order to tackle these challenges, the European Commission adopted the Europe 2020 strategy in June 2010. The goal of implementing this strategy is to ensure a smart, sustainable and inclusive development of member states with the aim of raising EU competitiveness to the level that is present in the most developed countries in the world. The realization of this strategy implies the fulfillment of numerous targets in the economic, ecological and social sphere set by the European Commission. In this regard, the aim of this paper is to assess the level of convergence of EU member states in achieving those targets, using the entropy method. The research results have profound implications for further successful implementation of the Strategy.

***Keywords**: Europe 2020, European Union, convergence, entropy method.*

1 Introduction

In order to improve its competitive position and thus accelerate growth and development, in the era of very rapid changes of science and technology and growing pressure on the world market, the EU adopted the Lisbon Strategy in 2000. This strategy was supposed to determine the direction of economic policy over the next 10 years after its adoption and make the EU "the most competitive and dynamic knowledge-based economy in the world that will be able to achieve sustainable economic growth by increasing the number and quality of jobs and greater social cohesion ". However, due to the tendency for greater competitiveness in the global market a number of environmental and social problems have been neglected. During the first 5 years of implementation, it became already clear that the Lisbon Strategy would not be able to ensure sustainable economic and social development in EU member states (primarily because it was too much focused on economic growth and employment), so the representatives of the Member States and the European Parliament adopted the „Europe 2020" strategy in June 2010, whose implementation should contribute to achieving of "smart, sustainable and integrative growth". Unlike the Lisbon Strategy, which had the character of purely economic program, the new strategy emphasizes the importance of the social and ecological dimension of development. Such an extended framework of action meant defining a new set of goals to be achieved over the next decade. The objectives of the strategy are grouped in the following five thematic areas:

1. Employment,
2. Research and development,
3. Climate change and energy,

4. Education,
5. Poverty and social exclusion.

Which are presented with appropriate indicators.

These five thematic areas are interconnected. This means that, achieving goals in the area of education increases employability, and higher employment reduces poverty. Higher investments in research and development in combination with more efficient use of resources increase the competitiveness of the economy, as well as the number of newly created jobs. Investments in "clean" technologies for energy production, based primarily on the use of renewable energy sources, provide environmental protection, support climate change and also lead to the creation of new jobs.

Having all previously said in mind, the aim of this paper is to look at the convergence in the realization of aforementioned goals among the countries, using entropy method. Based on the calculated entropy for each of the indicators, which reflect the situation in these areas, conclusions about the inequalities among EU members in the achievement of the Strategy' objectives, will be drawn.

2 Definition of the Strategy key development objectives

As already mentioned, the Strategy' objectives are grouped into five thematic areas, so it is necessary to analyze each thematic area in particular before examine convergence in the fulfillment of the set criteria, in order to highlight the significance of each criterion and the targets to be achieved by 2020.

2.1 Employment

The first thematic area, which was also part of the Lisbon Strategy, is employment policy. Employment and other issues related to the labor market are the most frequent subjects of economic and political debates in the EU, given that the increase in employment rate is a key precondition for ensuring a satisfactory living standard and the quality of life of the population. Therefore, according to the Europe 2020 Strategy for this thematic area, an increase in the employment rate of the population aged between 20 and 64 years from 69%, at the beginning of the implementation of the strategy (2010), to 75% in 2020, has been expected and also removal of structural unemployment, which means greater participation of women and the elderly people in the total employment, and easier access of migrants to the EU' labor market. In order to achieve the set goals at the EU level, Member States have an obligation to define national targets and a specific set of measures adjusted to the domestic labor market which will help them to achieve these targets. In order to achieve these targets and for the implementation of national programs Member States can use the resources of the European Social Fund, the European Regional Development Fund, the European Union Fund for Poverty and the Asylum, Migration and Integration Fund.

2.2. Research and development

Today, knowledge is considered to be an essential resource for achieving a competitive advantage. The very beginning of the 21st century is marked as a time of deep social transformation, the era of the rapid, but unequal advancement of science and technology in the world. The developed countries constantly invest approximately 2% of GDP in science, and the most developed countries between 2.5-3%, while Scandinavian countries invest over 3% [1]. In small, economically underdeveloped countries in transition, the problem of science development is very complex. The economy in these countries is slowly developing and it is not in condition to invest in research and development, so in such circumstances the state must finance all scientific activities. Given that the GDP of these countries is extremely low, it is obvious that investments in science are small, and as a consequence, there is a slow scientific and technological progress, which additionally enhance their economic and political dependence on the developed countries. In order to reduce the gap between developed and less developed countries and to bring national investment in science in member countries closer to the US and China, which are considered their biggest competitors in the knowledge transfer market, the European Commission set goals related to investment in research and development, within the framework of the Europe 2020 strategy [2]. The goal of the adopted strategy is that by 2020, all EU countries increase combined public and private investment in R&D to 3% of GDP.

2.3 Clime change and energy

The European Union as a whole represents the largest energy consumer and one of the largest emitter of greenhouse gases in the world [3]. Due to an increasing problem of air pollution and the fact that air transport does not recognize the national borders, targets regarding energy and climate standards within the Europe 2020 strategy, have been set. As part of strategy' implementation, greenhouse gas emission in the Member States are expected to decrease by 20%, utilization of renewable energy to increase by 20% and to increase energy efficiency by reducing energy consumption by 20%. Although greenhouse gases include many gases (CO2, NO2, methane), the level of presence of greenhouse gases is measured by the concentration of CO2 in order to obtain comparable data for all countries. Achieving set goals would not only mean compliance with regulations and the improvement of ecological and climatic conditions, but would also mean the elimination of sources that cause various health problems. This would reduce the health costs and increase the quality of life, primarily for those people who live in urban areas.

2.4 Education

An efficient and developed education system is the basic pillar of every developed society. Although the EU as a whole has a significant share of the highly educated people in the total population, in some Member States this share is relatively low compared to that recorded in the US and other highly developed countries of the world. Therefore, the following objectives in this area are set:

1. reduce the rate of early school leaving for the population from 18 to 24 years below 10%;
2. ensure that at least 40% of the population aged between 30 and 34 have university qualifications.

These goals reflect the opinion of EU representatives that secondary education represents the minimum desirable level of education for the citizens of the Union and that the skills and competences obtained during secondary and higher education are considered essential for successful inclusion in the labor market. Young people who leave education too early do not have basic skills and knowledge, which seriously lowers their chances to even find job (except uncertain and low paid jobs), so they face with problems of poverty and social exclusion. On the other hand, the growing competitive pressure on the global market and the rapid development of science and technology increase the number and level of qualifications that employees need to have to carry out daily business activities, which emphasizes the importance of tertiary education in the first place. In this context, the implementation of set goals, primarily from the resources of the European Social Fund, should improve the productivity, innovation and competitiveness of the EU globally.

2.5 Poverty and social exclusion

Poverty and social exclusion have negative impact on life of every EU citizen individually, but also on the functioning of the whole Union, bearing in mind that it limits the ability of a part of the population to reach its maximum work potential and thereby contribute to the development of the entire community. Without efficient educational, health and social system, appropriate tax benefit and employment policies, the risk of poverty is transmitted from one generation to the next. This increases the inequality in society, decreases the productivity of large part of the population, and limits the ability to achieve inclusive and sustainable development. In order to prevent the long-term negative effects of poverty and social exclusion, the European Commission defined within this thematic area the goal of reducing the number of people living below the national poverty line of 25%, which makes up to 20 million EU citizens. The implementation of this goal is primarily carried out with financial resources from the European Social Fund and depends to a large extent on the efficiency and dynamics of achieving the goals in the field of employment and education.

3 Literature review

Taking into consideration the complexity and importance of the Europa 2020 strategy for future EU development, a numerous authors deal with the dynamics, prerequisites and limitations of the realization of the defined goals, as well as, predicting trend of these goals in the future. Most of the papers are focused on analyzing the progress of the EU countries in some aspects of the strategy.

Many researchers have analyzed the dynamics in achieving climate and energy goals [4,5,6]. The conclusions most of them are that more than half of countries will succeed in reaching defined targets, but there are some countries, such as Belgium, the Netherlands, Estonia, Poland, Czech Republic, which according to their current regulations will not be able to reduce the percentage of energy use, while on the other hand, Belgium, the Netherlands, France, Ireland, Luxembourg and Malta will not be able to increase the share of renewable energy sources [3]. Therefore, these countries need to increase efforts on energy efficiency in order to achieve the target values.

Regarding the education in the context of the Europe 2020 strategy authors Dragomirescu et al. [3] analyzed the issue of how to increase the number of highly educated people in the EU by 2020. The results of these authors have indicated that Europe is on the right way to reach this target, but there is

divergence among developed and developing countries. Bearing in mind the risk of unemployment and the insecurity of inhabitants is highest at the age of 30-34 years, Chung et al. [8] recommended increasing social inclusion and youth safety as an urgent issue in the EU. Conclusion of these authors on tertiary education is that young people need a safe job to lead their own lives in order to contribute independently to the community.

The significance of knowledge and research and development in the context of the Europa 2020 strategy is also analyzed by Drăcea et.al [2]. These authors pointed out that the base line for growth must be transformation of European society into a knowledge society. The authors concluded that by insisting on knowledge and by supporting R&D activities would take society in progressive growth and development. In addition, authors analyzed investment in research and development in the context of a competitiveness gap [9]. They came to the conclusion that it is necessary for the EU countries to raise their commitment to the promotion of research and development in order to increase smart growth and reduce the gap in competitiveness.

Another of key elements of the Europa 2020 strategy - social cohesion was also subject of the authors [10]. These authors pointed out that poverty reduction is the greatest challenge for future EU policies. Despite the relatively stable employment situation in some countries, the income of some households is decreasing, which increases inequalities in incomes. They particularly emphasize the vulnerability of families with children. As a basic conclusion and recommendation, this authors state the strengthening of the national social inclusion policy rather than the strengthening of the employment policy. In addition to the above, author Zoltan [11] emphasized the importance of social cohesion since the establishment of the knowledge economy ensures the future of Europe in the long run. The author's conclusion is directed at the new member states as a recommendation to them to take further steps in aligning the needs of the labor market and tertiary education in the future period.

Formulation of a future European strategy is not possible without the inclusion of the employment component. Anna [12] analyzed the disparity in unemployment of EU 28 in the period 2008-2014, as well as, the chances of achieving employment target by 2020. The conclusion of the paper suggests that in order to reach the target of 75% of employment, EU needed another 16 million employees. That is why an active labor policy is necessary for achieving employment goals. In addition, lifelong learning strategies that are consistent with the complex integration policy are needed. Authors also emphasized the importance of labor policy in order to reduce structural unemployment [13]. Recommendations for achieving this part of strategy are related to the measures available to states, such as the promotion of labor mobility, adequate social security systems, and the motivation of the unemployed persons to actively seek job.

In general, the goals of Europe 2020 are important for achieving overall growth and development, as well as, for balancing development between countries. However, authors point out four targets (investments in R & D / innovation, 20% increase in energy efficiency, increase in employment and reduction of poverty and social exclusion) that are extremely important for achieving economic development [14].

4 Methodology and data

Authors use an entropy method to analyze the convergence of EU countries in implementation of Europe 2020 strategy. It is known that convergence can be measured by the entropy method, like measure of uncertainty. Czyż and Hauke proposed a convergence concept that takes into account the measurement of entropy in achieving economic convergence on the example of the region in Poland [15]. In analogy, this paper applies the methodology of these authors based on Shannon's measure of entropy.

The measure of average information, entropy H(x) as defined by Shannon [16] is the expected value of this series, which can be written as:

$$H(x) = -\sum_{i=1}^{n} p(x_i)\log p(x_i) \text{ or}$$

$$H(x) = \sum_{i=1}^{n} p(x_i)\log_2 \frac{1}{p(x_i)} \quad (1)$$

The H(x) entropy statistic as a measure of the uniformity of a distribution provides a basis for constructing an inequality measure I(x), or in the language of information theory, a measure of information differences. The inequality measure is useful in studies of spatial differences. It is governed by the equation [15]:

$$I(x) = H(x)_{max} - H(x) = \log_2 n - \sum_{i=1}^{n} p(x_i)\log_2 \frac{1}{p(x_i)} \quad (2)$$

$$= \sum_{i=1}^{n} p(x_i)\log_2[n\, p(x_i)\,]$$

$$\text{za } 0 \leq I(x) \leq \log_2 n$$

where I(x) = 0 shows an absence of inequality (a uniform distribution), while I(x) = $\log_2$n means a maximum non-uniformity in the occurrence of event x.

In the study of the inequalities of the European Union countries in the implementation of the Europa 2020 strategy is used an entropy method for measuring convergence or divergence of 28 countries. The data used as measure of Europa 2020 targets are: (1) Employment rate from 20 to 64 years, (2) Gross domestic expenditure on R&D (%GDP), (3) Greenhouse gas emissions, (4) Share of renewable energy in gross final energy consumption, (5) Primary energy consumption (per capita), (6) Early leavers from education (% of the population aged 18-24) , (7) Tertiary educational, age group 30-34, (8) People at risk of poverty or social exclusion (%). All data were collected from the official EUROSTAT statistics for the period 2005-2015.

5 Results and discussion

In order to assess the convergence in achieving the goals of the Europe 2020 strategy among EU countries, the entropy for all indicators is presented in Figure 1.

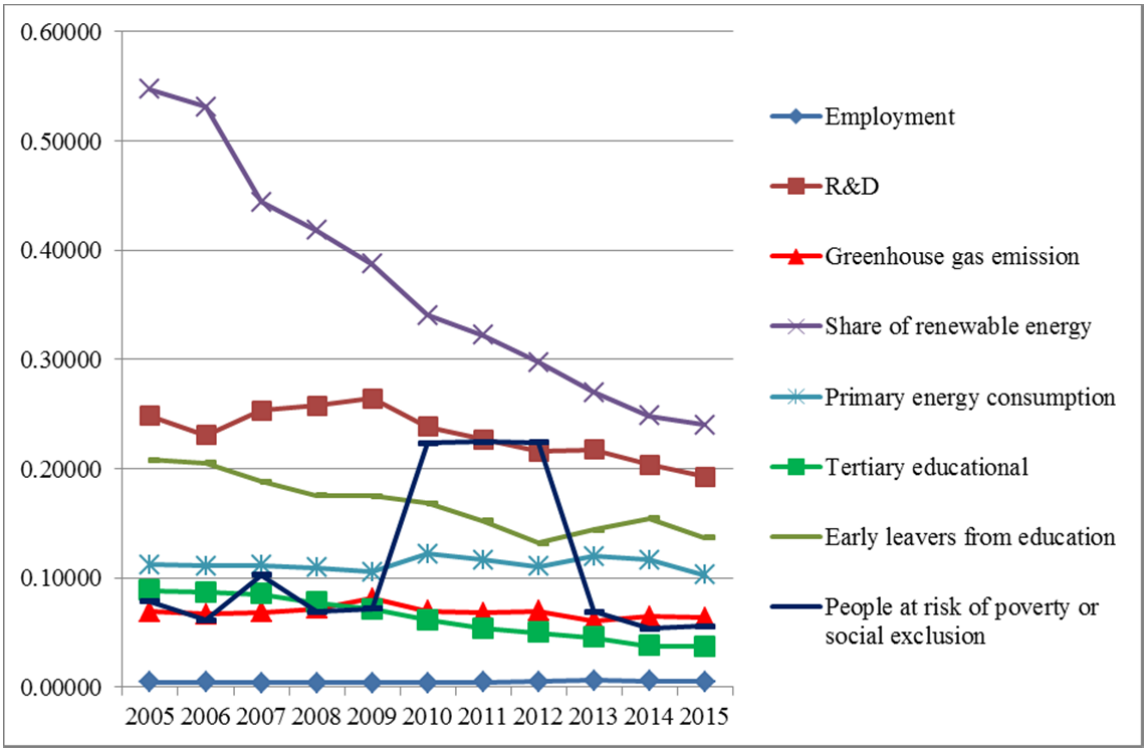

Figure 1. Entropy for Europa 2020 indicators among EU countries

The first observed area is employment. From the Figure 1 it can be seen that the difference between EU members had the low variations until 2009. Then, inequality in this indicator recorded the continuous growth until 2013. This growth is primarily result of global crisis, which affected each EU member in a different way, but also the different measures for overcoming the crisis implemented by member countries, the long period required to reflect the measures initiated in the labor market and slow progress in labor market reforms in some Member States. A gradual recovery from the crisis began in 2013, so the decrease in entropy and thus in the differences between EU countries occurred. Differences are still present, primarily between north and central Member States and east and south ones.

Differences in the area of research and development are much more pronounced. Due to different initial conditions, Member States have set different national targets. They are the highest in Finland and Sweden (4% of GDP), and the lowest in Cyprus and Greece (0.5% and 0.67%, respectively). Figure 1 indicate that, after decrease in entropy for research and development investment until 2006, there was a period of its increase, primarily due to accession of Bulgaria and Romania, which were lagging behind other Member States in this respect. Comparing to Finland, which had the largest investments in research and development in 2007 (3.35% of GDP), these countries had almost 3% less investments for the same purposes (Romania 0.52% of GDP and Bulgaria 0.43% of GDP). In the crisis period, the differences further increased, as less developed Member States had much less funds available for investment for this purpose, primarily due to low public revenues. In contrast to underdeveloped Member States, in the advanced ones the private sector is the main driver of research and development activities and their share in total research and development activities investments is much higher than in

the higher education and government sectors. After few years of increasing inequality, the period of continuous decrease occurred as a result of GDP growth and increased public funding for research and development expenditure in many Member States. But, differences in research and development investment still remain high at the end of the period, ranging from 0.46% in Cyprus to 3.26% in Sweden in 2015.

The next thematic area is climate and energy, which is represented with three indicators. First of them is related to greenhouse gas emissions. From the Figure 1 it can be seen that there were small variation in entropy until 2008. In 2009 it increased, predominantly due to economic stagnation. After this pic, period of small variations of entropy started again and lasted until the end of period. Relatively stable level of entropy is result of more effective climate and energy policies implementation. Another indicator in this area is share of renewable energy sources in final energy consumption. Figure 1 undoubtedly shows that the continuous decrease of differences in this indicator was reordered among EU members during the study period. This is predominantly result of accelerated growth in renewable sources investment. Over time, the EU has become a leader in this respect. Although the EU as a whole has made significant progress in this area, in most member states additional efforts are needed in order to improve the situation in this area. This is also indicated by the large differences in the targets among EU countries, ranging from 10% in Malta to 49% in Sweden. Third indicator in energy and climate area is energy efficiency which is represented by the level of primary energy consumption. It is clear from Figure 1 that entropy for this indicator was stable and somewhat lower until 2009. The reasons for such a trend were successful implementation of energy efficiency policies and, after 2007, low level of economic activity caused by the global economic crisis, which resulted in lower consumption of primary energy in all member states (similar as in the case of greenhouse gas emissions). After recovery of economic activities, there was a significant increase in the primary energy consumption, but also differences among EU members became higher because recovery pace differed a lot. Until the end of the period there were some small variations in the entropy for this indicator. The improvements in energy efficiency due to implementation of new policies are considered to have contributed to decrease of entropy during the last two years of the observed period.

Next group of indicators are those in the education area. The first indicator in this group is rate of early school leavers. From Figure 1 it is evident that there was continuous decrease in differences among EU members until 2012. The difference between the highest rate of 38.3% recorded in Portugal and the lowest 4.9%, achieved in Slovenia, has been halved during the period. Most of the southern European countries recorded a significant reduction in this rate, especially Portugal, Spain and Greece. There was slight increase in entropy until 2014, having in mind that some of countries have met their targets and other were still lagging. In 2015 trend of decrease was continued, predominantly due to further reduction in rate of early school leavers in mentioned southern Europe countries. Another indicator in mentioned area is people aged 30–34 who have completed higher education. The calculated entropy for this indicator recorded slight but continuous decrease over the period. The greatest progress was made in countries that have accessed in EU in 2004, but also Portugal, Spain and Greece (which is partly the result of reduction of early school leavers). The increase in tertiary educational attainment levels across the EU members to some extent reflects countries' investment in higher education to meet demand for a more skilled labor force and the shift to shorter degree programs following implementation of Bologna process reforms in some countries.

The last but not the least important area is poverty, which is represented by the share of people out of the risk of poverty or social exclusion. The calculated entropy for this indicator recorded variations during the period. There was some increase in entropy for this indicator in 2007, which is

primarily result of new member accession. Bulgaria and Romania significantly increased differences in share of people out of the risk of poverty or social exclusion among EU members, having in mind that they have accessed to EU with the mentioned share amounting 60.7% and 47%, respectively. After that, there was significant reduction in this indicator across all Member States, which resulted in decrease of entropy. But, the crisis has overturned these positive results, since it has not hit all Member States in the same way and with the same intensity. This significant and more pronounced increase of entropy occurred in 2010 and lasted until 2012. With the first signs of recovery there was a sharp drop of entropy in 2013 and it was relatively low and stable until the end of the period.

Generally observed, it can be concluded that the greatest progress was made in the reducing the differences in share of renewable energy sources in final energy consumption, where the gap between Member States was the highest at the beginning of the period. However, despite this, the differences in this indicator remain the highest at the end of the period. On the other side, the lowest gap was recorded in the level of employment during the period. The next indicator by the level of entropy at the end of study period is people aged 30–34 having completed higher education, followed by share of people at the risk of poverty, greenhouse gas emissions, primary energy consumption, early school leavers and research and development investment.

6 Conclusions

The more prominent process of globalization, numerous challenges for the development of the economy based on knowledge and innovations, the growing problems of environmental protection in conditions of accelerated growth of economic activity, primarily due to the use of energy from traditional sources, imposed the need to formulate and implement an EU development strategy that would ensure its long-term sustainable growth and development. In this regard, the Europe 2020 Strategy has been adopted, which defines goals and instruments aimed at strengthening the competitive position of the EU in a substantially changed conditions on the world market, but also to improve the standard of living and environmental protection.

The application of the entropy method has made it possible to identify inequalities in the achievement of the set targets among the EU member states during the period 2005-2015. The obtained results indicate that the greatest reduction of the differences in a given period was achieved in the area of increasing the share of renewable sources in the total energy production. However, despite significant progress, the differences in this indicator remained most pronounced at the end of the observed period due to the poor starting position. The next segment with significant differences is the area of research and development investment, where the appropriate set of measures should also be implemented in countries that are still lagging behind. These are mainly the countries of Southern Europe where the economy is still not operating at a satisfactory level, and the state does not have enough budgetary resources for these purposes. Indicator with slightly lower differences is the share of the population aged 18-24 who leave education, which also requires significant reforms of the education system in individual member states. Slightly lower differences are recorded in the area of primary energy consumption, with small variations during the period. The next area where the differences at the end of the period were considerably lower is the area of greenhouse gas emissions. Differences in this area and tertiary education had a very similar trend of very low variations. The most

pronounced variations during the observed period were recorded in the area of poverty and social inclusion, primarily due to the effects of the global economic crisis. And finally, the lowest differences between Member States were made in the level of employment. This can be partly explained by the fact that considerable progress has been made in this area during Lisbon Strategy implementation, which has been largely focused on this area, but also by effective labor market reforms.

The European Union is a complex conglomerate composed of countries of different levels of development. For the last ten years, the differences have been reduced, to a lesser or larger extent, but are still present. This is confirmed by the results of the research presented in this paper.

The goals set by the Europe 2020 Strategy on Improving the European Union's competitive position can only be achieved in the context of a higher level of harmonization of all segments of economic and social life. This is also an important prerequisite for accelerated economic growth and long-term sustainable economic development of the Union.

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APPLICATION OF THE OUTRANKING DECISION-MAKING METHOD IN THE EVALUATION OF NUTRIENT WATER POLLUTION

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Abstract: This paper presents an evaluation of the Danube water pollution in Serbia, from the aspect of the content of nutrients in water, using the outranking method of multi-criteria decision making analysis (PROMETHEE). Indicators of the content of nutrients in the water (total nitrogen, nitrite, nitrate, ammonium ion, total phosphorus and orthophosphates) were used as criteria for the ranking of locations on the Danube, along with appropriately assigned weights for each criterion. Based on defined criteria, five locations along the river were analyzed. Also, in order to get a better insight in conflicting criteria, we performed visual descriptive analysis using GAIA plane. Results of the complete analysis showed that the location of Bezdan (the entry point of the river flow in Serbia) was the most polluted one and so the variations of nutrient content on a monthly basis at this location were observed, while the conclusions were made.

Keywords: PROMETHEE method, nutrients, pollution, the Danube.

ORGANIC PRODUCTION IN REPUBLIC OF SERBIA

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Abstract: In most countries organic production has become an important element of agriculture.Organic production presents a specific type of agricultural production, which in recent times is increasingly gaining importance, first of all, as an exceptional quality, preservation of nature and, the most important - human health. It is believed that it has developed due to previous overuse of chemical and other harmful ingredients in food production. From this situation is produced organic production, which does not use chemicals, and has a very positive effect on the health and quality of people's lives. Considering the actual development of organic production has developed the need for scientific research of this type of agriculture. Bearing in mind the theoretical significance as well as the practical importance and the healthful of organic production, this paper has the purpose of exploring the possibilities and significance of the developing organic production in the Republic of Serbia.

Keywords: *organic production, agriculture, Republic of Serbia, Europe.*

1 Introduction

The World Health Organization (WHO) warns of an increase in mass non-communicable diseases caused by improper lifestyles and exposure to risk factors for their emergence. The WHO's first Global Report on "today's leading killers" states that in 2008 more than 63% of all deaths, or 36 million people across the globe, died of non-communicable diseases, the main threat comes from non-communicable diseases that are often the result of poor nutrition, bad habit, the influence of the natural environment or stress. Therefore, they significantly affect the economies with low and medium average income, which means that it is not only medical, but also become a social and economic problem [1].

The consumer is not an expert in many fields (medicine, technology, chemistry, biology, agriculture, toxicology, etc.) to follow all recommendations, for example, WHO, in order to provide quality food to him and his family. Or is it perhaps the responsibility of the responsible authorities to guarantee citizens safe food in the facilities that are intended for their distribution? Quite often, there is an affair about the composition of products, which in the previous period most often pointed to the presence of different toxins.

In essence, the fact is that in the 21st century, the century of science and incredibly rapid technological development, something that should not be a problem, because of the overall development of society, is essentially what it means that eating what we eat does not have any significance for health, except to have full stomach.

Organic agriculture is most often and clearly defined through its goal, which is the production of health-safe, quality food, in an environmentally sustainable way. The objective of organic agriculture is to improve the state of interdependent and related factors, that is, to coordinate the preservation of land, the development of plants, animals and humans. The rules used to define organic production and organic agriculture limit use of pesticides and fertilizers to almost nothing [2].

Organic agriculture defined in this way means [3]:

- Use of natural resources in a sustainable way (to preserve and leave natural resources in the next generations);
- Preservation of the ecosystem;
- Maintenance and increase of soil fertility;
- Reduction of all forms of pollution.

The basic principles for the development of organic agriculture were set by IFOAM (International Federation of Organic Agriculture Movements). These standards are base for EU regulations, then Codex Alimentarius, as well as the Law on Organic Production of the Republic of Serbia.

Table 1. Organic Agriculture: Key indicators and Top Countries

Indicator	World	Top countries
Countries with organic activities	2014:172 countries	New countries: Kiribati, Puerto Rico, Suriname, United States Virgin Islands
Organic agricultural land	2014:43-7 million hectares (1999: 11 million hectares)	Australia (17.2 million hectares: 2013), Argentina (3.1 million hectares) US (2,2 million hectares, 2011)
Organic share of total agricultural land	2014: 0.99%	Falkland Islands (Malvinas) (36.3%), Liechtenstein (30.9%), Austria (19.4%)
Producers	2014: 2.3 million producers (1999: 200 000 producers)	India (650 000; 2013) Uganda (190552) Mexico (169 703; 2013)

Source:Willer, H., & Lernoud, J. (2016). The world of organic agriculture. Statistics and emerging trends 2016 Research Institute of Organic Agriculture FiBL and IFOAM Organics International.[4]

FOAM EU (2014) emphasizes the most important points of improvement to the current legislative framework for organic production [5]:

- Increasing the effectiveness of controls of European and third country operators;
- Moving to a '100% organic ingredients' approach (away from a '95% approach'), cutting the list of non-organic ingredients by half in organic processing and improving origin labeling;
- Reducing exceptional rules and increasing transparency in the regulation using a step-by-step approach;
- Introducing requirements for measuring environmental performance by organic processors and traders and
- Enabling group certification for small farmers in Europe.

2 Organic agriculture in the Republic of Serbia

The national organic organization for organic production development, named Serbia Organica, was established in 2009 with the aim of supporting the development of organic production and promotion of organic production in the Republic of Serbia. In addition, there are several other organic production associations: Terra's, Green Network of Vojvodina, Vojvodina Organic Agriculture Cluster, Center for organic production Selenča, Center for organic production Uzice, Eco-Energy Organic Food Production Association.

Different types of alternative production (organic agriculture, ecological, biological, etc.) most reflect the breakthrough of the concept of sustainable development [6]. The Republic of Serbia has many good prerequisites, especially natural conditions, for the development of quality, health-safe, organic food, and therefore, much more needs to be done to educate all stakeholders in organic agriculture: advisers, manufacturers, consumers.

With the entry into force the new organic production regulations in the EU, the Law on Organic Production were adopted in Serbia (Official Gazette of RS No. 30/10) and its implementation started on January 1, 2011. The Ministry of Agriculture publishes a list of authorized organizations for the control and certification of organic production. In 2017, this activity is performed by Organic control system Subotica, TMS CEE Belgrade, Control Union Danube Belgrade, Ecocert Balkan Belgrade, Food Research Center Belgrade and Ecovivendi Belgrade [7]. Within the Serbian Chamber of Commerce, there is also the Center for organic production. In accordance with the Law on organic production, the certified organic product is marked with the label "Organic product", by the code of the authorized organization and the national symbol. The condition that the product bears the sign „organic" is that it contains at least 95% ingredients of agricultural origin produced by the organic production method.

According to a survey conducted in the Republic of Serbia, as much as 75% of respondents claimed that organic products are healthier, but the same numbers of respondents were not familiar with the organic food law. Also 50% of respondents said they were prepared to pay more for organic products. This research has also led to the knowledge that as much as 84% of respondents do not buy organic products, and 50% of them think that too high price is a limiting factor. Those who buy organic products usually buy them in markets, supermarkets and specialized stores [8].

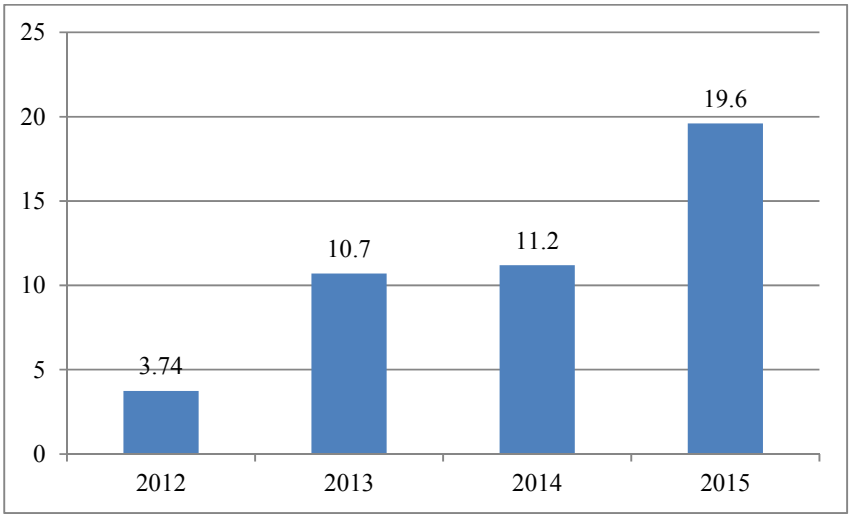

Figure 1. Export of organic products in Serbia, in milion EUR [9]

Organic products are one of the largest export potentials of the agrarian sector of the Republic of Serbia. In the period 2012-2017 exports of these products have grown by about 500% and continue to grow. The types of products which are mostly exported are based on low level of processing and are mainly frozen fruit and fresh vegetables.

In the Republic of Serbia recorded growth in terms of area involved in organic production, as well as the number of animals and the number of producers of organic products. Organic production in 2015 took place on a total area of 15298 hectares (with meadows and pastures).

Compared to 2014 (9547.8 hectares), the total area increased by 60.25%, which is a significant increase. If is observed a 5-year period, total organic areas are increased by 261.3%. Total arable land used for organic production in 2015 (without meadows and pastures) amounted to 13. 298 hectares and represents an increase of 67.53% compared to 2014 when the area was 7998.5 hectares [10].

Table 2. Overview of the share of organic production in the Republic of Serbia

Year	**Surfaces under Organic production (in hectares)**	**Share of organic production areas in total utilized agricultural land (%)**
2012.	6340	0.18
2013.	8228	0.23
2014.	9547.8	0.28
2015.	15298	0.44

Source: Simić, I., (2017) Organic Agriculture in Serbia, National Organic Production,Organica Serbia, p.16.[10]

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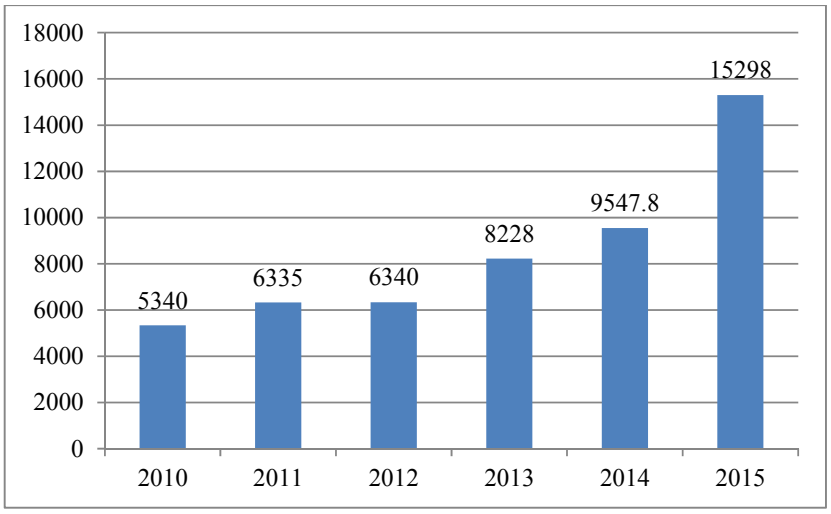

Figure 2. Areas under organic production in the Republic of Serbia [10]

The largest share of organic production areas is taken by fodder production (68.7%), including meadows and pastures. On the other hand, in the total arable crops are predominant with 31.7%, then fruits with 21.6%, while vegetables are grown only 1.3% of the area compared to the total area under organic production. Compared to 2010, the number of organic producers has increased significantly in 2015. Of the 137 producers that were in 2010, in 2015 this number reached as many as 2000 producers.

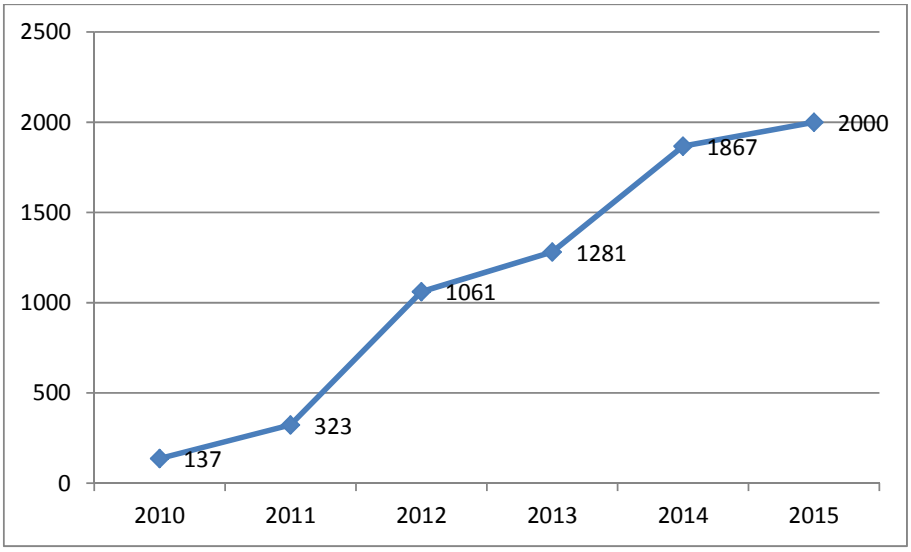

Figure 3. Number of organic producers in the Republic of Serbia [10]

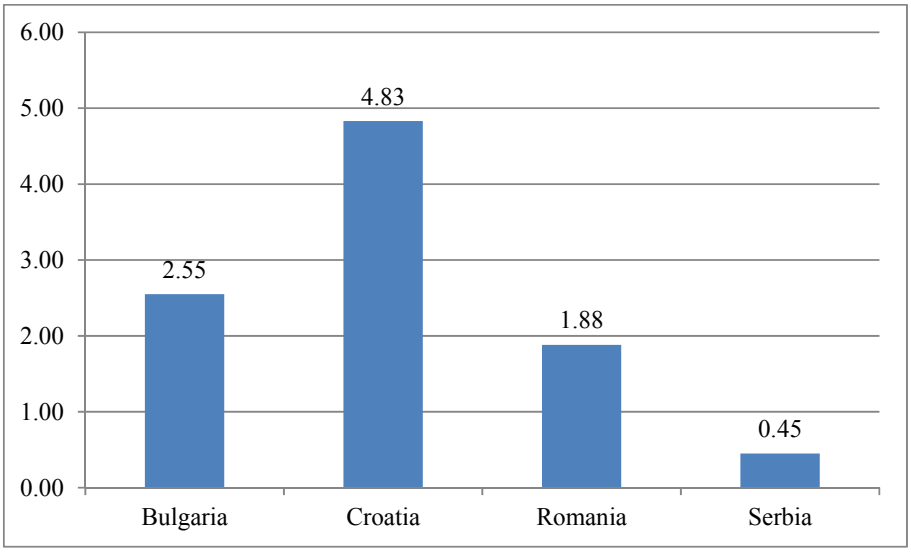

Figure 4. Share of organic production in total agricultural land (in %) in Republic of Serbia and neighboring countries, 2015. [11]

Figure 4 shows a comparative overview of organic production in the total agricultural land in Serbia and surrounding countries. Comparing with neighboring countries, Serbia has the smallest share of organic production, while Croatia is the leader in this parameter. Since Bulgaria and Romania, as well as Croatia are members of the European Union, they adopted organic production regulations, but it is expected that Serbia will increase this participation in the future, bearing in mind the impressive prospects of Serbian agriculture and intensification of access process to the EU.

3 Conclusions

Organic production in the Republic of Serbia has great potential for development. As shown in the paper, organic production in the Republic of Serbia has recorded enormous growth. However, in comparison with the countries in the region which are the members of the European Union, this growth is still insufficient. Certainly, organic production is growing worldwide and this trend is present in the Republic of Serbia. A possible solution for reaching level of EU can be found in organic producer associations.

Also, it is necessary a marketing plan to ensure the long-term implementation of healthy lifestyle strategies. Marketing presents a series of activities, instructions, process creation, communication process which provides and exchange values for customers, clients, partners, and society as a whole. Lobbyists through the media should provide support for a public opinion that is very inclined to accept what society recognizes as right. It is especially important to present "organic" messages in the right way, through effective communication and the collection of the right information, because it is never too late to adopt healthy living habits.

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RISK MANAGEMENT IN A HUNGARIAN UNIVERSITY

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Abstract: The implementation of risk management procedures in Hungarian public institutions is relatively new. It has been mandatory and widespread only for the last few years.Inthis analysis the authors take on potential risks facedat a Hungarian state university. The essence of this paper a case study. The examination is made to analysation ofarisk management survey used in 2016 and reused as well as continued in 2017.Consideration and evaluation of potential risks were originally done by organizational units and then selected for expert work. This is the starting point at the university level.During the analysis, the threats were grouped by different aspects. However, these risks usually do notmeet risks that are generally described in risk analysis manuals. The analysed risk assessment includes several aspects which concern overall operations and which are more general questions of the higher education than the problems at the university level. Of course, every university has risks for example demographically one due to the demographic reasons. Or even the tightening of the recruitment system is a consequence of the public education policy.Since many factors that pose significant risks are missing of the document analysed. This several or different indicates which are developed as risk factors for the university were mastered by few professionals and probably not involving major publicity. This can predict the following problem: How can the university make this undoubtedly useful tool accepted among the employees?

Keywords: *Risk Management, University, Hungary*

1 Introduction

In Hungary in the 2010s is taking place a strong political centralization. A centralized education system has been established from elementary schools up to universities. At the highest level of education - in the sectoral ministry - the higher education leader is a manager-oriented person.Public roles in higher education are changing [1]. Management competencies are transforming [2].The economic responsibility of governing universities converted into a chancellor system. This brings a new perspective in the management of higher education institutions.As there is very little information on organizational transformation, historians of Hungarian higher education are looking for historical parallels [3].

Initial centralization measures may follow a consolidation period. Relative calm gives new opportunities to introduce advanced management techniques in higher education, what are similar with methods of company management. However, this approach is less likely to be expected from academic academics with top academic backgrounds. The educational government establishes a parallel, decisively administrative institutional system, with chancers. Central government influences local decision-making processes through chancelleries. At universities, the rector and the chancellor jointly make the decisions, thus strengthening consensus cooperation. (Here and now, let's see whether the central educational policy will in the meantime become stronger or the local leadership.)

This organizational change is very significant. The universities have built on the divisional organizational model: they had relatively autonomous responsible units. The university has been a one-

dimensional, decentralized and one-line organization [4]. As a result of this change, develops a two-dimensional and multi-line organizational form, in which the leaders adapting to one another's aspirations, make common decisions [4].

The matrix organization, if it works well, can be a modern organizational form that can bring the knowledge, that is concentrated in the knowledge centers, like in the universities. At the current stage of constructing an organizational form - realistically considering the organizational resistance in traditional structures - top-down processes can be observed. At present, workers at the lower level of the hierarchy have the task of executing the "top" tasks in the form of instructions. It is a good question, that the central power will have a future intention to include the knowledge of the lower levels in the initiator role. This is a difficult task. Professors and administrative staff behind the changes are not so much up to modernity, but they see the administrative unfolding and completeness of the chancellor system. Even the lawyer is concerned primarily with the administrative side of the new organizational framework [5], and not with the potential that the new organization can make for better functioning.

The risk management of universities is not only seen in Hungary as one of the best practices. Many foreign institutes [6] and authors deal with this problem, and are trying to provide guidance and advice [7-11].

First step in organizational transformation is the initial status assessment. In this context, universities in Hungary perform, among other things, risk analyzes. In this paper we present an example. Since the results of our analysis can be largely generalized in the whole of Hungary's higher education, we do not name the university whose documents we worked on.

2 General risks: direct and indirect effects of state measures

There are problems in the 2016 risk assessment of a given university in which public condensation is observed. University-level risks include those that have an impact on all higher education institutions. Such is the risk from demographic processes. It is easy to see, if fewer children are born and grow up, then they will be less students in the universities.

The universities in the capital have a significant advantage. The demographic situation is exaggerated by rural institutions of higher education. Rural unfavorable processes, including aging, impoverishment, slamming are phenomena, that talented young people encourage to move in the capital. Paradoxically, the major universities in Budapest have profits from the country's unfavorable demographic processes, and this is clearly apparent in the changes of the number of university graduates.

"*State funded student numbers may be reduced due to the increase in the range of points*" as a risk of losing the student's lump-sum to the entire higher education segment. This finding can therefore appear in the risk disclosure of any higher education institution. Likewise, all the universities in the capital could be concerned at the risk that the number of students enrolled could be reduced due to the increase in the number of competitors ("*Due to the increase in the number of competitors, the number of students enrolled can be reduced*"). At this point, we must add an extra point, that while in the present-day Hungary universities have rural campuses, then rural higher education institutions can not

be sure of their training in Budapest. Thus, rural institutions are faced with a double disadvantage: they have got not enough possibilities for talented students and young people,becausethey are going to Budapest to hope for a better future, and rural universities in place must struggle withfamous universities from Budapest. In addition, if this is not enough: the universities in the capital often offer state-funded training,and their students hope, that they will be easier to get into one of the popular training institutes in Budapest. In summary, it can be said, that even though the universities of Budapest have a sense of competition for the students, and the growth of the number of competing institutions is not necessarily felt. However, it is also true, that this may change later, so it must be included among the risks.

The following risk is also referred to the difficult processes of state intervention: "*Good practices in workflows and contradictions of a frequently changing legal environment can cause interruptions in operation*." For example, individual institutions may feel in their everyday operations when a Chancellor acting on the central provision governs an area with their internal instructions previously covered by the Rector's Office, and this rule respects its mandate for many years. If the chancellor proves stronger, then the danger is, that the new rule will be difficult to follow, or may be inconsistent, e.g. a worse condition will occur in the operation.

State legislation has another direct impact on the operation of a university. In the document analyzed, this was identified as a risk that "*Due to the regulation of the procurement procedure, we may not get the product that we originally ordered*". This may also be a problem for a substitute product. However, if it is a work tool that can not be used in such cases, then the equipment will be missing, and on the other hand, there will be an unnecessary tool. For a computer, it may also be wasted if a PC can not run any software that is needed for education or administration. It may be unpleasant if you must buy one of the previous versions of a software. This also appears among the risks identified: "*The lack of educational software can cause a breakdown in practical training*". For technical equipment, it may even lead to an accident if you do not have the proper or customized machine line for service or maintenance.

State centralization measures, mainly due to the public procurement obligation, have further difficulties and risks. These include "*The long lead time of a forgiving asset can cause a supply problem*" -e.g. when the educational and administrative processes are complicated or impossible because it is outdated at the end of a lengthy purchase time (or missing when it is not there). A related problem is that because of the risk of accumulating a large amount of security stocks due to the long lead time of a current asset, it is possible to obtain quantities that can not be properly stored. This can be a hotbed of wasting much more than what is needed, that is, too large quantities of orders. In other cases, however, it is anticipated that the expected amount is not anticipated at the time of purchase, so fewer orders are received than needed: "*Due to the lengthy process of purchasing assets, the pre-calculated order quantity may not be appropriate*."

In this context, there is another risk that "*the impossibility of ad hoc purchasing due to current regulations may lead to the inefficiency of certain assets*", but this would not be directly attributed to the effect of state measures. We think this could be improved with due care and foresight.

In the entire Hungarian training system, there was the risk that "*Underfunding of directly assisting teachers / educators could cause migration*", e.g. the ability of the competitive sector or the ability to work abroad employs a qualitative labor force. However, this is mainly true for the technical (physical) workforce. Along with the fact that the retirement of those retiring in the meantime is becoming more and more difficult (as a risk, it appears as "*Due to the inability of the tutors to open a*

lecture, the faculty of the faculty can fall below a critical level"), this seems to be an increasingly difficult situation. Indeed, and indeed, they do not pose a real risk. It is true that there is a fluctuation among the physical workers, but their substitution among the universities of Budapest does not cause any real difficulties: there is an employee replenishment from the countryside. Not only talented young people are coming to the capital, but also many employees in the hope of higher earnings. This can be explained by the territorial disparities in Hungary, rural disadvantages, poverty, deprivation [12]. By September 2017 a nationwide shortage of teachers emerged. However, this is crucial to public education. The extraction effect of the private sector is an old problem: earning much money in universities can hardly be.

The "*Difficult course of contracting outsourcing with outsourcers can cause disruption to regular work*" risk has emerged for one of the universities specifically for the purchase of services through public bodies. There are some functions in the education that appear in public funding primarily in public education, general and secondary schools. Such as swimming pools, sports grounds, sporting facilities, cases. While many secondary schools have their own swimming pool, universities do not normally have this. Or few universities have their own gym. At the same time, the curriculum is a compulsory subject for physical education, which can typically be accomplished by concluding a cooperation agreement with a (state) institution with unnecessary sports and sports equipment capacity. In the meantime, however, institutions with sports facilities have been placed under state central control. The new situation has just been made clear to new leaders. The organization of university physical education classes for a few months was very difficult.

3 Internal Risks

Among the internal risks we listed the factors that universities could address with internal organization, attention, and innovations. This does not mean that internal risks can not have its roots of central origin. A significant part of the internal risks is general, probably all the Hungarian higher education institutions could be formulated. There are also some of the risks that can be identified only in that university.

Almost all universities in Hungary are struggling to find the number of training places to run an effective dual training system. This is expressed in the following risk: "*Due to the scarcity of business relationships, the differences between theoretical education and practice can increase*", which means that there is a negligible amount of support that provides practical training at a suitable level.

It is also the general risk that we should bear in mind the internal problem that "The cumbersome, lengthy process of repairing the corrupted devices may make it harder for daily workflows" and that "Deterioration of some devices may not be predictable". Although the document describes them as two separate risks, it really is that there are devices that we do not buy in just to be - for example, printers on computers - it is unpredictable for their downtime (staying at the printer: it is difficult to calculate how many years), but if they break, they are slow and difficult to repair. There is the risk that "the lack of maintenance work can cause problems in education". The internal risks appear that the university neglects the maintenance of its machines and assets.

Further risks are grouped into administrative tasks. Another common problem is that "*Insufficient administrative processes cause multiple documents to be unnecessarily stored in multiple locations*". Before thinking that there are personality protection and data protection reasons behind this phenomenon, the makers of risk analysis are more likely to think that public bodies often collect and collect data that are centrally stored within the university and that the necessary information at the time of delivery. A general problem is that "*Flow of information flow in the university may cause some workflow problems*". This risk has increased considerably with the establishment of Chancellery offices. There are also a lot of problems that the IT departments or other organizational units are getting late and incomplete. These, in the first instance, cause significant overwork or disruption in organizational units of an economic nature. The "*slowness of some administrative procedures facing everyday activity*" risk identification was signing and returning of contracts is very slow on a regular basis, causing a significant amount of overwork.

When we are interested in any university of Hungary, it is almost certain that there will be a set of problems related to the electronic learning system. Among the identified risks of the university, this is as follow: "*The failure or slowness of the Neptun system may cause interruption in some administrative workflows*". It results in a significant amount of additional work that "*IT systems can not be linked, and this causes excessive administrative burdens*", which refers to the interconnection of the so-called Poseidon and Neptun systems in the given higher education institution, and broadly all the administrative and registration software, system.

At the university from where we received the analyzed document, the administrative local problem was that "*frequent personal changes in the center may lead to an infiltration of information*". This is especially noticeable for staff dealing with student learning issues, which may jeopardize the reputation and reliability of the whole university and may undermine it: "*A lack of quality workforce may make it difficult for the Department of Education to work*." The authors of the risk analysis suggested that there were so many exits, maternity leave and disease fluctuations in each university that they had already endangered their functionality. And because these posts have very low wages, a positive change is hardly expected.

The aspect that makes mistakes in the administration process correlates with the disruption of organizational behavior seems to be subjective: "*Increasing the admissions burden may give you extra errors during workflows*." It is difficult to feel the real problem of "*Creating non-wholly thoughtful smoking places can lead to the creation of ventilation problems*": it comes to the fact, that one of the smoking areas has been constructed tooclose tooffice.

4 Summary

In our paper we analyzed a document exploring the risks of a university in Hungary. We have been particularly concerned about the risks that may seem to be problems in the whole of Hungary's higher education system. Risk management is part of strategic planning. Future activity, which seeks to reduce present risks in the future.

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PRINCIPALLY MELIORATIVE METHOD FOR COMPLEX ANTI-EROSION PROTECTION OF A TERRAIN WITH PERENNIAL CROPS

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Abstract: The aim of the project was to suggest a method for complex anti-erosion protection of a terrain, where on the natural grassy vegetation was planted vineyard. The cultivation of vineyards on the terrain was successful in the technological aspect, but several years exploitation of the plants caused an active erosion process. The study was based on an analysis of the soil, climatic and topographical conditions of the terrain in Chelnik village, Bulgaria and aims to offer a complex system for anti-erosion protection of the terrain. The soil within the boundaries of the terrain is Pellic Vertisols.

Keywords: *erosion, Pellic Vertisols, terrain, vineyard*

1 Introduction

The study was based on an analysis of the soil, climatic and topographical conditions of the terrain in Chelnik village, Bulgaria and aims to offer a complex system for anti-erosion protection of the terrain. The soil within the boundaries of the terrain is Pellic Vertisols. The development of linear forms of erosion was found along the western boundary of the object, in the area where the cadastral fields bordering the adjacent hydrographic network. The meliorative task requires reinforcement the slopes of the gully. The reinforce of the slopes have to be done depending on the degree of development of the processes of coastal erosion. The aim of the project was to suggest a method for complex anti-erosion protection of a terrain, where on the natural grassy vegetation was planted vineyard. The cultivation of vineyards on the terrain was successful in the technological aspect, but several years exploitation of the plants caused an active erosion process.

1.1 Soil melioration characteristic

1.1.1 Taxonomy and general soil characteristics

The soil within the boundaries of the terrain is Pellic Vertisols. The studied terrain is situated in the conditions of partial erosion and partially accumulated hilly relief. The main slope of the terrain is from north to south. The soils are formed on a shallow weathering bark. The soil-forming rocks are Andesites and their weathering products. The soil profile is average deep and in the eroded areas is shallow. Its depth is on average between 0.8 and 1.20m. The erosion process that has formed the linear erosion shape of the relief is intensive.

1.1.2 Soil texture

The soil on the top layer is sandy clay to clay. The depth of the profile reveals an increase in the physical clay content and significant compaction [1]. Differentiation between the individual horizons is slightly expressed. The average texture coefficient is 1.10. There is a pronounced tendency to increase

the skeleton (stones, coarse sand and gravel) in the lower part of the profile, close to the solid material rock.

2 Main content

2.1 Erosion characteristics of the terrain

2.1.1 Conditions for formation of surface runoff

Surface water runoff in the terrain is formed as a result of the topographical, soil and hydrological conditions, established directly in the areas intended for melioration and in adjacent terrains. The two group areas of soil, hydrological and topographic represent a unified whole. Preview of the terrain conditions is presented in Figure 1.

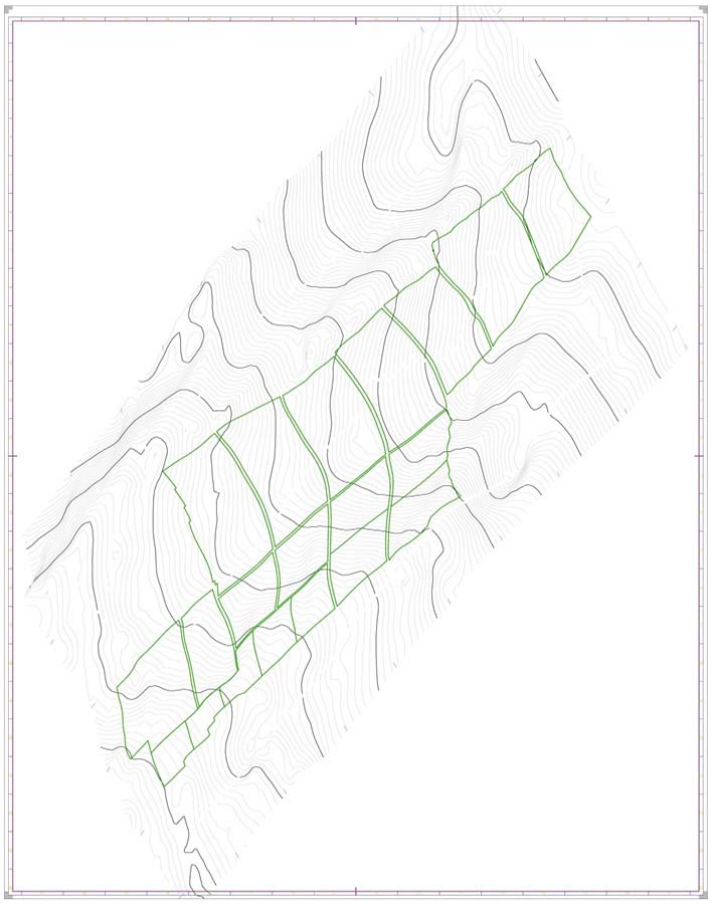

Figure 1. Model of the topographical location of the vineyards, Chelnik village, EKATTE 80306

2.1.2 Topographic conditions

The terrain is with a south exposition and a predominant north-south slope. The average altitude of the terrain is 243.52m. The slope of the terrain is differentiated by zones, depending on the altitude through 5m section. In the low southern parts of the studied terrain was found poorly drained zones, which can be characterized as accumulative zones. In this sense, the erosion danger zones in the terrain are not morphologically distinct, but they are a function of the quantity of the momentary outflow, and in particular the part of it that is formed on the top of the terrain. The map of the local areas where the topographic factor has a major role in the formation of erosion danger outflow can be seen in Figure 2.

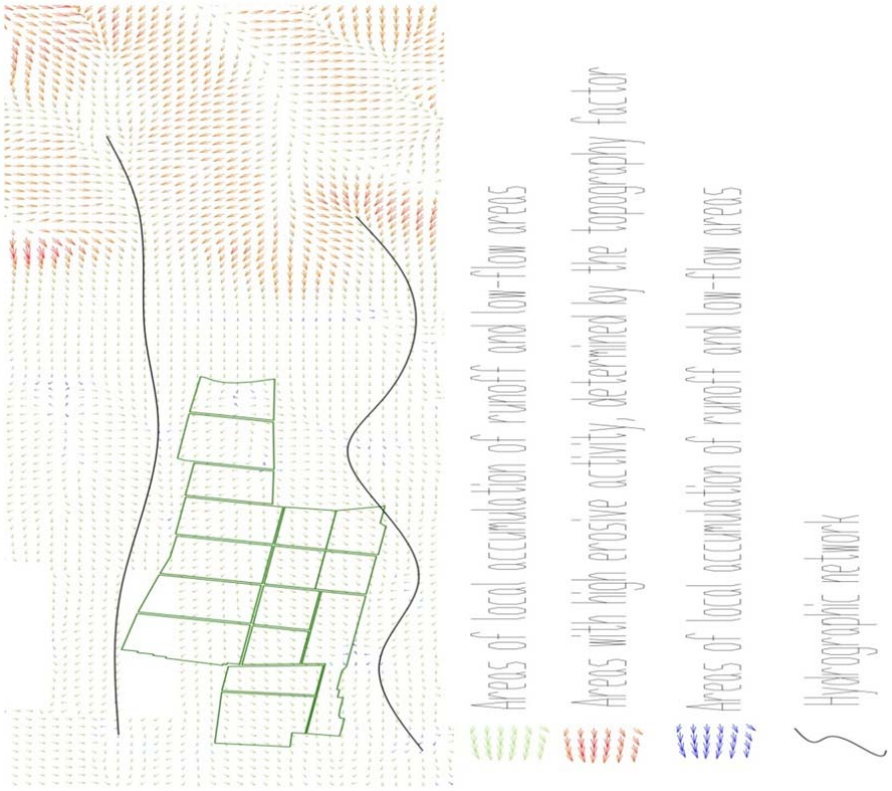

Figure 2. Results of the zoning of the studied terrain based on the topographical factor of the erosion activity - object Chelnik village, ESATTE 80306

The development of linear forms of erosion was found along the western boundary of the object, in the area where the cadastral fields bordering the adjacent hydrographic network. It is represented by a gully, developed in the north-south direction and length of about 1000m. In its the northern part the gully has adjacent offshore lands and is erosionally active, because the bottom level is located on the loose ground of the underground horizon and at the point of discharge is higher than the erosion base. The shape of the cross-section is predominantly triangular, which means that the slopes and the bottom are subject to reinforcement. The meliorative task requires strengthening the slopes of the gully.

The eastern boundary of the object is also bordered by a gully, but erosion activity along its shores has faded away, and there is no risk of new one. However its shores, are very poorly drained and around them there are zones of over-wetting of the soil profile of different depths. This is a prerequisite for the formation of top runoff at intense rainfall.

2.1.3 Climate conditions

The average annual rainfall recorded for a 50-year observation period at the base station is 546mm and varies from a range of 513 to 576mm. Greater significance has the rainfall recorded during the vegetation period of the plants - 1 April - 30 September. The average rainfall during the vegetation for the area is 294 mm (confidence interval from 272 to 316 mm) [2]. The average annual rainfall and the rainfall during the vegetation period are insufficient and do not provide the necessary moisture. According to the data from the multiannual observations, the main rainfall maximum is in the period May - June, while the main rainfall minimum - in August - September [3].

3 Reviewing process

3.1 Meliorative conception

In the parts of the terrain, which bordering the adjacent hydrographic network was found the beginning of water chanel erosion activity, as the chanel formation is active and its activity is expected to increase due to the deep erosion base. This requires the reinforcement of the newly formed slopes at the border of the hydrographic network with the off-shore lands. The reinforcement should be done permanently, aiming to reinforce the steep and shores with the hydrographic network without a correction of its route.

As the height of the shores with the hydrographic network is limited, it is sufficient the reinforcement to be only within the boundaries of the cultivated cadastral plots to achieve the meliorative purpose [4].

The erosion characteristics of the studied terrain result from the conditions of the relief, the topography, the hydrology and the properties of the soil top layer. These factors determine the presence of an erosion danger, associated with the formation of surface runoff. The runoff is subdivided into external and internal for the terrain.

Over-wetted areas create conditions for the formation of erosion alluvion, which are easy to move, because of the fine particle character of the top soil horizon. At this stage, the described mechanism causes water sheet erosion, with a tendency to channel rill erosion at the sites of concentration of the surface runoff [5].

The meliorative solution is related to the necessary for the surface runoff to be transformed into subsoil by applying two groups of activities.

- Projection and implementation of a system for partial underground drainage.
- Deep meliorative loosening of the tillable terrain, in a direction, coincident or at a small angle to the direction of the runoff.

3.2 Meliorative method solutions

3.2.1 Construction of anti-erosion terraces with reinforced slopes

It is provided that the reinforcement of the slopes have be done depending on the development degree of the processes of coastal erosion, as follows: [6,7].

- In a shallow (<1.00m) incision of the coast slope, decreased erosion channel process and slope angle of ±0.8-1.0α1, compaction of the slope is performed to a depth of 0.1m and stabilization of the newly formed top of the slope.
- In shallow (<1.00m) incision of the coast slope, active erosion channel process and slope angle, which differs by more than ±0.8-1.0α, the coastal line is reinforced with gabions.
- In deep (>1.00m) incision of the coast slope, active erosion channel process and slope angle, which differs by more than ±0.8-1.0α, the coastal line is reinforced with retaining walls.

There are three erosion zones, where the construction of reinforcement facilities is envisaged, as follows:

- Erosion zones 1
  - Construction of a terrace with a horizontal canvas, partially reinforced with a retaining wall, height up to 1.00m, with drainage of the base, reinforcement of the canvas, construction of a local drainage and water removal facility for the drainage water.
  - Mounting of gabions to reinforce the slopes of the terraced canvas, in the sections without a retaining wall.
  - Formation and compaction of earthly slopes on the terraced canvas in the part with good natural drainage.
- Erosion zones 2
  - Leveling the terrain by embankment from the Erosion Zone 1.
  - Reinforcement of the slopes of the project top area with gabions.
- Erosion zones 3
  - Construction of a terrace with a horizontal canvas, partially reinforced with a retaining wall, height up to 1.00m, with drainage of the base, reinforcement of the canvas, construction of a local drainage and water removal facility for the drainage water.
  - Construction of an open drainage system.

3.2.2 Retaining wall. Situation and profiles

The situation is presented in M 1:100 in Figure 3. The momentary levels of the ground elevations and the areas of the field collapses are indicated on the situation sketch. The angles of the slope are taken into account in order to achieve a sufficient resistance of the terrain [8].

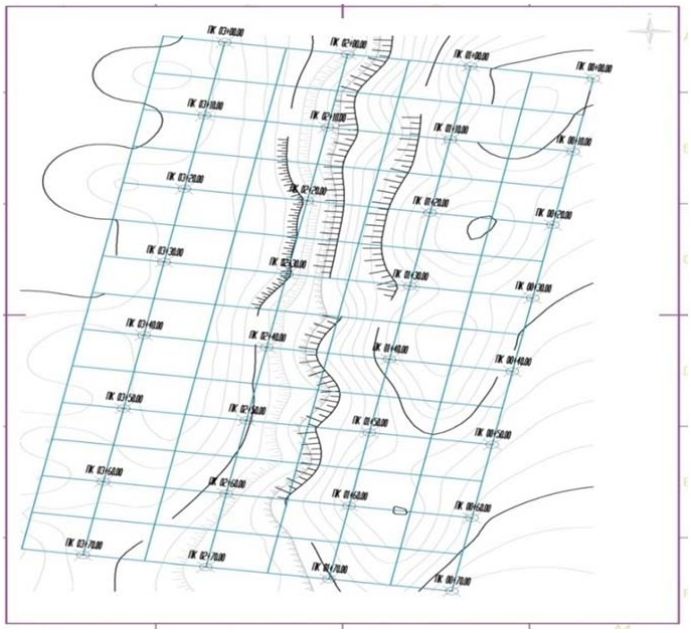

Figure 3. Situation and topographic base of Erosion Zone 1

The situation of the placement of the supporting wall by dry masonry is shown in Figure 4. The drain pipe is laid on the base of the wall of dry masonry. The drainage works, as a drainage of a perfect type, because the terrain under the base remains undamaged and therefore is with a filtration factor lower than that of the wall.

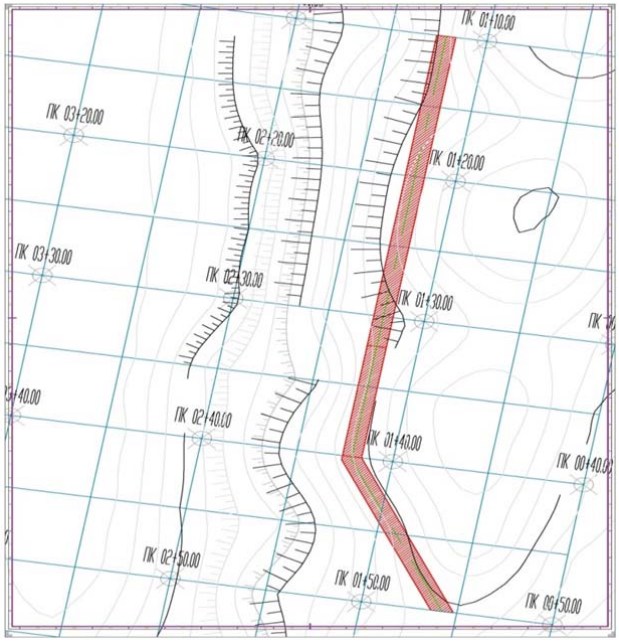

Figure 4. Supporting wall situation in Erosion zone 1

3.2.3. Reinforcement of slopes with gabions

Gabions are crafted as boxes or skeleton of steel bars ø14, wrapped with a grid of galvanized wire ø 2 ÷ 5 mm, filled with stones. They are located on the lower part of its slope as a gabion mattress. Considering, that in their baseline order, the gabions are placed in contact with a high humidity soil, it is allowed to fill only with the Andesite rocks, which are also the main rock in the region.

Gabions unfold on the level ground. After assembling and installing the gabions, fill them with the inert material. The size of the fraction should be 125-200mm. crushed stone. Gabions are filled with the crushed stone fraction, sequentially occupying the low levels of the gabions located on the same level. At every 300mm filled gabion height, install intermediate grid to reinforce the vertical walls of the gabion [9].

After filling the entire volume of the gabion, the reinforcement is tightened by wire, connecting the upper front, rear and side edges. With wire links are tightened and every two adjacent gabions. The situation and the plan for the transport of earth masses, reinforced with gabions in erosion zone 2 is presented in Figure 5.

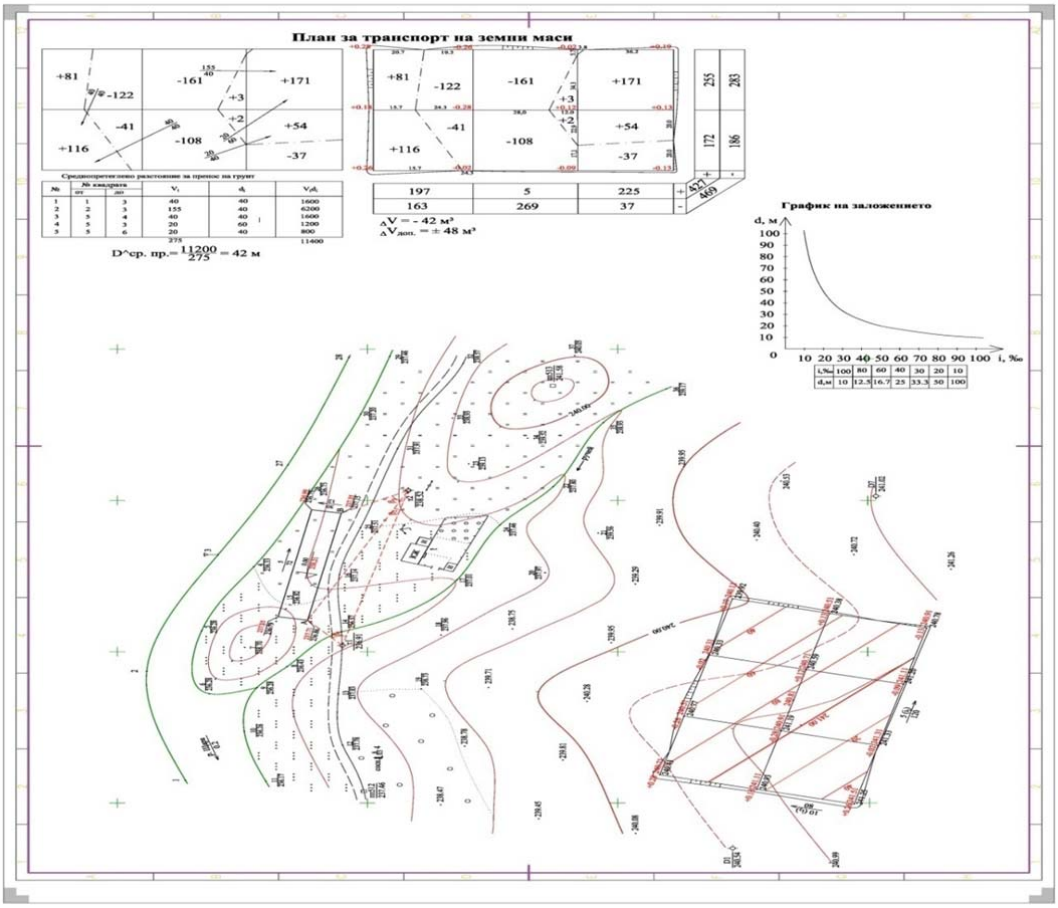

Figure 5. Situation and plan for transportation of earth masses - erosion zone 2 - gabion reinforcement

3.3 Drainage

3.3.1. Characteristics of the water catchment

The location of the terrain and its adjacent water catchment is presented in Figure 6.

The project for drainage of the section is based on the following initial data:

- Topographic plan, with a section of 1.0m.
- Nourishing groundwater – rainy.
- Depth of the soil to the water in the drainage areas 0.6-1.00m; in transit zones 1.00-2.00m.
- Coefficient of filtration:
    a. Humus horizon – 0.2m/d.
    b. Subsoil horizon – 0.5 m/d.
- Initial level – 0.00-1.00m.
- Area of the water catchment to the section - 50ha.
- Length of the main stream.
    a. Right water catchment - 1500m.
    b. Left water catchment - 600m.
- Rainfall and evaporation for the vegetation and off-vegetation period.

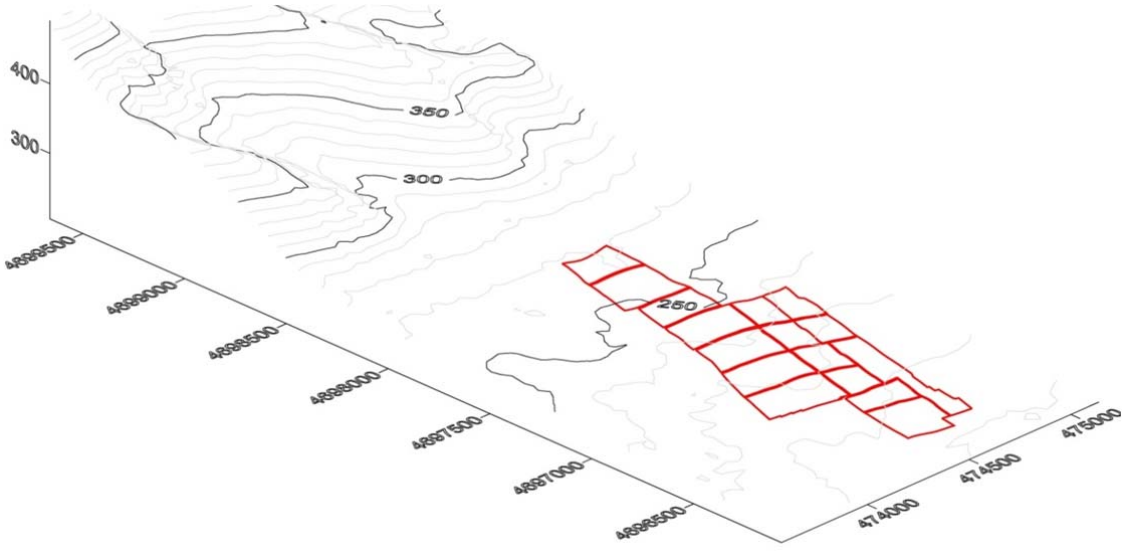

Figure 6. Situation of the terrain in the adjacent water catchment

3.3.2 Drainage routes, longitudinal and transverse profiles

The situation of the drainage elements is shown in general plan in Figure 7 and the main routes of the collecting collectors are shown, as for some of them provided with short drainage deviations - suckers, which are indicated on the longitudinal profile.

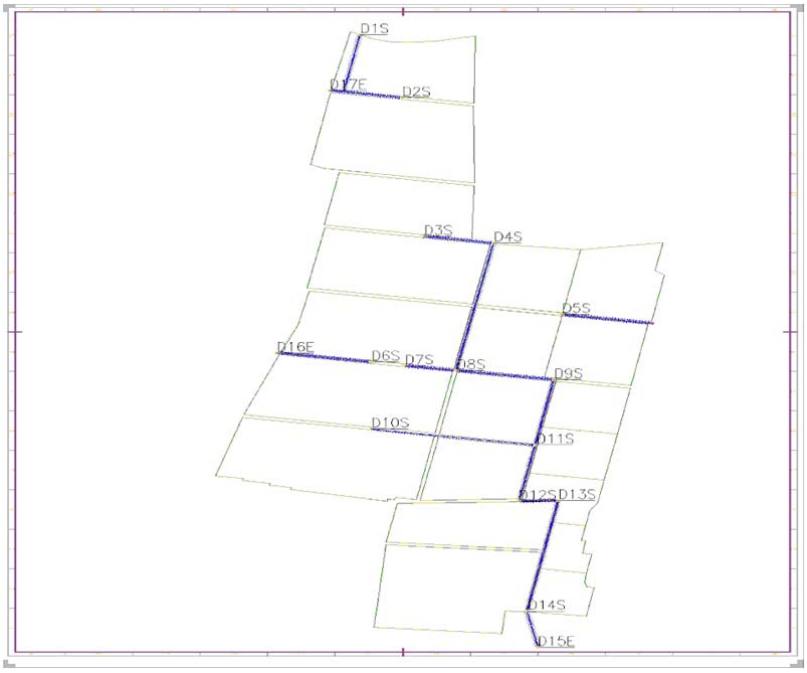

Figure 7. Situation of the routes of the drainage collectors

3.3.3 Hydraulic calculation of drainage collectors

The calculations of the drainage system capacity are performed by hydraulic resistors method. The calculated schemes are applicable at a filtration coefficient >0.2m/d, which clause is performed in the boundaries of the object.

The layers of the drainage are assumed to be single layer, when the system is located within the boundaries of the depth of the trench and for the double layers if the depth of the drainage suction exceeds the depth of trench [10].

The calculation period for water reduction is assumed for 10 days at the peak spring runoff and 3-5 for all other annual periods.

The calculations for the winter-spring load of the system envisage two variants:

- Absence of over-wetting of the soil to and above the surface of the terrain at the beginning of the period of water balance calculations.
- Full water saturation of the soil and conditions for formation of surface runoff.

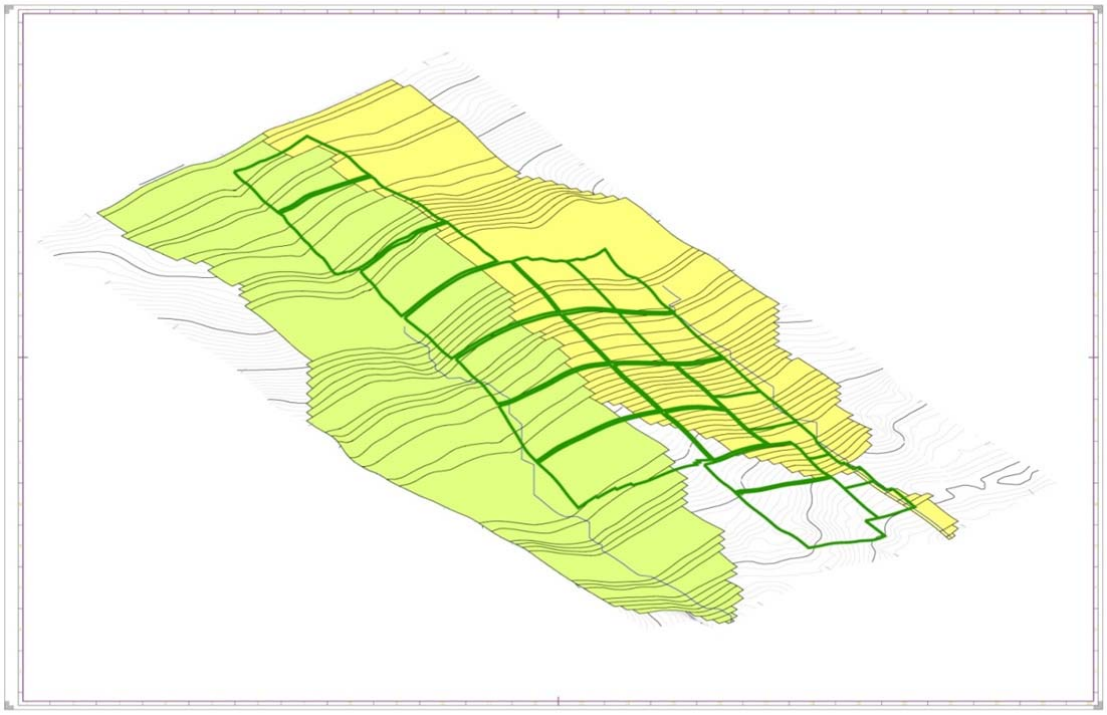

Figure 8. Analysis of water catchment areas

3.4 Technology

The section covering the drainage system will be implemented as a closed pipe systematic drainage, consisting of 12 drainage suction, located obliquely to the direction of the horizontals. The total length of the drainage suction is 4805m. They are discharged via standard PVC fittings into drain collectors. The internal diameter of the drainage suction is 132 and 80 mm. The effective diameter of the drainage suction was increased. This provides an effective diameter of 0.32 m of the drainage suction.

The drainage of the adjacent terrains of drainage suckers is carried out by auxiliary drainage wings discharged into the suction at an angle greater than 45°. Hydraulic connection to the suckers is accomplished by fixed standard PVC fittings.

The reinforcement of the pipe in the change of direction is done by wooden semi-brackets and wedge. It is planned to use a gravel. Its working height reaches the level of the terrain or is lower than it, depending on the depth at which the laying of the pipe is calculated.

At the end of the part of the sectional collector, which is intended to carry out simultaneously a controlling and conducting function, is envisaged the construction of an inspection shaft precipitator. Inspection shafts are also built into the outer edges of the drainage suckers. The openings of the shafts diverge in the rows, so that they do not interfere on the treatments.

4 Conclusions

The development of linear forms of erosion was found along the western boundary of the object, in the area where the cadastral fields bordering the adjacent hydrographic network. The meliorative task requires reinforcement the slopes of the gully. The reinforce of the slopes have to be done depending on the degree of development of the processes of coastal erosion. The section covering the drainage system is implemented as a closed pipe systematic drainage, consisting of 12 drainage suction, located obliquely to the direction of the horizontals. The total length of the drainage suction is 4805m. They are discharged via standard PVC fittings into drain collectors. The internal diameter of the drainage suction is 132 and 80 mm. The effective diameter of the drainage suction was increased. This provides an effective diameter of 0.32 m of the drainage suction. The reinforcement of the pipe in the change of direction is done by wooden semi-brackets and wedge. It is planned to use a gravel. Its working height reaches the level of the terrain or is lower than it, depending on the depth at which the laying of the pipe is calculated. At the end of the part of the sectional collector, which is intended to carry out simultaneously a controlling and conducting function, is envisaged the construction of an inspection shaft precipitator.

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INTEGRATING REMOTELY COLLECTED DATA INTO FIELD CROP PRODUCTION

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Abstract: The presentation starts with some background information related to why farmerswill benefit from remotely collected data and what the limitations of different technologies (ground-, air-, and space-based) are.

Upon presenting this background information it concentrates on the use of "copter" drones for real-life applications. Main advantages and disadvantages of such systems are presented, followed by the examples of actual application of such drones in agricultural setting.

Main avenues for the utilization of drones in precision agriculture are identified as:

- Dynamic tracking of the crop condition
- Monitoring of
  - Water regime — zones of excess or insufficient water availability
  - Nutritional regime — zones of excess or insufficient nutrient availability
- Near real-time tracking of
  - presence and development of weeds
  - emergency and spreading of diseases
  - damages from insects, rodents, etc.
- Estimating actual crop density (number of plants/m2 or ha) in closed canopy crops, i.e. winter cereals and rapeseed.
- Possibility to determine the total volume of the biomassaccumulated during the vegetation / year (particularlyin wood species)
- Precise determination of theborders and sizes (dimensions) of crop fields — geodetic accuracy(down to 2 cm) is possible
- Identification andprecise size determinationof landscape peculiarities- single and/orgroups of trees / bushes, field dividers, canals etc.
- Further discussion on the possibilities to develop prognostic and response applications of drone systems and what benefits they can bring to real-life farming is provided.

A COMPARATIVE STUDY OF ENVIRONMENTAL AWARENESS OF RESIDENTS AND COMPANIES IN BOR DISTRICT

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Abstract: Companies and residents have a significant impact on the preservation of their local environment. Bor represents one of the most important ore and metal production centers in East Europe, and due to this, environment has been polluted in this area for years. The perception about environment of people living in Bor depends on numerous factors, and a difference in opinions between the employees in the Mining and Smelting Combine Borcompany and citizens of Bor exists. This research focuses on a comparative analysis of the environmental consciousness of residents and companies in Bor, Serbia. The paper presents aspects of ecological awareness that are essential for the adoption and implementation of the environmental management concept in our municipality. In the research process, a survey was used for data collection. A sample of 209 respondents was tested. For statistical data analysis we used SPSS v17.0 based on which we derived appropriate conclusions.

Keywords: *environment, environmental awareness, environmental consciousness, Bor*

1 Introduction

Environmental awareness is created and developed primarily on the basis of ecological problems in the environment of individuals and their communities.In recent years, business has been criticized as a major cause of social, environmental, and economic problems. Companies are widely thought to be prospering at the expense of their communities [1]. Environmental responsibility has become an important keyword for more and more global companies, not only in their mission and communication message, but also in their manufacturing processes [2].

Awareness, attitude and knowledge are important components that are mentioned frequently in the literature about environmental education. Awareness is defined as concern for what is happening in the environment, while attitude is defined as the acquisition of values, feelings and motivations towards the environment. On the other hand, knowledge is defined as an understanding of the basic fundaments in the environment [3].

The goals of environmental education are:

a) To foster clear awareness of, and concern about, economic, social, political and ecological interdependence in urban and rural areas;
b) To provide every person with opportunities to acquire the knowledge, values, attitudes, commitment and skills needed to protect and improve the environment;
c) To create new patterns of behavior of individuals, groups and society as a whole towards the environment [3].

Industry is a major cause of air pollution, since the operation of factories results in the emission of pollutants, including organic solvents, respirable particles, sulfur dioxide (SO_2) and nitrogen oxides (NO_x). These pollutants can both harm public health and damage the environment by contributing to global phenomena such as climate change, the greenhouse effect, ozone hole and increasing desertification.

Air pollution is one of the most important environmental problems in the town of Bor, situated in East Serbia. The main source of air pollution with sulphur dioxide, heavy metals and other toxic and carcinogenic elements present in particulate matter (PM) and aero sediments is the Copper Mining and Smelting Complex Bor. The distribution of air pollutants is mainly determined by the copper smelter operations, as well as by meteorological parameters such as wind speed and direction [4].

Taking into account the fact that this town exists in the vicinity of the mine, as well as the location of the copper smelting plant and two more mines nearby, the town itself represents serious environmental problem of Serbia and this region [5]. The influence of pyrometallurgical treatment of copper sulphide minerals and pyrite on the environment from the aspect of ambient air pollution is dangerous to the environment and to all the citizens.

The concentrations of sulphur-dioxide released from copper smelting process are too high. For instance, the total emission of SO2 from *Bor Smelting Plant* in 2007 was 370 t SO2 per day, i.e. about 140,000 t per year – this amount corresponds to the average values from several years of 170–250,000 t [6]. According to the results it can be observed that the Bor'scitizens were exposed to the high concentration of SO_2 and arsenic which were found to be above the Serbian legislative limits.

2 Ecological consciousnesses of the citizens of Bor

For too many years the environment was nowhere near being a priority for many businesses in our town, especially those operating in manufacturing and mining industries.

The most important research results from 2013 where citizens of Borare surveyed within revision of Local Ecological Action Plan (LEAP) for the Municipality of Borindicated that there was a change in citizens' attitudes about the most important ecological problems and their potential solutions.The survey showed that ecological consciousness of the citizens of Bor is an important factor for solving ecological problems. Therefore, within the LEAP, further strengthening is defined as one of the priorities of environmental policy in next period. The survey showed that the significance and the role of environmental awareness as a factor of further LEAP implementation and problem solving environmental protection had increased. The most significant ecological problem is still air pollution (63% of respondents). New to the survey is that the other ecological problem is low ecological awareness (20%). More than half of the respondents think that the first problems that need to be solved are problems created by the mining and metallurgy industry. Further, 30% of respondents think that a new metallurgical plant needs to be built, 15% think the new plant for purification of mining and metallurgical wastewater should be built, while 13% find that flotation refineries should be recultivated. In order to improve the quality of the environment, it is first necessary to introduce new educational programs in schools (13%) and then introduce new radio and television shows (3%) [7].

During 2015, a survey was conducted to determine the level of environmental awareness of students at the Technical Faculty in Bor, University of Belgrade. The fact that the state of the environment affects our health is best shown by the opinion of examined students.According to the students of the Technical Faculty in Bor, University of Belgrade, the largest environmental problem in the municipality of Bor is air pollution (91.2% of students). Other opinions are less present, where 3.9% of the surveyed students thought that waste is the biggest environmental problem in the municipality of Bor, 2.0% of students thought that the water pollution is an important problem, while 1.5% of respondents share the opinion that the pollution of the land and low ecological awareness are the main problems.When asked about the impact of environment on health 91.2% of respondents said the environment has a negative impact on health, 3.4% of students said that the environment does not affect health, while 2.9% of respondents said the effects of the environment on health are positive and 2.4% of the respondents are unaware of the effects of the environment on human health. The above statistics is primarily relatedto the impact of polluted air on the respiratory system of the citizens of Bor [8].

3 The sample

The research was carried out on the territory of Bor in September 2016 and October 2017, on a sample of 209 respondents, where 50 respondents were unemployed citizens of Bor, while 159 respondents were employees in companies in Bor. The research targeted the environmental awareness of employees in Mining and Smelting Combine Borcompany and citizens of Bor, their attitudes and opinions, and their knowledge about burning issues related to ecology. The questions from this questionnaire were taken from authors Schreiner &Sjøberg(2005) [9]and then modified to be appropriate for our research. The answers were given on a five point Likert scale, with answers ranging from 1 – absolutely disagree to 5 – absolutely agree.

In this paper, the environmental awareness of residents and companies in Bor district was examined. This research is an upgrade of our previous research [10].Survey questions included employed and unemployed citizens' assessments and opinions on the environment and the most important ecological problems which are further developed by economic sectors.

The main assumption of the survey was that the ecological awareness of the employees in the Mining and Smelting Combine Borcompany and citizens of Bor is continuously developing. This research focuses on providing answer to the following research question: Does environmental awareness of unemployed citizens differs from environmental awareness of employees?

4 Results

4.1 Descriptive statistics

Demographic results show that 50 unemployed citizens participated in this study, as well as 159 employees. In both cases, there were more female participants (42% of total number of unemployed citizens, and 65.4% of total number of employees). Also, most participant unemployed citizens are younger than 25 years (26%), while most employees are aged between 36 and 45 years (Table 1).

Table 1.Demographic structure of respondents

	Gender (citizens)		**Gender (employees)**	
	Frequency	Percent	Frequency	Percent
Male	24	48.0	55	34.6
Female	26	52.0	104	65.4
Total	50	100.0	159	100.0
	Age (citizens)		**Age (employees)**	
<25	13	26.0	22	13.8
26-35	11	22.0	32	20.1
36-45	11	22.0	57	35.8
46-55	9	18.0	38	23.9
>56	6	12.0	10	6.3
Total	50	100.0	159	100.0

4.2 Kruskal-Wallis test

A questionnaire was employed to measure the environmental awareness of unemployed citizens and employees, which consisted of 30 questions. The scale had a medium, but acceptable level of internal consistency, as determined by a Cronbach's alpha of 0.682 (Table 2) [11].

Table 2. Cronbach's alpha

Cronbach's Alpha	**N of Items**
.682	30

The Kruskal-Wallis H test was used to determine if there are statistically significant differences between unemployed and employed residents of Bor. This is a nonparametric alternative to one-way analysis of variance (ANOVA) and it is used when there is no normality in distribution of dependent variables. Table 3 presents the ranks for each question from the survey.

Table 3. Ranks for citizens

Q	Respondents	N	Mean Rank	Q	Respondents	N	Mean Rank
Q1	1	42	113.00	**Q16**	1	42	97.74
	2	55	102.87		2	55	116.65
	3	40	106.63		3	40	105.59
	4	22	100.82		4	22	136.43
	5	50	101.16		5	50	83.99
	Total	209			Total	209	
Q2	1	42	101.10	**Q17**	1	42	126.20
	2	55	101.90		2	55	102.62

	3	40	110.98		3	40	94.19
	4	22	113.50		4	22	99.02
	5	50	103.17		5	50	101.09
	Total	209			Total	209	
Q3	1	42	129.96	**Q18**	1	42	125.45
	2	55	93.03		2	55	106.36
	3	40	100.39		3	40	96.86
	4	22	140.36		4	22	99.32
	5	50	85.33		5	50	95.33
	Total	209			Total	209	
Q4	1	42	98.45	**Q19**	1	42	55.30
	2	55	119.32		2	55	129.90
	3	40	112.50		3	40	114.64
	4	22	120.41		4	22	100.73
	5	50	81.97		5	50	113.53
	Total	209			Total	209	
Q5	1	42	124.19	**Q20**	1	42	147.12
	2	55	94.43		2	55	99.04
	3	40	94.23		3	40	106.00
	4	22	125.41		4	22	129.48
	5	50	100.15		5	50	64.61
	Total	209			Total	209	
Q6	1	42	97.42	**Q21**	1	42	162.57
	2	55	105.55		2	55	105.36
	3	40	110.06		3	40	102.05
	4	22	112.55		4	22	117.86
	5	50	103.39		5	50	52.94
	Total	209			Total	209	
Q7	1	42	115.17	**Q22**	1	42	107.02
	2	55	119.24		2	55	114.25
	3	40	90.28		3	40	125.38
	4	22	149.66		4	22	135.45
	5	50	72.93		5	50	63.43
	Total	209			Total	209	
Q8	1	42	105.69	**Q23**	1	42	100.45
	2	55	125.97		2	55	115.96
	3	40	80.34		3	40	133.26
	4	22	138.18		4	22	140.66
	5	50	86.48		5	50	58.46
	Total	209			Total	209	
Q9	1	42	107.20	**Q24**	1	42	135.31
	2	55	102.05		2	55	101.54
	3	40	105.01		3	40	109.16
	4	22	90.61		4	22	99.36
	5	50	112.71		5	50	82.50
	Total	209			Total	209	
Q10	1	42	126.06	**Q25**	1	42	140.31
	2	55	104.68		2	55	101.95
	3	40	98.34		3	40	110.85
	4	22	108.50		4	22	65.86
	5	50	91.45		5	50	91.23
	Total	209			Total	209	
Q11	1	42	128.12	**Q26**	1	42	80.43

	2	55	122.84		2	55	114.05
	3	40	64.56		3	40	111.53
	4	22	123.59		4	22	113.82
	5	50	90.13		5	50	106.58
	Total	209			Total	209	
Q12	1	42	95.32	**Q27**	1	42	82.95
	2	55	120.89		2	55	106.71
	3	40	116.95		3	40	112.66
	4	22	106.09		4	22	135.52
	5	50	85.61		5	50	102.08
	Total	209			Total	209	
Q13	1	42	109.45	**Q28**	1	42	161.14
	2	55	105.27		2	55	103.70
	3	40	80.55		3	40	106.74
	4	22	124.70		4	22	92.52
	5	50	111.85		5	50	63.37
	Total	209			Total	209	
Q14	1	42	123.71	**Q29**	1	42	119.74
	2	55	95.99		2	55	96.32
	3	40	129.08		3	40	97.93
	4	22	93.93		4	22	85.34
	5	50	84.80		5	50	116.48
	Total	209			Total	209	
Q15	1	42	116.13	**Q30**	1	42	101.04
	2	55	125.61		2	55	112.33
	3	40	102.85		3	40	128.26
	4	22	131.61		4	22	143.95
	5	50	62.99		5	50	64.52
	Total	209			Total	209	

1 – Public Utility Company Waterworks and Sewerage Bor
2 – Copper Smelter Refinery
3 – Mining and Smelting Combine Bor
4 – Copper Mine Majdanpek
5 – Unemployed

Table 4 presents the results of the Kruskal-Wallis test for unemployed citizens and employees in Bor.

Table 4. Kruskal-Wallis test for unemployed citizens and employees in Bor

Variables	Chi square	df	Asympt. Sig.	Variables	Chi square	df	Asympt. Sig.
Q1	3.069	4	.546	**Q16**	15.646	4	.004
Q2	5.301	4	.258	**Q17**	10.092	4	.039
Q3	28.647	4	.000	**Q18**	10.741	4	.030
Q4	18.610	4	.001	**Q19**	50.097	4	.000
Q5	12.487	4	.014	**Q20**	51.910	4	.000
Q6	1.499	4	.827	**Q21**	82.087	4	.000

Q7	34.148	4	.000	**Q22**	46.567	4	.000
Q8	25.818	4	.000	**Q23**	56.839	4	.000
Q9	3.582	4	.466	**Q24**	21.079	4	.000
Q10	12.583	4	.014	**Q25**	34.818	4	.000
Q11	37.503	4	.000	**Q26**	17.430	4	.002
Q12	16.383	4	.003	**Q27**	14.235	4	.007
Q13	17.717	4	.001	**Q28**	65.606	4	.000
Q14	26.166	4	.000	**Q29**	12.432	4	.014
Q15	42.925	4	.000	**Q30**	40.783	4	.000

A Kruskal-Wallis H test showed that there was a statistically significant difference in all questions except for Q1, Q2, Q6 and Q9, between employees in four different companies and unemployed citizens. Because other 26 questions were statistically significant, a pairwise comparison among five groups controlled for inflated Type I error through Dunn-Bonferroniwas conducted. The results of the pairwise comparison between statistically significant groups that include unemployed citizens and employees in different companies are shown in Table 5.

Table 5. Pairwise comparison

Q	**Sample**	**Test St.**	**Adj.Sig.**	**Q**	**Sample**	**Test St.**	**Adj.Sig.**
Q3	5/1	44.634	.001	**Q20**	5/2	34.426	.022
	5/4	55.038	.001		5/3	41.390	.007
Q4	5/3	30.530	.042		5/4	64.867	.000
	5/2	37.348	.001		5/1	82.509	.000
	5/4	38.439	.028	**Q21**	5/3	49.110	.001
Q7	5/1	42.237	.006		5/2	52.424	.000
	5/2	46.306	.001		5/4	64.924	.000
	5/4	76.729	.000		5/1	109.631	.000
Q8	5/2	39.493	.006	**Q22**	5/1	43.594	.001
	5/4	51.702	.006		5/2	50.815	.000
Q10	5/1	34.610	.007		5/3	61.945	.000
Q11	5/2	32.706	.036		5/4	72.025	.000
	5/1	37.989	.016	**Q23**	5/1	41.992	.003
Q12	5/3	31.340	.037		5/2	57.504	.000
	5/2	35.281	.004		5/3	74.802	.000
Q13	3/5	-31.300	.010		5/4	82.199	.000
Q14	5/1	38.914	.002	**Q24**	5/1	52.810	.000
	5/3	44.275	.000	**Q25**	5/1	49.080	.000
Q15	5/3	39.860	.007	**Q26**	1/5	-26.151	.043
	5/1	53.141	.000	**Q28**	5/2	40.330	.004
	5/2	62.619	.000		5/3	43.368	.004

	1/4	68.624	.000		5/1	97.773	.000
Q16	5/2	32.655	.043	**Q30**	5/1	36.516	.030
	5/4	52.442	.005		5/2	47.807	.000
Q18	5/1	30.122	.033		5/3	63.742	.000
Q19	1/5	-50.232	.000		5/4	79.435	.000

1 – Public Utility Company Waterworks and Sewerage Bor
2 – Copper Smelter Refinery
3 – Mining and Smelting Combine Bor
4 – Copper Mine Majdanpek
5 – Unemployed

Based on the data from Table 5, it can be observed that, for most questions, unemployed citizens had lower scores than those working, which means they mostly disagreed with the statements from the questionnaire. The biggest difference in opinions can be observed for Q21, where unemployed citizens of Bor mostly think that threats to the environment are their concern, while those working in the Public Utility Company Waterworks and Sewerage Bordon't agree with this statement. When it comes to disagreement between employees in different companies and unemployed citizens of Bor, the most common disagreement in opinions is between unemployed and employees in Public Utility Company Waterworks and Sewerage Bor, where in 15 cases, a statistically significant difference between these two groups is found. A statistically significant difference between unemployed and workers in Copper Smelter Refinery was found in 13 cases, while between unemployed and workers in Mining and Smelting Combine Bor (Copper Mine Bor) was found in 10 cases. Lastly, a statistically significant difference between unemployed citizens and workers in Copper Mine Majdanpekwas found in 11 cases. Table 5 shows the differences between these groups.

6 Conclusion

People and organizations have the responsibility to live in ways that guarantee the conditions for the existence of future generations. As educators, we have the civic and ethical responsibilities to develop positive awareness, knowledge, and attitudes towards the environment.

The aim of the study from 2016 was to compare the level of environmental awareness among workers from companies in Bor (Public Utility Company Waterworks and Sewerage Bor, Copper Smelter Refinery, Mining and Smelting Combine Bor, Copper Mine Majdanpek).The research showed that opinions of unemployed citizens and employees in Bor about environmental issues widely differ, except for questions 1, 2, 6 and 9, where no statistically significant difference was found. Unemployed people in Bor seem to be more optimistic and more environmentally aware as opposed to employees. Lowest environmental awareness is found for those working in Public Utility Company Waterworks and Sewerage Bor, while the highest awareness is observed among unemployed citizens of Bor.

The ecological awareness of the citizens of Bor is still under dominant effect of the most severe ecological problems in our environment – air, water and agricultural land pollution. The emergence of ecological awareness in "sustainable consciousness" will be created by linking environmental issues with economic and social development through local sustainable development strategy, spatial plans and programs of technological development of mining and metallurgy, and development of business branches which are closely related to ecology.

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Appendix A: **Environmental awareness research**

Please indicate your level of agreement or disagreement with each of the following statements by circling your response using this scale:

1 - strongly disagree, **2**- disagree, **3**- neutral, **4**- agree, **5** - strongly agree.

Gender: 1. Male 2. Female
How old are you?

1. The effect of the environmental problems is not only serious for the present generation but also for future generations	1	2	3	4	5
2. Clean environment is a property that belongs to all people	1	2	3	4	5
3. Environmental problems are exaggerated	1	2	3	4	5
4. Science and technology can solve all environmental problems	1	2	3	4	5
5. The most important factor for preventing environmental problems is an effective environmental education	1	2	3	4	5
6. Environmental problems make the future of the world look bleak and hopeless	1	2	3	4	5
7. People worry too much about environmental problems	1	2	3	4	5
8. Environmental problems can be solved without big changes in our way of living	1	2	3	4	5
9. People should care more about protection of the environment	1	2	3	4	5
10. Rich countries are responsible for solving environmental problems in the world	1	2	3	4	5
11. Environmental problems should be left to the experts	1	2	3	4	5
12. Nearly all human activity is damaging for the environment	1	2	3	4	5
13. I think each of us can make a significant contribution to environmental protection	1	2	3	4	5
14. Almost everything in modern life is harmful to the environment	1	2	3	4	5
15. Economic development is always harmful to the environment	1	2	3	4	5
16. There are more important things in life than environmental protection	1	2	3	4	5
17. Environmental problems are global problems	1	2	3	4	5
18. We can still find solutions to our environmental problems	1	2	3	4	5
19. Environmental problems are the most important problems that our country needs to solve	1	2	3	4	5
20. I believe that environmental problems will be solved in the near future	1	2	3	4	5
21. Threats to the environment are not my business	1	2	3	4	5
22. I believe that environmental problems can be solved even if this means sacrificing many goods	1	2	3	4	5
23.Environmental protection thinking causes regression of industry	1	2	3	4	5
24.Technological developments are damaging to the environment	1	2	3	4	5
25.All living creatures in nature have an equal right to live as humans	1	2	3	4	5
26.People are harming the environment more than other living beings	1	2	3	4	5
27.A sensitive balance of nature can easily break down	1	2	3	4	5
28.It is unclear to me what is good and what is bad for the environment	1	2	3	4	5
29.Environmental education should start at preschool	1	2	3	4	5
30.People have the right to, in order to survive, harm the environment	1	2	3	4	5

IMPLEMENTATION OF SUSTAINABLE DEVELOPMENT FRAMEWORK (SDF) IN THE MINING SECTOR AND ITS REVIEW

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Abstract: The Indian mining sector has been facing severe criticism on several issues such as impacts on environments and sustainable development. Infact local stakeholder consultation is a highly neglected subject in the Indian mining industry. Except for one-time public hearing in the environmental impact assessment process (prior to start of mining operation), there is no meaningful consultation between mining enterprises and communities living in mining project areas.

The High Level Committee Appointed in the year 2005, specifically studied the impact of mineral development with the need to develop sustainable principles in mining, best practices and reporting standards which may be measured objectively.

This technical paper focused on implementation of sustainable development framework (SDF) in the Indian mining sector and its review.

Keywords: Sustainable development, ecofriendly mining, CSR activities.

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SWOT ANALYSIS OF ENERGY SYSTEM OF MUNICIPALITY OF ŠTRPCE

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Abstract. Regular and unhindered energy supply is a prerequisite for the development of national and local economies. Štrpce is municipality situated on south of Kosovo and Metohija. Since the end of the war in 1999, Štrpce has been continuously exposed to the restrictions on electricity. This greatly affects the quality of life of the population, as well as the (im)possibility of developing the local economy. Goal of this paper is to show current strengths, weaknesess, opportunities and threats of energy sistem in municipality of Štrpce. Also, paper will propose conclusions to improve energy situation in Štrpce.

***Keywords**: SWOT, Štrpce, Energy*

1 Introduction

Proper functioning of the energy systems in the 21st century is by default. However, like all other large systems and energy systems are often faced with numerous problems and challenges. Prices, continuous network expansion and meeting the growing demand for energy while taking care of the environment is some of the biggest challenges today. At world level, net electricity production is increasing by 69%, from 21.6 (trillion kWh) in 2012 to 25.8 (trillion kWh) in 2020 and up to 36.5 (trillion kWh) in 2040 [1].

To solve different energy problems in literature is used numerous methods, tools and techniques. One of them is strengths, weaknesses, opportunities and threat analysis (SWOT). Success of any organization, project or system depends on both internal and external environments. SWOT analysis provides an insight into both environments in a way that allows making the right decisions. SWOT is often used in literature to address different energy issues. One of the main drawbacks of a SWOT analysis is inability to prioritize factors but even so it is often employed standalone: Terrados et al., [2] used SWOT analysis for regional energy planning. Shi [3] discusses about energy mix in the Association of Southeast Asian Nations (ASEAN) using SWOT analysis. Also, SWOT is employed and in combination with different methods: Ren et al. [4] used SWOT method to analyze hydrogen economy in China and to propose effective strategies. Tavana et al. [5] combined SWOT and modified Delphi technique for strategic planning on oil and gas pipelines in Caspian Sea.

1.1 Study area

Municipality of Štrpce is located in the south of Kosovo and Metohija (Kosmet) and covers area of about 247.36 km². One of the big problems that face Štrpce since 1999. until today is the unstable supply of electricity. It must be admitted that after war 1999. the entire Kosmet had problems with regular electricity supply. However, it is noticeable that Štrpce was significantly more frequently exposed to restrictions than other settlements in Kosmet. It is assumed that this was also a form of political pressure on this Serbian majority municipality. The main problems for frequent power restrictions in Štrpce might include: insufficient production of electricity in thermal power plants in Kosmet, transmission losses, illegal connection to the network, non-payment of consumed electricity to the supplier, old transmission network, frequent network failures, etc.

Table 1. Electricity consumption in Štrpce by years (Source: KEDS unit Štrpce)

Year	2014	2015	2016
Total (MWh)	1475	1678.8	2201.3

Štrpce is currently supplied with electricity through the "Kosovo Electricity Distribution and Supply Company" (KEDS). The main production facilities in Kosmet are Kosovo A and Kosovo B thermal power plants in Obilić. Lignite is used to produce 97% of total electricity production in Kosmet [6]. Such a great dependence on only one source of electricity generation show the energy (in)security of Kosmet as a whole.

2 Methodology

The description of internal strengths and weaknesses, as well as external opportunities and threats, takes place on the basis of a well-known technique called SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis [7].

Generally SWOT is a list of statements or factors with descriptions of the present and future trend of both internal and external environment. The expressions of individual factors are general and brief which describes subjective views [8].

Table 2. SWOT matrix

	Internal factors	External factors
Desirable factors	Strengths	Opportunities
Undesirable factors	Weaknesses	Threats

SWOT is easy to conduct, and no specific knowledge is required for its implementation and understanding. Unfortunately, there are and SWOT drawbacks. The use of conventional SWOT analysis has no means of determining the significance of each SWOT factor. Also, SWOT is often only a passive list of factors without a precise direction for actions. In order to overcome mentioned drawbacks SWOT is often used in combination with other methods.

In this paper SWOT analysis is conducted by 5 experts in different fields (economist, mechanical engineer, electrical engineer, lawyer and geologist). Final SWOT matrix is reached by conducting of several steps:

1. **Defining the research goal and forming expert team** – The goal is to be defined by the researchers. The researchers should create a simple questionnaire in the form of a SWOT matrix, and to collect data relating to the subject of research (strategies, regulations, legislation, technical data, scientific papers, local research, short- and long-term plans of the municipality etc.).
2. **Defining n- SWOT matrices** - The researchers shall submit the questionnaire and the data relevant to the research topic to each of n-decision-makers. Also, time frame should be defined. In this paper step 2 and 3 are merged.
3. **Defining a global SWOT matrix** - The global SWOT matrix should include all factors from the individual matrices obtained in Step 2. The researchers are in charge of implementation of this step.
4. **Ranking all SWOT factors** - The researchers gives the global SWOT matrix to each expert, asking them to weight each of the factors. The experts (n-) evaluate all the factors from the global SWOT matrix using values (0-unimportant, 1-extremely important) with 0.1 increments. Only the factors with an overall importance >0.75 will be included in the final SWOT matrix. The overall importance is calculated as an average score from all n-experts.
5. **Final SWOT matrix** – after all SWOT factors were weighted (in step 4) final SWOT matrix is obtained. This matrix includes the most important factors according experts opinion.

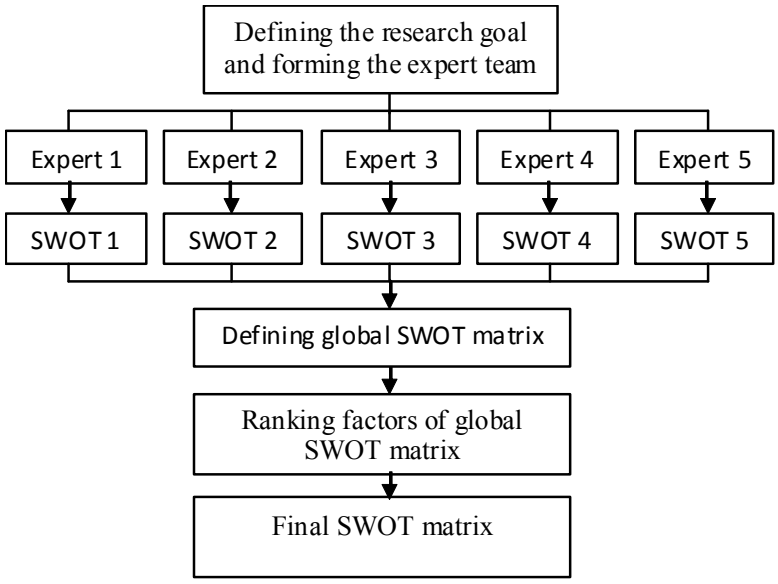

Figure 1. Proposed SWOT model

The study was conducted in the period September-October 2017. in municipality of Štrpce.

Step 1. Defining the research goal and forming expert team - The objective of this methodology is to be defined by researchers. It is to obtain core information about energy system of municipality of Štrpce. Find out its strengths, weaknesses, threats and opportunities. The team consists of five experts of different professional backgrounds: an mechanical engineer, geologist,

electrical engineer, lawyer and an economist. Research team also deliver to the experts numerous data/documentation.

Step 2. Defining n- SWOT matrices - The research team furnishes each of the expert with the SWOT questionnaire and data collected in Step 1. Deadline of 7 days for the analysis of data and filling out the questionnaires is defined. Each expert conduct a SWOT analysis without any restrictions in the number of factors that can be used for each SWOT group.

Step 3. Defining a global SWOT matrix - The completed SWOT questionnaires from Step 2 is sent to the research team. Then, out of the all factors from the individual matrices global SWOT matrix is created. In this paper will not be presented the SWOT analyses prepared by each expert, but the global SWOT matrix which include 51 factors.

Table 3. Global SWOT matrix

Strengths	**Weaknesses**
S_1 Coverage of entire municipality by network S_2 Human capital in energy field S_3 Small hydroelectric plants on municipality area S_4 Potential of renewable energy sources S_5 Potential for increasing energy efficiency in the production, distribution and consumption of energy	W_1 Frequent restrictions W_2 Old network W_3 High energy supply dependence W_4 Only one supplier W_5 Insufficient use of renewable energy sources W_6 Often drop out of the system W_7 Large losses in distribution W_8 Non-rational use of electricity for heating W_9 Illegal network connections W_{10} Significant portion of unpaid bills W_{11} Non-rational use of energy W_{12} Undeveloped internal and regional electricity market
Opportunities	**Threats**
O_1 Construction of underground electric power networks O_2 Use of hydro energy sources for generating electricity O_3 Use of solar energy sources for generating electricity O_4 Use of biomass and waste energy for generating electricity O_5Use of geothermal energy sources for generating electricity O_6 Use of wind energy sources for generating electricity O_7 Use of solar sources for heating O_8 Use of biomass for heating O_9 Greater use of renewable energy sources O_{10} EU funding O_{11} USA funding O_{12} Attracting investors to RES O_{13} Improving energy efficiency O_{14} Introduction of energy management in the public, commercial and industrial sectors O_{15} Modernization and revitalization of the energy network O_{16} Sustainable use of renewable energy sources O_{17} Improvement of network	T_1 Social disorders T_2 Accidents T_3 Abolition of financial and technical support of donors T_4 Loss of human life T_5 Brain drain from Štrpce T_6 Slow development T_7 Unresolved problem between Serbia and Kosovo about thermal power plants Obilić and the distribution network in Kosovo T_8 Terroristic attacks T_9 Unfavorable demographic trends and population aging T_{10} Unstable political situation T_{11} Pressure by Kosovo institutions T_{12} Problems in getting permits

O_{18} Employment of local residents O_{19} Engagement of local companies O_{20} Local tax income enlargement O_{21} Better quality of life for local residents O_{22} Development of local economy	

Step 4. Ranking all SWOT factors – From all of 51 factors from global SWOT matrix only the most relevant factors should be included into the final SWOT matrix. Therefore, the research team furnishes each expert with the global SWOT matrix, and asks them to weight all factors. In assessing the weight factors, the experts rely on the accompanying documentation and their experience. Hence, the SWOT factors are ranked by appointing weight factors from the range (0- unimportant, 1- extremely important) with 0.1 increments.

Table 4. SWOT factors ranking

SWOT factor	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Mean
S_1	0.9	0.8	1	0.9	1	**0.92**
S_2	0.7	0.9	0.8	1	0.9	**0.86**
S_3	1	0.6	1	0.8	0.9	**0.86**
S_4	0.8	0.9	1	0.8	0.9	**0.88**
S_5	0.7	0.9	0.8	0.7	0.7	**0.76**
W_1	0.8	0.8	0.7	0.9	0.8	**0.8**
W_4	0.9	0.7	0.8	1	0.8	**0.84**
W_5	1	1	0.8	0.9	0.8	**0.9**
W_7	0.8	0.8	0.7	0.7	0.9	**0.78**
W_9	1	0.9	0.6	0.7	0.7	**0.78**
W_{11}	0.9	0.8	0.8	0.8	0.9	**0.84**
O_1	0.9	0.6	0.8	0.7	0.8	**0.76**
O_2	1	0.8	1	0.9	1	**0.94**
O_3	0.8	0.9	0.8	0.8	0.8	**0.82**
O_4	1	0.8	0.8	0.9	0.9	**0.88**
O_{12}	0.7	0.8	0.8	0.9	0.8	**0.8**
O_{13}	1	0.8	1	0.8	0.7	**0.86**
O_{15}	1	1	0.9	1	1	**0.98**
T_3	0.8	0.9	0.9	0.8	0.7	**0.82**
T_5	0.9	0.8	1	0.7	0.8	**0.84**
T_7	1	1	0.9	0.9	0.9	**0.94**
T_{10}	1	1	1	1	1	**1**
T_{11}	1	0.9	0.9	1	0.8	**0.92**

Step 5. Final SWOT matrix – After all factors have been weighted in Step 4. the research team calculates the mean value (table 4). The final SWOT matrix includes only those factors with the (mean) weight factor ≥ 0.75. Out of 51 factors there are 23 with a weight factor ≥ 0.75.

Table 5. Final SWOT matrix

Strengths	Weaknesses
S_1 Coverage of entire municipality by network S_2 Human capital in energy field S_3 Small hydroelectric plants on municipality area S_4 Potential of renewable energy sources S_5 Potential for increasing energy efficiency in the production, distribution and consumption of energy	W_1 Frequent restrictions W_4 Only one supplier W_5 Insufficient use of renewable energy sources W_7 Large losses in distribution W_9 Illegal network connections W_{11} Non-rational use of energy
Opportunities	**Threats**
O_1 Construction of underground electric power networks O_2 Use of hydro energy sources for generating electricity O_3 Use of solar energy sources for generating electricity O_4 Use of biomass and waste energy for generating electricity O_{12} Attracting investors to RES O_{13} Improving energy efficiency O_{15} Modernization and revitalization of the energy network	T_3 Abolition of financial and technical support of donors T_5 Brain drain from Štrpce T_7 Unresolved problem between Serbia and Kosovo about thermal power plants Obilić and the distribution network in Kosovo T_{10} Unstable political situation T_{11} Pressure by Kosovo institutions

5 Conclusion

- Entire municipality of Štrpce is covered by electricity network but restrictions is very often. It is because old network and dependence from only one supplier;
- Political situation is unstable. It is the most obvious on Serbia – Kosovo relation about thermal plant Obilić and distribution network ownership;
- Energy situation in Štrpce can be improved by increasing the use of RES and revitalization of the energy network;
- Also, shall be working on increasing energy efficiency in the production, distribution and consumption of energy.

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SMALL HYDRO POWER PLANTS IMPACTS ON QUALITY OF LIFE IN ŠTRPCE – SURVEY

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Abstract: The survival and development of a modern society is unthinkable without uninterrupted supply of electricity. Unfortunately, the largest percentage of electricity in the world is obtained by combustion of coal. This greatly affects our environment as well as the quality of people's lives. In the last twenty years the production of electricity from renewable sources is increasing. However, in this case too, it is possible to talk about different influences on the environment and people. In the following article, a survey about the attitude of the population of the Štrpce municipality on the impact of the small hydro power plant on the quality of life is presented.

Keywords: RES, Štrpce, SHPP

1 Introduction

Regular and unhindered energy supply is a prerequisite for the development of national and local economies. As energy needs are increased and fossil fuels are exhausted with negative effects on the environment, a possible solution to this problem is sought in renewable energy sources (RES). This is also especially suitable for isolated and rural areas for electricity supply.

Štrpce is municipality situated on south of Kosovo and Metohija. Since the end of the war in 1999. Štrpce has been continuously exposed to the electricity restrictions. This greatly affects the quality of life of the population, as well as the (im)possibility of developing the local economy. Natural conditions for the exploitation of the water power of the Lepenac river and its tributaries in the area of Štrpce municipality can be classified into the most productive basins in Serbia [1].

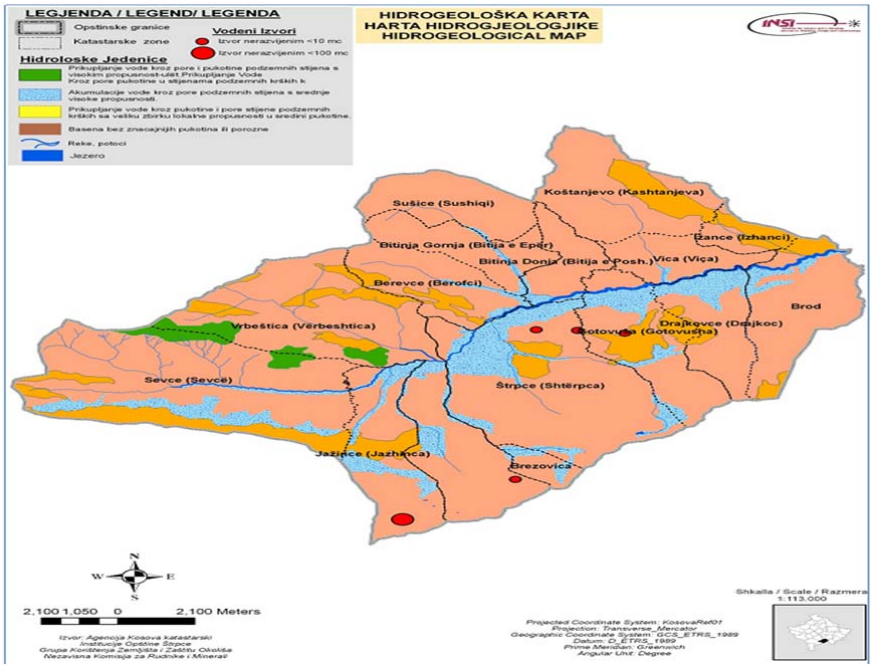

Figure 1. Hydrological map of Štrpce municipality [2]

The hydropower potential of the municipality of Štrpce was used in the fifties of the XX century until the electrification of the municipality. According to [1], on the territory of the municipality of Štrpce, it is possible to build about 27 derivative flow hydroelectric power plants with the installed capacity of about 20 MW. Today, on the territory of the of Štrpce, there is one operating SHPP, while the construction of 4 more is in progress.

Table 1. Electricity consumption in Štrpce (Kosovo Electricity Distribution and Supply Company)

Month/year	2014 (MWh)	2015 (MWh)	2016 (MWh)
January	201.5	220.1	260.4
February	165.2	184.8	234.9
March	148.8	167.4	248
April	108	123	210
May	99.2	117.8	167.4
Jun	84	96	126
July	71.3	86.8	117.8
August	65.1	80.6	111.6
September	78	93	114
October	117.8	139.5	167.4
November	147	159	201
December	189.1	210.8	242.8
Total (MWh)	**1475**	**1678.8**	**2201.3**

However, the question arise here is what is the attitude of the local population toward RES facility. There are many papers in literature about mentioned question. Kalkbrenner and Roosen [3] analyzed how community identity, social norms, trust and environmental concern foster or constrain citizens' willingness to take part in community energy schemes. Delicado et al. [4] explored community perceptions of renewable energies in Portugal. Murakami et al. [5] examines consumers' willingness to pay for nuclear and renewable electricity as two alternatives to fossil fuels for the reduction of greenhouse gas emissions.

2 Methodology

A survey will be used to collect data. Of the 95 questionnaires sent, 78 were answered. The survey was conducted in the territory of the municipality of Štrpce in the period from 4.9.2017. until 10.9.2017. The research includes two groups of questions: environmental (impact on air, soil and water) and socio-economic (impact on employment, impact on noise and landscape, impact on energy security, impact on agriculture (irrigation)).

3 Results and discussion

During the construction phase hydropower air pollution is caused by the release of dust during the excavation, loading, transportation and unloading of earth, dust release during handling and loading machines motor vehicles in operational areas and transport roads without asphalt. Air pollution is also caused by the release of corrosive gases from cars, loading, and compaction, for compression and transport vehicles [6]. According to the research, 56.86% of the respondents consider that there was pollution in a small extent during the construction phase of the SHPP. Only 5.88% believe that there was no pollution at all, while 17.64% thought it were pollution to a great extent.

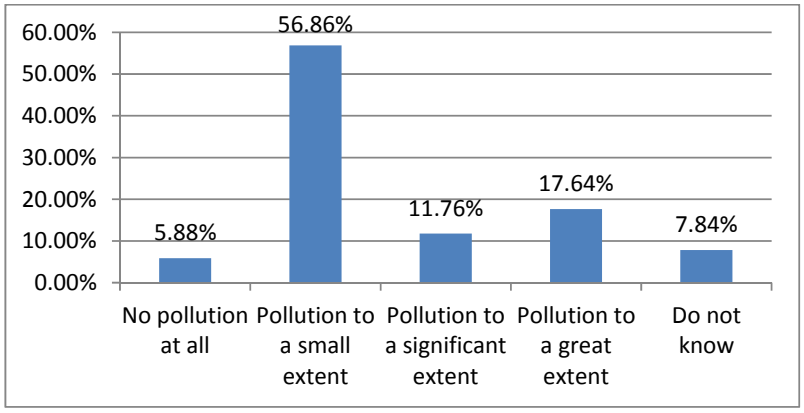

Figure 2. The attitude of the population towards air pollution during the implementation of the SHPP project

Also, the construction of SHPP leads to certain impacts on the land. Solid and liquid wastes also appear. Solid waste is generated during maintenance and repairs required loading and transport cars and various organic and non-organic wastes that are created by workers. Impacts from liquid waste arise from the discharge of oil and petroleum products, from cars and other machines. Also, during construction phase some agricultural land is damaged. It is question will it be returned for agricultural production or will remain abandoned. For municipality with small agricultural land it can be negative effect of SHPP construction. Even 56.40% of respondents believe that there was pollution to a significant extent, while only 2.60% believe that there was no pollution at all.

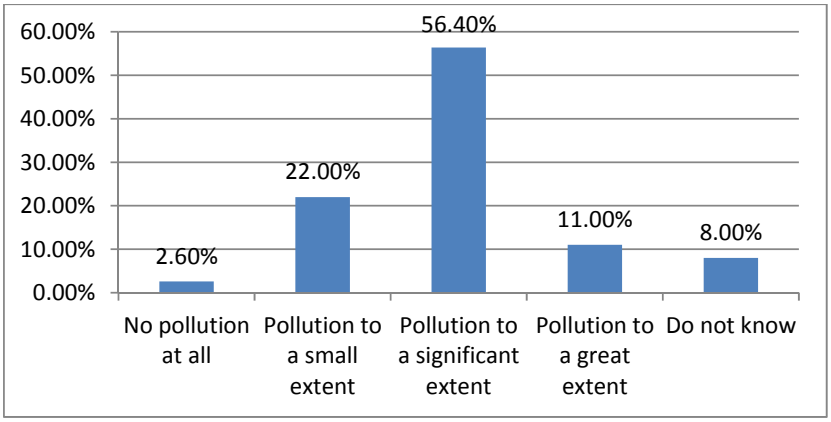

Figure 3. The attitude of the population towards pollution of the land during the implementation of the SHPP project

During the construction and during the exploitation of the SHPP, negative impacts on water can occur. Namely, different fuels and oils can come into the water (surface and underground water). This would greatly endanger the natural ecosystem in the water. Also, changes of the river flow in some places may also occur. Water can be contaminated and by numerous solid dust residues that occur during digging, pipe laying and transportation. In addition to all of the above, workers create waste which can end up in the river. Another major problem concerns the negative impact on flora and fauna. This impact is most pronounced on fish. A significant part of the respondents 29.1% believe that there were no pollution of water at all, and 29% do not know. While only 10% respondents believe that the pollution is to a great extent.

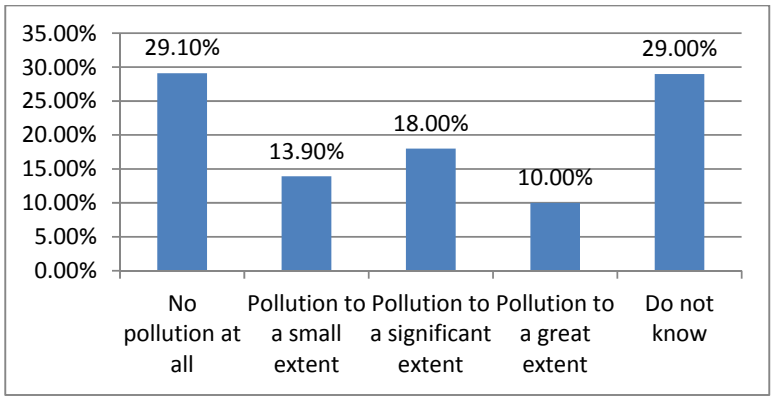

Figure 4. Population's attitude towards pollution of water during the implementation of the SHPP project

It can also be said about the impact on employment in Štrpce both in the construction and in subsequent exploitation of the SHPP. During the construction phase, various experts, suppliers, and ordinary workforce are needed. Engaging local resources would greatly help to increase the employment and living standards of the population. Unfortunately, the characteristics of small communities are that generally do not have all the necessary resources for the construction of SHPP. Therefore, the missing resources are provided from other communities. 33% smatra da construction and operation of the SHPP increase employment in Strpce in a small extent and only 11.62% in a large extent. Even 25.8% believe that construction and operation of the SHPP do not increase employment in.

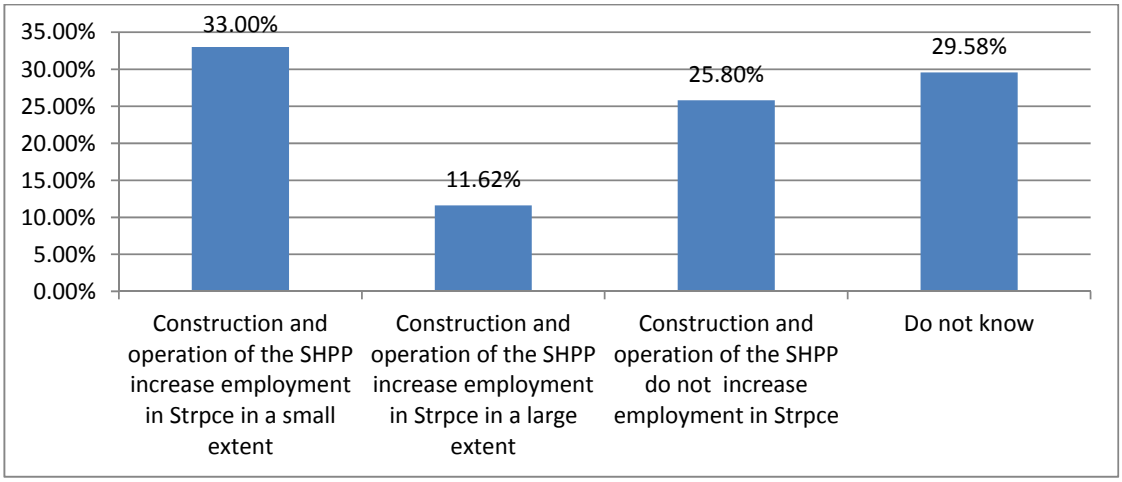

Figure 5. Impact of realization of the project of SHPP on employment

During the construction and later operation and maintenance of the SHPP comes to the appearance of noise. If it is not within the permitted limits, it may present an obstruction to the normal functioning of the population. Especially are vulnerable residents living near the realization of the SHPP project. Also, for the needs of the SHPP construction, natural landscapes are often violated and altered. This is especially important for tourist sites and national parks such Štrpce is. Even 33.1% of respondents believe that there were and are negative impacts in a large extent. Also, significant percentage of the respondents (27.1%), believe that there were no negative impacts at all.

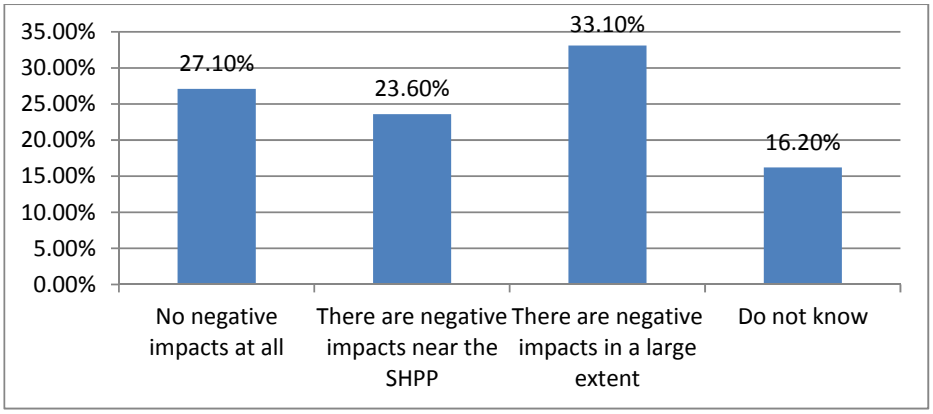

Figure 6. Impact on noise and landscape

In the last 10 years, agriculture has been developing rapidly in Štrpce. At the first place is raspberry production. This culture requires a significant amount of water during spring and summer. Unfortunately, there is no irrigation system in the territory of Štrpce. Irrigation is mainly done by redirecting a part of the river Lepenac into smaller flows to the agricultural land. By building a SHPP, one part of the agricultural land can be left out for irrigation water. This will greatly affect the yield reduction and to the end the abandonment of this land. This is a big problem for a mountainous municipality with little agricultural land. Even 41.2% believe that there are negative impacts on irrigation at some areas in Štrpce and only 12.2% believe that there were no negative impacts on irrigation at all.

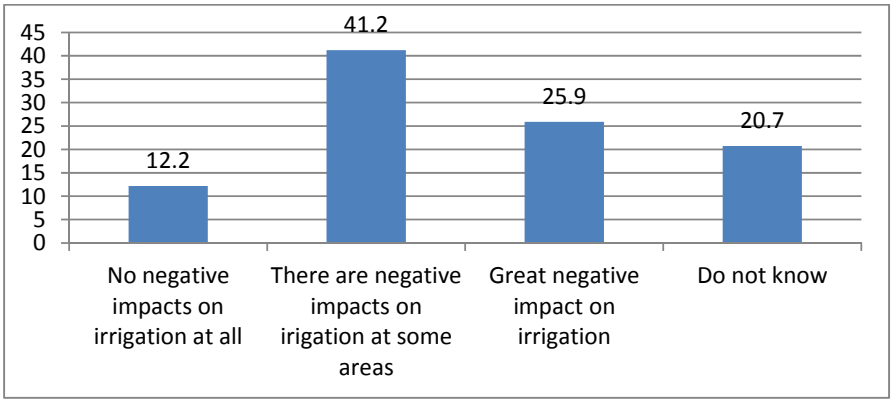

Figure 7. Impact on agriculture (irrigation)

Renewable energy sources are often used worldwide to improve energy security of communities. Perhaps, it is most obvious at rural and remote areas. Municipality of Štrpce is very often exposed to the electricity restrictions since 1999. until now. So question arise here is can SHPPs can improve energy security of Štrpce? Unfortunately, according research 37.3% respondents believe that SHPP facility in Štrpce do not contribute to increasing energy security of Štrpce and only 17.3% consider that its contribute. The main reason for this is likely that the SHPP is private company. This means that the company will sell electricity on the market to those who are ready to offer the highest price and will not worry about the energy security of the municipality in which it operates. A possible solution is to enter a public private partnership with an existing company or to build new plants under this model.

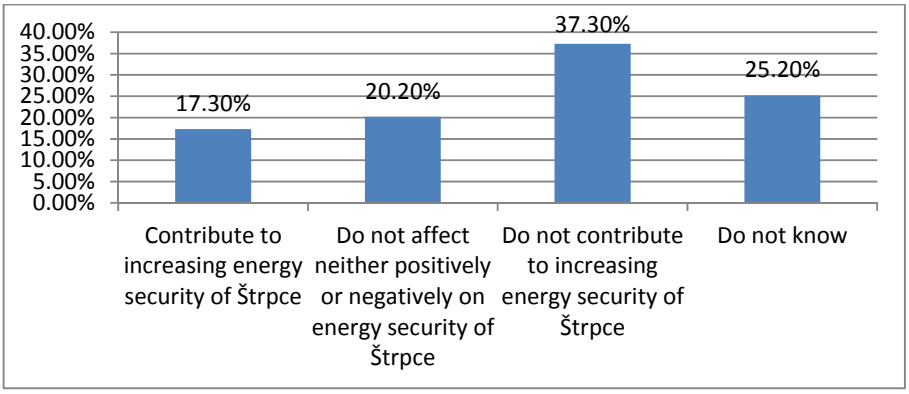

Figure 8. The impact of the construction of SHPP on energy security

4 Conclusion

- Construction and operating of SHPP in Štrpce do not have significant negative impacts on quality of life of local residents;
- Shall be created alternative ways of irrigation in the areas that are now endangered by the construction and operating of the SHPP;
- Public private partnership can be a good model for SHPP building and providing higher energy security of Štrpce.

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DEVELOPMENT OF HYBRID SWOT-MCDM MODELS OF GROUP DECISION MAKINGFOR STRATEGIC PLANNING IN NATIONAL PARKS

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Abstract: Group Multi-criteria Decision Making (MCDM) model considers situations in which the decision-makers have to choose one of the alternatives from a set of available alternatives, which are assessed based on a number of criteria. This methodology has found numerous applications in different areas of management. Group methods, based on participatory planning, can be applied to integrate different interests into an optimal, joint decision. In order to obtain objective results in the decision-making process, multiple stakeholders with different knowledge, experiences and prospects, need to be involved.The aim of this paper is to present the hybrid group multi-criteria models which can be used to improve the quantitative information basis of strategic planning processes in national parks. The paper discusses the similarities in MCDM methods, evaluates their robustness and compares the obtained results through the case study example of the largest national park in Serbia, National Park Djerdap.

Keywords: MCDM models, SWOT analysis, national parks

AFFECTING DETERMINANTS OF TRUST IN BUSINESS RELATIONSHIPS

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Abstract: Scholars claim cooperation conflict and even competition can exist between the relationship partners. Why are there conflicts among business partners? The logical answer is permanent changes in the fields of politics, economics, regulations, social norms and technological systems. It can also happen that in a new business network a company has to cooperate with its former competitor. In a dynamic prospective, trust affects satisfaction. Satisfaction and conflicts are always perceived by business relationship partners. Different cultures evaluate a business relationship in different ways, therefore they have various views on how to start or develop business relationships.

Our aim is to investigate the complex effects of trust on perceived satisfaction, perceived conflict and among organizations in existing business relationships. In our research we find that trust is affected by both: satisfaction (positively) and conflict (negatively). Due to the lack of a widely accepted definition of trust in business and what determines it, this quantitative research may bring new thoughts to researchers or even support earlier models as well.In this empirical paper we used quantitative research methods and analysed 315 valid questionnaires received from organizations registered in Hungary, independent of size and economic sector. The valid questionnaires were analysed by SPSS using factor analysis and regressions.

THE APPLICATION OF THE MULTICRITERIA RANKING IN CHOOSING THE COPPER SMELTING FACILITIES BASED ON THE ECOLOGICAL PARAMETRES

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Abstract: There are over hundred smelting facilities in the world which are involved in the production of copper. All these smelting facilities use different technological processes for copper extraction from primary and secondary raw materials. Each of these processes has its advantages and disadvantages, and it is of great importance to select the most optimal of them. The decision maker frequently takes into account only technological and economic parameters, neglecting the ecological parameters in the selection of the adequate technological process. This approach, as a result, provides the selection of a technological process which could have a significant negative impact on the environment, where the cost of the damage would eventually be greater than the total profit gained by the owner of the new smelting facility. This paper describes the tools used for multi-criteria decision making in choosing the most adequate copper smelting technology with various ecological parameters of significance taken into consideration.

Keywords: *Ecological parameters, Multi-Criteria ranking, Copper smelting*

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EXPLORING THE POSSIBILITIES OF USING BIOMASS FOR INCREASING THE ENERGY EFFICIENCY OF THE PIROT REGION BY CONSTRUCTING A COGENERATIVE PLANT

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Abstract: This paper presents the possibility analysis of wood biomass utilization for production of electrical power and heat in a cogeneration (combined heat and electric power production, or CHP) with the purpose to increase energy efficiency and energy supply independence of Pirot region. The certainty in supply of fuels, sustainability, and environmental impact are the key factors which argue and support the use of biomass in the energy sector. In addition to this, Serbia took over commitments as candidate for full membership in EU to increase the share of renewable energy sources to 27% of overall energy consumption by 2020. Theoretical research based on secondary data about available wood biomass on considered territory and situational analysis of the region has been done. The results provide the detailed review of disposable resources for usage of biomass as renewable energy source and proposal for capacities of a potential cogenerative plant with evaluation of economic sustainability. Proposed CHP technology decreases primary energy consumption, lowers greenhouse gas (GHG) emission, and enables diminution of dependence on imported energy sources. Other economic and social effects which would be consequential connected with the implementation of this type of energy production are also been considered.

Keywords*: Biomass, Combined Heat and Power, Energy efficiency*

1 Introduction

Each human activity is connected with energy consumption. Renewable energy sources (RES) represent those sources that are used for energy production and their formation in nature is faster than consumption. The special importance of RES is reflected in its role in lowering of carbon dioxide (CO_2) emission, increasing energy efficiency and, at the same time, decreasing dependency on imported energy raw materials and electricity. The problem of fossil fuels dependency is global and there are a lot of reports and studies which are dealing with this problem.

According to the data of The European Biomass Association (AEBIOM), despite the great dedication to RES, reliance on fossil fuels is on the rise. "In 2014, the average EU-28 energy dependency was 53.4%, a share that has been steadily increasing over the last two decades. Oil represented the highest import dependency (87.4%), followed by natural gas (67.2%) and solid fossil fuels such as coal (45.6%)" [1]. "When looking at the nature of the energy dependency, it is important to note that 99.4% of the net imports of energy in Europe were fossil fuels. Such dependency not only contributes to the weakening of the EU's geopolitical influence, but also creates Gross Domestic Product (GDP) leakage across Europe that could amount to € 1 billion per day" [2]. In 2015, European bio-energy's final consumption reached its highest historical point. With 112 374 kilotons of oil equivalent (ktoe) consumed, the whole sector grew by 6.53% from 2014 to 2015 [3].

In the report Instrument for Pre-accession Assistance (IPA II) in which indicators of strategy for Serbia 2014-2020 are presented, it is stated: "The energy sector in Serbia is dependent on fossil fuel. According to the International Energy Agency, Serbia is annually emitting about 60 million tons of

CO2. In 2011, the share of renewable sources of energy in the final energy consumption was 17.8%. Serbia has practically no new, renewable sources of energy, apart from the large hydro power plants, which produce around 7% of electricity. The use of renewable energy must be increased in order for Serbia to meet the Energy Community Treaty target of 27% of final energy consumption by 2020." [4]

Stated issues motivated the authors of this paper to research and present the information about possibilities of supply and demand of wood biomass and combining of estimated potentials with real needs for use at cogenerative plant, CHP (Combined Heat and Power), with purpose to increase the energy efficiency of Pirot region.

Based on previous allegations the following research questions are defined: Whether there are adequate potentials for sustainable utilization of biomass in function of energy production at cogeneration plant? Whether is construction of cogeneration facility in Pirot region economically justified? By reviewing of relevant literature concerning that issue the existence of research gap between foreign and domestic authors in research methodology as well as in number and quality of published papers is determined.

One of the goals of paper is research of possibilities for significant decreasing of primary energy consumption obtained from fossil fuels that are mainly used by residents of Pirot region and Serbia and replacement with RES, especially with biomass. Another goal is the influence assessment of biomass use on economic indicators in the region.

The paper is structured as follows. In second section review of relevant literature with an insight into available research is given. In the third section, the research methodology, possibilities for use of biomass in energy production, CHP technology, its advantages and influence on energy efficiency are described. The fourth section focuses on available resources and potentials for construction CHP plant in Pirot region and framework budget for the potential construction project of CHP plant that uses wood biomass as fuel. Also, economic and financial pre-study for the project with all necessary assessments of costs and benefits has been done. The fifth section is dedicated to a discussion of obtained results and the sixth section consists of concluding considerations.

2 Literature review

The efficiency of cogeneration can be observed from different points of view. Efficiency in energy supply and energy savings are considered trough relation of inputs (quantity of used fuel) and outputs (heat and electricity) [5], by following numerous variables such as: logistics costs, the degree of exploitation etc [6].

The legislative for the promotion of cogenerative energy production and for monitoring performances of CHP plants were developed by European Parliament and Council [7]. The objective of the directive is the establishment of complied methodology for calculating electrical power from cogeneration and guidance for its application. Based on assigned parameter values for calculation of efficiency of cogenerative plants, existing and planned cogenerative capacities can be evaluated [8,9].

Research the influence of using biomass on rural communities pointed several economic benefits. Some of them are establishing new markets, development of rural areas, promoting and implementing of better practice in forest maintenance and lowering of regional economic differences [10].

The degree of exploitation of forest waste and wood residues as an energy source has been studied in many papers. A special attention has been dedicated to long-term supply and logistics for continuous operating of CHP plants considering specific supply chains and fluctuations dependent on periods over the year. The decision support systems for managing supplying of energy plant with renewable forest fuels have been developed [11].

Several procedures for sustainability evaluation of biomass plants have been proposed [12,13]. Results of the research show that independently of location, all cogenerative plants have high cogeneration efficiency with the highest profitability in regions with medium and strong winters [14]. An increasing number of authors have devoted attention to economic justification of building CHP plant depending on size [15,16] and economic optimization of energy production [17,18,19] using different methods for optimization and establishment an adequate ratio between heat and electricity production [20].

3 Research methodologies

Conducting systematic research of existing official documents enacted by municipality, authorities and NGO [21, 22, 23, 24, 25] related with subject of this research, a base for evaluation of wood biomass exploitation for energy production is defined. Compatibility between local and state documents regarding utilization of RES and willingness and competences of management in different sectors to promote and use RES in order to increase the energy efficiency of the region were been considered. The situational analysis (SWOT) trough which is being examined all factors influencing on strategy for sustainable development of the region, was done (*Appendix 1*). Also, the data of potential benchmarking partners were used for evaluation of capacities and costs in CHP plant.

3.1 Biomass

Biomass is renewable energy source which can be used for the production of electrical power, heating power and transport fuel. Biomass includes a large group of crop plants, agriculture residues and other materials formed by biological means. It was the oldest source had been used by humans for producing different types of energy.

The fuels got from biomass have a lot of advantages comparing the fossil fuels. Besides the fact that biomass is flexible in sense of production a couple types of energy (electricity and heat) it is also reliable and there is no excessive loss of invested energy compared with obtained energy. Additional benefits include positive environmental impact, energy savings, local development, decreasing of waste, etc. Biomass can contribute to energetically safety in many ways. Biomass could be easily stored in various forms (wood and derivates, biogas, bio-fuel). It can affect positively on mitigation of imported fuels dependency and enhances certainty of fuel supply from domestic sources.

Solid biomass consists of virgin wood, wood from dedicated cultivation, forest residues, waste from lumber industry and agricultural residues (*Figure 1*). It considers being renewable energy source

because can be renewed for a couple dozens of years when speaking of wood biomass and much faster when other biomass forms are in question [26].

Use of wood biomass plays important role in suppressing forest degradation. Actually, investments in development and maintenance of forests, that is necessary for stable supplying with biomass, condition the growth of forest resources for two reasons. Firstly, because the continuous increase of areas under the forest is necessary and secondly because the choice of wood type that grows faster increases the overall volume of growth. Further, forest removes CO2 from the atmosphere and reduces climate changes. Promoting the bio-energy as an economically sustainable way of energy production can be incentives for forests owners to undertake additional measures by introducing high-quality forest management and forest maintenance. Orientation on this policy, directed on bio-economy, gave very positive results in some European countries. Over the last 20 years, the forest area has expanded in all European regions and has gained 0.8 million hectares each year. Over the same period, the total growing stock of forests in Europe has increased by 8.6 billion cubic meters [27].

The economic importance of using forest biomass for energy production reflects the fact that import of biomass is negligible and most of the incomes directly contribute to local economic development, especially in rural areas where the most wood resources are located and where primary biomass preparation is done. Schematic diagram of transformation solid biomass in energy is shown in figure 1.

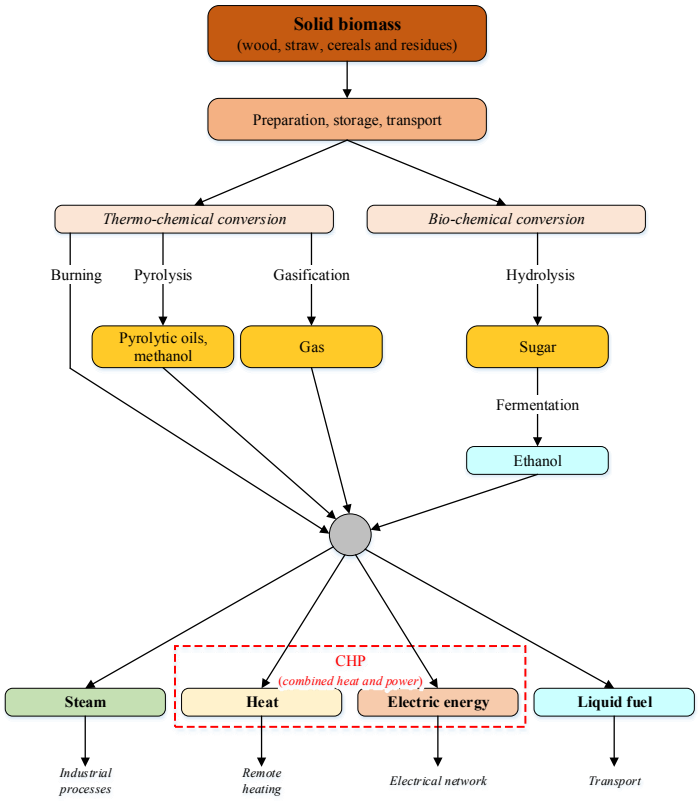

Figure 1. Transformation of solid bio-energy (Source: authors' construction based on [28])

3.2 CHP technology

The combined production of heat and power is an efficient and clean approach for producing heat and electricity from a single energy source [29]. CHP is used to replace or supplement conventional method of separate production of heat power and electric power. Getting energy in CHP plants as addition to traditional methods that use fossil fuels provides significant improvement of energy efficiency and positively affects the environment.

The majority of bio-electricity (57.7%) is generated by combined heat and power plants (CHP) whereas in overall energy production 11.2% of the electrical power is produced in CHP plants [3]. The present opinion that prevails in EU is that the sustainability of bio-power has based on using biomass in CHP.

CHP plants reach the 75-80% efficiency that represents a great improvement relative to 45% efficiency of separate production (*Figure 2*).

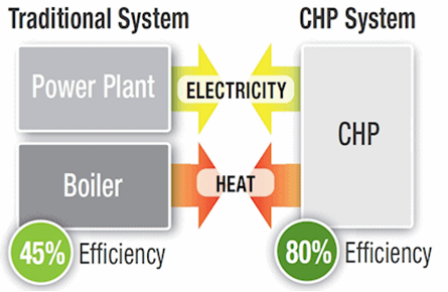

Figure 2. Energy efficiency of traditional and CHP systems [30]

CHP technology consists of a set of special components integrated into the whole. Equipment that is been installed defines CHP system, its performance and price. Purpose of CHP plant implementation is the rise of fuel utilization efficiency. Schematic representation of CHP technology is given in figure 3.

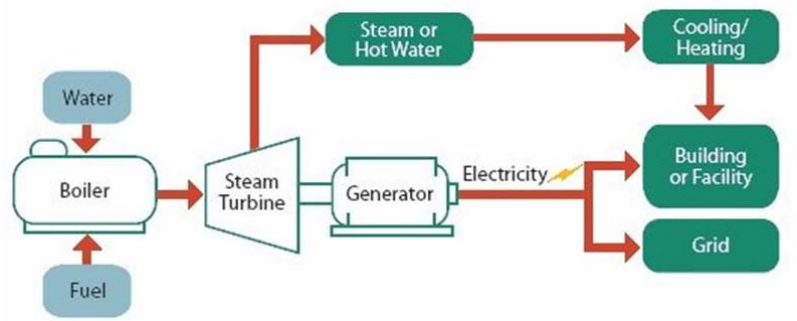

Figure 3. Schematic diagram of CHP technology [31]

Advantages of using CHP energy:

- The costs of energy for a consumer are lower.
- The risk of electricity supply disturbance is being reduced.
- The uncertainty in calculating the prices of electricity is being decreased.
- The emission of greenhouse gasses and others pollutants in the air are being reduced.

- The low-cost approach for adding new capacities in power production is being applied.
- The reliability of the distributive electro-energetic system is being ameliorated.
- The need for new electro-energetic facilities and a new distributive network is being downsized.
- The significant energy efficiency and environmental protection are being provided in comparison with classical energy production.
- The qualified local workforce is being engaged.
- A plenty of clean, domestic energy sources are being used.

4 Research results

RES capacities in Republic Serbia are about 4.7 mtoe (mega tones of oil equivalent), that is a half of yearly needs of the state for energy. The most of those capacities, about 2.7 mtoe or 55% is biomass. Candidate status of Republic Serbia for EU membership with the goal to become a full member until 2020, directly is conditioned with use of RES.

4.1 Potentials of forest biomass on the territory of The Pirot forestry holding

The Pirot forestry holding is one of the seventeen holdings in the composition of the "Srbija šume" Public Company. Total area under the forests and forestry land in Nišavsko area, that is managed by the Pirot forestry holding amounts to 39 366 ha with 28 692 ha (73%) overgrown and 10 674 ha (27%) non-overgrown areas. The overgrown area comprise of the following forest [24]:

- high natural forests with 5 820 ha (20%), with 1 644 700 m^3 (51%) or 283 m3/ha wood volume and growth rate 31 694 m^3/year (39%) or 5.4 m^3/ha;
- woodlands with 10 985 ha (38 %), with 1 535 300 m^3 (48 %) or 140 m^3/ha wood volume and growth rate 46 677 m^3/ year (58%) or 4.2 m^3/ha;
- artificially raised forests and cultures (mostly conifers) with 3 046 ha (11%), with 37 600 m^3 (1%) or 78 m^3/ha wood volume and growth rate 2 491 m^3/ year (3%) ili 0.8 m^3/ha;
- widths with 7 662 ha (27%);
- shrubs with 1 171 ha (4%);
- other forests (experimental fields) with 8 ha.

Stated data show that the Pirot forestry holding is in significantly better conditions than average in Serbia. By reviewing potentials of the Pirot forest holding the operational quantity of woody biomass that can be counted on as energy source or technical material has been defined (*Table 1*).

Table 1. Review of available wood biomass for cutting on territory of the Pirot forestry holding [24]

Pirot forestry holding	P	V	Zv	SE	Otp	NS
	ha	m^3	m^3/ year	m^3/ year	m^3/ year	m^3/ year
State forests	11 156	2 053 822	35 258	15 424	3 084	12 339
Private forests	17 536	1 882 753	26 750	11 702	2 340	9 362
Total	28 692	3 936 575	62 008	27 126	5 424	21 701

Legend:

P (ha) - Unit for surface area of forestry holding

V (m^3) - Overall available wood mass expressed through volume

Zv (m^3/ year) - The yearly volume growth rate

SE (m^3/ year) - Gross logging

Otp (m^3/ year) - Forest waste (20% of gross logging)

NS (m^3/ year) - Net logging

This data represents so called net logging with data for gross logging 27 126 m^3/god. That means that in forest, at the cutting place made loss of 5 425 m^3/ year. When getting out of wood its losses amount 7 595 m3/ year or 35% of net logging.

The general conclusion is that in the present exploitation of forests for fulfilling energy need, efficiency forest biomass conversion in heating power barely 20 % if energy chain begins in the forest and finishes in the home furnace. Exploitation efficiency in the chain that begins in a forest and finishes in a timber yard is also very low with barely 50%. The conclusion undoubtedly points on seeking the solution that will be the compromise between forest as a need and forest as a treasure.

4.2 Investment budget-CHP plant

Based on the stated advantages of CHP plant in sense of reaching the energy efficiency and safeness through using a biomass as RES, the investment in construction of such facility in the city of Pirot would be the solution for the long-lasting problem in supply, especially with the heat. The idea for investment proposal has been deriving from the necessity of heat production that fulfills the heating needs of the city of Pirot and additionally produced electrical power would be sold to Public company "Elektroprivreda Srbije" for further distribution. The installed capacity of the facility would be 10MW.

The investment idea, technically speaking, implies construction of CHP plant, connection on heat pipes system and installation for connecting to a power grid. The realization of such projects can be achieved through public-private partnerships between municipality institutions, state institutions and strategic investors. Table 2 shows the indicative budget of the planned investment.

Table 2. Indicative budget of potential investment

Activities	Duration	Cost (€)
Feasibility analysis (Level I)	1 weeks	1 000
Pre-feasibility study (Level II)	6 weeks	8 000
Feasibility Study (Level III)	4 months	100 000
Acquiring the right to build a CHP plant	10 months	4 000
Acquiring the right to produce electricity / heat	8 months	4 000
Capital investment	22 months	18 550 000
Maintenance	continuous	0.005/0.015 €/kw/h
TOTAL		**18 667 000**

4.3 Payback period

Most of the data concerning the necessary capacities of CHP plant and costs which arise from its building are estimated based on data of potential benchmarking partners [32]. Table 3 shows the indicative calculation of the payback period for the building of the biomass-CHP 10MW plant in Pirot.

Table 3. Calculation of the payback period for bio-CHP 10MW plant

№	Index	Units	Cost
	Revenues, excluding VAT		
1.	Installed electrical capacity - 10 MW	MW/h	10
2.	Hours of bio-CHP operation per year	h	8 000
3.	Electric power generated for 4000 hours of annual operation in heating mode (7 MW)	MW/h	28 000
4.	Electric power generated for 4000 hours of annual operation in generator mode (9 MW)	MW/h	36 000
5.	Total annual generation of electric power	MW/h	64 000
6.	Electricity consumption for internal (own) needs (23%) annually	MW/h	12 800
7.	Cost of electricity sold at feed-in ("green") tariff	€/kWh	0.09
8.	**Cost of electricity sold at feed-in tariff in wholesale energy market, excluding own needs**	€	**4 608 000**
9.	Produced average amount of heat energy per season	Gcal/h	14
10.	Amount of heat energy released per heating season (4000 hours)	Gcal/god	56 000
11.	Sale price of 1 Gcal for households (population) (70% of sales are for population)	€/Gcal	30
12.	Sale price of 1 Gcal for municipal and other consumers (30% of all sales)	€/Gcal	90
13.	**Cost of sold heat energy to households (population)**	€	**1 176 000**
14.	**Cost of sold heat energy to municipal and other consumers**	€	**1 512 000**
15.	**Total revenue from sales of electric and heat energy per year**	€	**7 296 000**
	Expenditure part, excluding VAT		
16.	Hourly consumption of wood biomass	t/h	15
17.	Biomass consumption for generation of electric and heat power per year	t/god	120 000
18.	Specific weight of wood chips with humidity of 55%	t/m^3	0.450
19.	Market price of biomass	$€/m^3$	10
20.	Required annual amount biomass	m^3	266 700
21.	Cost of biomass per year	€	2 667 000
22.	Price of feed water	$€/m^3$	0.60
23.	Required amount of feed water for bio-CHP per year	m^3	25 000
24.	Cost of feed water	€	15 000
25.	Cost of capital assets included in the cost calculation	€	18 667 000
26.	Market exchange rate (dinar/euro)	RSD/€	125
27.	Percentage of depreciation on fixed assets	%	0.04
28.	Total amount of depreciation on fixed assets	€	746 680
29.	Annual salary of the staff (50 employees)	€	300 000
30.	Other operating costs (1% of the value of capital assets)	€	186 670
31.	Repayment and service of credit	€	0
32.	**Total annual costs (biomass + depreciation + operation cost +**	€	**3 915 350**

	gross earnings + credit)		
33.	**Average annual gross profit**	€	**3 380 650**
34.	**Average annual net profit (15% income tax)**	€	**2 873 553**
35.	**Payback period, excluding construction period (investment value / net profit)**	god	**6.5**
36.	**Payback period, including construction period**	god	**9**

In this case, the payback period, excluding construction period, is 6.5 years after commissioning the plant. The exact calculation with real figures and considering all factors could be carried out during engineering (in feasibility study).

5 Discussion

In period from 2005 until today the government of Republic Serbia has enacted numerous strategic documents in which goals, measures and priorities of Republic Serbia in the field of development and methods for goals realization are listed. Strategies contain elements for planning and implementing activities for achieving objectives of sustainable local development.

Some priorities of a new energy strategy of Republic Serbia, which implies production of sufficient quantity of energy and fuels at sustainable prices, are:

1. Using the renewable energy sources in cogenerative plants for production of heat and power.
2. Development and building-up efficiency of communal energetics through production heat and power in heating plants with gradual replacement environmentally harmful energy sources as oil fuel or coal with renewable sources, primarily with biomass.

The strategic development of the city of Pirot, by setting own strategic goals for the period 2015-2020 year is completely concordant with the energetic strategy of Republic Serbia. One of the important objectives is: *Promotion of Pirot as energy efficient town through using alternate energy sources.* Within the frame of this strategic goal one specific goal is defined: *Building facilities in Pirot and creation of a favorable environment for sustainable utilization of biomass in the whole region.* Achievement of this objective can contribute higher energy efficiency, rural development and environmental protection through lower emission of harmful gases and control of waste materials.

Also, the realization of the project constructing a cogenerative plant on biomass is in accordance with conditions and objectives of IPA (IPA-Instrument for Pre-accession Assistance) financing programs. IPA program is mean by which EU assists technically and financially reforms in societies in pre-accession process. IPA II is program for period 2014-2020 where is as assistance for Serbia predicted about 1.5 billion €. Priority sectors for financing and provided funds are shown in Appendix 2.

The positive influence on social and economic indicators in Pirot region would be achieved in different manners:

3. By downsizing the consumption of oil fuel, presently the only energy source for heating in city heating plant, the import dependency would be decreased.
4. Operating of CHP plant on cheap fuel (wood) would enable enormous financial savings that are otherwise used for buying liquid fuels.

5. Energy independence would be achieved in the city of Pirot and in the whole region through reduction of possible fuel shortcomings as well as through increased share of stable energy sources.
6. Operating of CHP plant would enable that present prices of heating for citizens stay unchanged or even become lower and the positive socio-economic influence would be accomplished.
7. New working places in CHP plant with direct employment as well as cooperatives with indirect employment would be realized so numerous problems (migrations, downsizing of the population, unemployment, low incomes, poverty etc) can be solved.
8. Reducing the costs of production in other sectors as consequence of lower energy prices, producing the competitive products and increasing the level of business operations.
9. Increasing the city budget.
10. The agricultural waste could be used as fuel after adequate treatment so enables additional income for farmers.
11. Drastic reducing emission of air pollutants and maintenance of existing and raising new forests are invaluable environmental benefits.
12. The popularization of using RES among the population through educations would contribute to better understanding of the importance of energy efficiency and greater involvement of all stakeholders.
13. Stopping the degradation process of rural areas through encouragement of private forest owners in making long-term supplying connections with management of CHP plant and increasing the incomes.
14. Development of infrastructure in rural areas at first in order to enable undisturbed supply with raw wood and later to enrich the living conditions and satisfying needs of local inhabitants;
15. Development of sustainable tourism through the promotion of region as ,,green,, with clean energy and products.
16. Development of entrepreneurship directly or indirectly connected with CHP plant operations
17. The most important benefit- overall increase in quality of life and creating more conscious and more organized society.

6 Conclusion

By realizing the project idea of constructing CHP plant on biomass, the city of Pirot would become recognizable very soon as modern energy sustainable town, the first in Serbia, where the intention would be that all energy production is from RES and all consumption is energy efficient.

Results of this research are suitable for further use by different stakeholders. Investors can use the results for preliminary assessments in the phase of developing their projects, when choosing the right location, when consider the potentials of the region for sustainable supply with biomass for the particular investment period. Biomass suppliers can use this study to find new ideas for the development of biomass production and utilization. Other stakeholders can get a comprehensive review of implementation cogenerative production of heat and power with detailed insight into the sustainability of this type of projects and market perspective.

This and similar projects for increasing energy efficiency and production of clean energy could become the cores for sustainable development Recognition of this projects is being realized through non aggressive measures of environmental protection by using renewable energy sources and improving the energy efficiency of habitation and transport.

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Appendix

Appendix1. SWOT analysis - The potential of the Pirot region

Strengths	**Weaknesses**
- Favourable geographical and transport position (highway corridor 10, two airports Niš-65km and Sophia-80km) - Great forest resources - Great hydro potential - Great energy potentials of wind - Natural potentials for development of agriculture at more than two third of the area - Available workforce - Local action plan for energy - The existence of a fully equipped industrial zone with well-developed infrastructure - The existence of location owned by the city available for new investment - Adopted Spatial plan of the city of Pirot, General urbanism plan of the city of Pirot and Plans of detailed regulation - Great coordination between institutions and services in order to improve cooperation with investors - Developed GIS system - Trained personnels in public institutions for using of EU funds	- Insufficient exploitation of natural resources - Unplanned logging of forests - Non-existence of strategic documents for environmental protection - Insufficient level of economic development of the region and society - Emigration of the qualified workforce - Mismatch of economy and education - Lack of innovativeness in business - Technological backwardness - Unplanned agricultural production and weak organization of agricultural households - Deficiency of primary waste separation - Complicated administrative procedures in municipality authorities and communal services - Insufficiently good local infrastructure - Expensive heating and decreasing number of the consumers - Unsolved legal property relationships - Insufficient promotion of regional potentials - Developed GIS system is not used enough - Nonexistence of entrepreneurs and companies for collecting and recycling of waste - Ineffective use of agricultural waste
Opportunities	**Threats**
- Construction of a gas pipeline Sofia-Niš - A new branch of corridor 10 and vicinity of EU - Pre-accession IPA funds - Cross-border cooperation (Macedonia, Bulgaria) - Transfer of technologies, knowledge and good practice - Development of public-private partnerships - Development of regional and inter-municipal infrastructure projects - Support of EU for improvement of agriculture and innovations of small and medium enterprises - Reconstruction and privatization of public companies - Harmonization of domestic laws with EU legislative - Introduction of EU standards - Interested foreign investors for investments - Promotion of using RES - Incentives for companies that deal with eco-waste	- Lack of funds for development and improvement of infrastructure - Poor economy in the region - Very slow process of decentralization - Competition of other regions with similar potentials - Financial centralization of the state - Emigration of population - Gray economy - Unfavorable loan policy of bank sector - Mismatch of legislations - Lagging behind in technological development - The poorly developed concept of corporate social responsibility

Appendix 2. INDICATIVE ALLOCATIONS (million EUR) - per policy areas and sectors [4]

	2014	**2015**	**2016**	**2017**	**2018-2020**	**Total 2014-2020**	**Relevant to climate change**
a. Reforms in preparation for Union membership	**95.1**	**61.4**	**77.9**	**78.4**	**230.2**	**543.0**	
Democracy and governance				177.8	100.2	278.0	
Rule of law and fundamental rights				135.0	130.0	265.0	
b. Socio-economic and Regional development	**85.0**	**75.0**	**85.0**	**80.0**	**240.0**	**565.0**	
Environment and climate change				85.0	75.0	160.0	80%
Transport				90.0	85.0	175.0	
Energy				80.0	45.0	125	40%
Competitiveness and innovation				70.0	35.0	105.0	
c. Employment, social policies, education, promotion of gender equality, and human resources development	**15.0**	**40.0**	**20.0**	**27.0**	**88.0**	**190.0**	
Education, employment and social policies				102.0	88.0	190.0	
d. Agriculture and rural development	**0**	**25.0**	**25.0**	**30.0**	**130.0**	**210.0**	
Agriculture and rural development				80.0	130.0	210.0	40%
TOTAL	**195.1**	**201.4**	**207.9**	**215.4**	**688.2**	**1 508.0**	

THE BACKGROUND OF RISKS IN (AND OF) THE VIRTUAL WORLD

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Abstract: The story of the personal computers started in the middle of the 1970's and by the end of the last millennium their penetration became general as well as that of the network access. It soon commenced change of our world as a revolution of IT similar to the impact of the steam engine.

The new technology has made it possible (and necessary) to store more and more digital data in computers and, in addtion, our dependency on these data becomes stronger and stronger every day. These changes have resulted in a new and virtual world and soon we have found ourselves in a very awkward situation: some well-known old rules must be questionned because they seem not valid in the virtual world and at the same time some new rules came into existence that have never been experienced. In case of a physical theft, for example, we can know at least that the thief must have been on the spot personally at the exact time of the theft while in case of a "virtual theft" the perpetrator need not be anywhere for sure at any time.

These new circumstances mean new threats of new risks on our everyday and physical personal life as well as on our companies. In this paper I'm investigating this phenomenon and its effects on our everyday privte and company life by analysing a lot of related news from the last two decades with the conclusion that beside our three existing environments of biological, social and technical nes we have got a fourth one, the physical environment of a virtual world. And it means that we are supposed to develop and complement our culture, too, to be able to accomodate to the new attributes of the new world.

PRIORITIZATION OF REGIONAL STRATEGIES USING A SWOT-AHP ANALYSIS - CASE STUDY:BUILDING ECO-LODGEIN EASTERN SERBIA

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Abstract: The aim of this paper is to identify and prioritize the criteria (strengths, weaknesses, chances and threats) and the sub-criteria of the SWOT analysis of Eastern Serbia, conducted in order to build eco-lodge in this area. Based on the information obtained by SWOT analysis, regional strategies were generated and their prioritization was carried out. The methodology applied for the realization of this task is reflected in integration of the SWOT approach and the analytical hierarchical process (AHP). Strategy prioritization and sensitivity analysis were performed using the Expert Choice software package. The obtained results represent the most efficient guidelines for the development of ecotourism in the analyzed region and emphasize the need for strategic planning in regional development.

Keywords: SWOT, AHP, Strategy, Regional development, Eco-lodge

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