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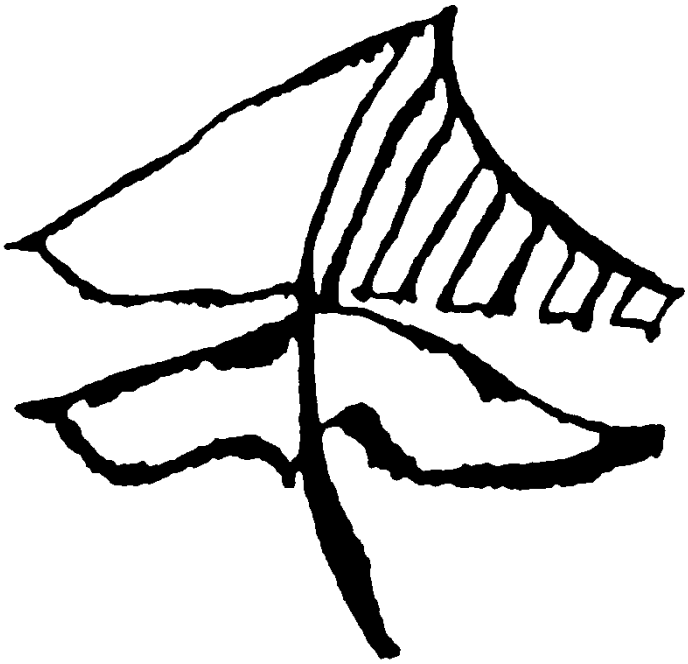

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Wojciech Lis

Hanna Adamska, Anna Barczyk[1]

THE ASSESSMENT OF SELECTED ENVIRONMENTAL ELEMENTS IN THE EUROPEAN UNION COUNTRIES IN CONTEXT OF ECOLOGICAL SAFETY

Abstract: The paper contains characteristics of selected environmental elements of EU countries in terms of ecological safety. The work included issues of primary energy, renewable energy and greenhouse gas emissions. Presented statistical data comes from the European Statistical Office. The time range covered the period from 2004 to 2013.

People through their activity cause a number of changes that lead to hazards in the environment. One of them is climate change. Preventing these changes can be achieved by increasing the share of energy from renewable sources and reducing greenhouse gas emissions. It must be achieved through collective actions of all countries worldwide including the EU.

Keywords: primary energy, renewable energy, greenhouse gas, European Union, environmental security

INTRODUCTION

There are many definitions defining the concept of security. The most relevant concept to determine security is to describe it as a state of confidence, calmness, lack of threats and protection from dangers [www.…]. Earlier this concept involved mainly the political and military areas. Currently security covers five domains: political, military social, cultural, ideological and ecological. Each of these areas is essential to the security of global, national or local character. However, special attention should be focused on ecological security, due to the progressive state of environmental degradation.

Dziamski and Nowosielski [2012] think that "environmental security is a state of social relations in the content, forms and methods of operation that reduce and eliminate environmental hazards, providing comprehensive and safe development of all humanity". Ecological security should focus on the relationship between men and the environment. The environment is still an element that sustains life, providing the basis for the safe operation of man [Dziamski, Nowosielski 2012]. It can therefore be concluded that the ecological security boils down to create the appropriate conditions for life on Earth for all living organisms, man in particular. So it becomes necessary to maintain and improve the environment to ensure ecological safety. This issue is dealt with by Art. 5 of the Constitution, which mentions the need to "ensure the protection of the environment". The need to protect the environment is not just taking measures aimed at counteracting the negative effects of environmental degradation, but also activities related to raising the level of environmental protection for the safe use and functioning in it. [Surówka 2012]. Therefore, the action on the environmental safety can be directed to the reduction or elimination of environmental hazards and the protection against factors which may jeopardize the functioning of the human.

Given the ecological security of the world, including the European Union, all countries must carry out measures to prevent environmental degradation. This requires the use of the same rules and cooperation. It is not easy, because the interests of individual countries are diverse, e.g. of the developed and developing countries [Zacher 1991].

One way of making efforts to preserve ecological and energy safety in the EU is seeking alternative energy sources, which is, among other things, pointed out by Kruk [2012]. The use of

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renewable energy sources can help reduce the extraction of non-renewable resources and combat climate change by reducing greenhouse gas emissions.

METHODOLOGY

The study addresses issues related to energy security of the European Union. Observations were subjected to such factors as: production of primary energy and renewable energy and greenhouse gas emissions. Considerations were made on the basis of EUROSTAT statistical data resource and related to a period of 10 years (from 2004 to 2013).

In this study we employed statistical methods, which include the rate of dynamic changes, the trend and determination of the average values of the studied phenomena. Considerations were based on the vertical analysis (compilation of statistical data in different years) and horizontal one, comparing the data in a spatial system (selected countries of the European Union).

The object of observation includes 10 member states - 5 belonging to the European Union before 2004 (France, Germany, Italy, Sweden and United Kingdom) and 5 belonging to the Union since 2004 or later (Bulgaria, Czech Republic, Estonia, Poland and Slovakia).

RESEARCH OUTCOMES

In the first stage of the research studies we are focused on the production of primary energy, which is energy derived from all natural sources, both non-renewable and renewable per capita of the country (Table 1).

In most studied countries (Czech Republic, France, Germany, Poland, Sweden, United Kingdom), there was a decrease in primary energy production in comparison to the year of output. However, the greatest reduction in primary energy production has taken place in the United Kingdom - this production in 10 years dropped by more than 50% (from 156072MJ in 2004 to 71753 MJ in 2013). In other countries (Bulgaria, Estonia, Italy and Slovakia), there has been an increase in primary energy production.

Given the dynamics, the major changes in increments characterized two countries: Estonia and Italy (by 156,84%, and 126,33% compared to the initial year). Estonia is a country where they make the most of primary energy per capita - almost 180 thousand MJ. Sweden (almost 152 thousand MJ per capita) holds the second position.

In all countries, the European Union currently (2013) produces 70667 MJ of primary energy per capita. Its quantity in the analyzed period has been dropping systematically.

In the Member States that belonged to the structures of the EU before 2004 the amount of production decreased in the years of 2004-2013. The situation is different in the new Member States, where the production of primary energy per capita rather than declining is slightly increasing, as seen in the example of Estonia.

Traditional methods of obtaining energy from non-renewable resources through the use of greenhouse gas emissions have a significant impact on the environmental safety. Table 2 presents statistics on greenhouse gas emissions in selected EU countries per capita. The greatest emissions of greenhouse gases are characteristic for such countries as Estonia (14,48 t per capita), the Czech Republic (12,51 t per capita) and Germany (11,47 t per capita). The lowest greenhouse gas emissions in the period 2004-2012 was recorded in Sweden, where it is about half less than in the countries with the highest emissions. In Poland greenhouse gas emissions throughout the whole period remained on a similar level, ie. about 10 t / per capita.

Countries that belong to the European Union for more than 10 years show a negative growth rate of greenhouse gas emissions - the emissions of all time decreases, even though statistically the values are still greater than in the case of new member states. On the other hand, some of the countries joining the EU in 2004 and later (Estonia and Bulgaria) are characterized by an increase in greenhouse gas emissions.

Table 1. The production of primary energy in selected European Union Countries per capita (MJ) and the dynamics of change (%).

	Country/Year	2004	2006	2008	2010	2012	2013
Production of primary energy per capita (MJ)/Dynamics of change (%) base year = 2004 index = 100	Bulgaria	55692	60272	56683	59132	66748	60567
		100,00	*108,22*	*101,78*	*106,18*	*119,85*	*108,75*
	Czech Republic	136083	137253	132643	126254	127480	119231
		100,00	*100,86*	*97,47*	*92,78*	*93,68*	*87,62*
	Estonia	114311	116123	132179	154823	160857	179289
		100,00	*101,59*	*115,63*	*135,44*	*140,72*	*156,84*
	France	90322	89525	88567	87245	85529	86269
		100,00	*99,12*	*98,06*	*96,59*	*94,69*	*95,51*
	Germany	69406	70451	67672	65855	62774	61544
		100,00	*101,51*	*97,50*	*94,88*	*90,44*	*88,67*
	Italy	20473	19689	19129	20866	24706	25862
		100,00	*96,17*	*93,44*	*101,92*	*120,68*	*126,33*
	Poland	85654	84293	77586	73500	78082	77634
		100,00	*98,41*	*90,58*	*85,81*	*91,16*	*90,64*
	Slovakia	48553	49697	48006	46402	48287	49586
		100,00	*102,36*	*98,87*	*95,57*	*99,45*	*102,13*
	Sweden	157062	149787	149476	146424	157742	151960
		100,00	*95,37*	*95,17*	*93,23*	*100,43*	*96,75*
	United Kingdom	156072	128128	112641	98519	76780	71753
		100,00	*82,10*	*72,17*	*63,12*	*49,20*	*45,97*
	EU before 2004	**84000**	**80667**	**78000**	**77333**	**70667**	**70667**
		100,00	***96,03***	***92,86***	***92,06***	***84,13***	***84,13***
	EU after 2004	**57692**	**56154**	**57692**	**57692**	**59231**	**58462**
		100,00	***97,33***	***100,00***	***100,00***	***102,67***	***101,33***
	EU total	**78689**	**74330**	**71181**	**69180**	**65873**	**65269**
		100,00	***94,46***	***90,46***	***87,92***	***83,71***	***82,95***

Source: own study based on EUROSTAT

Another analyzed factor that is extremely important from the point of view of environmental safety is the production of energy from renewable sources. The data presented in Table 3 show that the largest energy production from renewable sources per capita occurs in Sweden, Great Britain and Estonia. The lowest energy from renewable sources produced per capita is in Poland. Our country compared to European Union countries ranks at further locations. However, a significant progress in obtaining renewable energy should be noted. In 2004, output per capita was 4739 MJ and 2013 increased by 50% to 9362 MJ.

Overall, the European Union has increasing the amount of energy produced through renewable sources of energy per one person. The dynamic growth is seen in both the old and new Member States. The biggest positive dynamics in 2004-2013 is observed in the UK, where renewable energy

production has increased to over 270% compared to 2004 and the lowest in France and Sweden (respectively 140% and 120%).

Table 2. The emission of greenhouse gas in selected countries of European Union per capita (t) and dynamics of change (%)

	Country/Year	2004	2006	2008	2010	2012
Greenhouse gas emission per capita (t)/ Dynamics of change (%) base year = 2004 index = 100	Bulgaria	8,15	8,36	8,89	8,12	8,33
		100,00	*102,58*	*109,08*	*99,63*	*102,21*
	Czech Republic	14,45	14,38	13,75	13,10	12,51
		100,00	*99,52*	*95,16*	*90,66*	*86,57*
	Estonia	14,00	13,21	14,60	14,92	14,48
		100,00	*94,36*	*104,29*	*106,57*	*103,43*
	France	8,95	8,65	8,32	7,99	7,51
		100,00	*96,65*	*92,96*	*89,27*	*83,91*
	Germany	12,36	12,16	11,92	11,57	11,47
		100,00	*98,38*	*96,44*	*93,61*	*92,80*
	Italy	10,03	9,70	9,22	8,44	7,75
		100,00	*96,71*	*91,92*	*84,15*	*77,27*
	Poland	10,42	10,85	10,65	10,68	10,36
		100,00	*104,13*	*102,21*	*102,50*	*99,42*
	Slovakia	9,48	9,37	9,11	8,42	7,90
		100,00	*98,84*	*96,10*	*88,82*	*83,33*
	Sweden	7,77	7,38	6,86	6,97	6,07
		100,00	*94,98*	*88,29*	*89,70*	*78,12*
	United Kingdom	11,39	11,08	10,44	9,69	9,15
		100,00	*97,28*	*91,66*	*85,07*	*80,33*
	EU before 2004	**12,82**	**12,50**	**11,70**	**11,14**	**10,21**
		100,00	***97,48***	***91,26***	***86,94***	***79,62***
	EU after 2004	**9,23**	**9,34**	**9,47**	**8,90**	**8,61**
		100,00	***101,17***	***102,57***	***96,39***	***93,28***
	EU total	**10,59**	**10,42**	**10,00**	**9,44**	**8,98**
		100,00	***98,39***	***94,43***	***89,14***	***84,80***

Source: own study based on EUROSTAT

Among the countries that joined the European Union in 2004 and later there is also an increase in the share of energy from renewable sources. This applies particularly to Bulgaria, Poland and Slovakia (as compared to the initial year, the amount of energy produced from renewable sources in these countries doubled). Despite this dynamic growth still about 50% more renewable energy is produced in the old member states from before 2004.

Table 3. The production of renewable energy in selected countries of European Union per capita (MJ) and the dynamics of change (%).

	Country/Year	2004	2006	2008	2010	2012	2013
Production of renewable energy per capita (MJ)/ Dynamics of changes base year = 2004 index = 100	Bulgaria	5495	6436	6077	8483	9360	10492
		100,00	*117,12*	*110,59*	*154,38*	*170,34*	*190,94*
	Czech Republic	7697	8837	9779	11606	12941	14493
		100,00	*114,81*	*127,05*	*150,79*	*168,13*	*188,29*
	Estonia	20968	19996	23629	31010	33373	35591
		100,00	*95,36*	*112,69*	*147,89*	*159,16*	*169,74*
	France	10524	10372	12148	13646	13342	14735
		100,00	*98,56*	*115,43*	*129,67*	*126,78*	*140,01*
	Germany	7393	10178	11756	14184	16414	17192
		100,00	*137,67*	*159,02*	*191,86*	*222,02*	*232,54*
	Italy	8203	8229	9015	11235	14869	16485
		100,00	*100,32*	*109,90*	*136,96*	*181,26*	*200,96*
	Poland	4739	5229	5934	7550	9325	9362
		100,00	*110,34*	*125,22*	*159,32*	*196,77*	*197,55*
	Slovakia	5804	6729	8043	10904	11105	11349
		100,00	*115,94*	*138,58*	*187,87*	*191,33*	*195,54*
	Sweden	61082	66581	71216	76185	81788	73474
		100,00	*109,00*	*116,59*	*124,73*	*133,90*	*120,29*
	United Kingdom	2036	2683	3133	3495	4657	5506
		100,00	*131,78*	*153,88*	*171,66*	*228,73*	*270,43*
	EU before 2004	**17093**	**18407**	**20129**	**22208**	**23603**	**23975**
		100,00	***107,69***	***117,76***	***129,92***	***138,09***	***140,26***
	EU after 2004	**10149**	**10507**	**11438**	**13948**	**15182**	**15904**
		100,00	***103,53***	***112,70***	***137,43***	***149,59***	***156,71***
	EU total	***13869***	***14739***	***16094***	***18373***	***19693***	***20228***
		100,00	***106,27***	***116,04***	***132,47***	***141,99***	***145,85***

Source: own study based on EUROSTAT

Taking into account the share of renewable energy in total primary energy production according to the data in Table 4 it should be noted that Italy (71,53%), Sweden (49,25%) and Germany (27,7%) produce the most of it. These are the countries that form the main source of renewable energy in the EU. In turn, the smallest production of renewable energy in comparison with the overall primary energy is generated in the United Kingdom (less than 10%).

Every country except Estonia shows a strong upward trend of the share of energy from renewable sources in total energy production. The biggest increase is shown by the United Kingdom, where even in 2004 the share of renewable energy in the total energy acquisition amounted to less than 2% (1,46%), and currently (2013) the proportion is more than 6-fold higher (9,22%). High dynamic features are also among such countries as the Czech Republic, Germany and

Poland, where the share of renewable energy produced by these countries in the EU renewable energy increases substantially - in Poland from 5,53% (2004) to 12,13% (2013).

Comparing the so-called countries of "Old EU" to the countries which joined the Community in 2004 and later it may be noted that in both cases there is a rapid increase in the share of renewable energy in total energy production, but in those first countries the dynamic is slightly higher than in younger member countries.

The sharp increase in the importance of energy from renewable sources is an important phenomenon from the point of view of security, not only energy security, but also ecological safety, because it is the result of strict restrictions and technological progress and growing ecological awareness [Strategia…].

Table 4. The share of renewable energy in total primary energy produced by selected countries of European Union and the dynamics of change (%)

	Country/Year	2004	2006	2008	2010	2012	2013
The share of renewable energy in primary energy production (%) / Dynamics of change (%) base year = 2004 index = 100	Bulgaria	9,58	10,38	10,44	13,9	13,93	17,21
		100,00	*108,35*	*108,98*	*145,09*	*145,41*	*179,65*
	Czech Republic	5,24	5,76	6,77	8,81	10,03	11,92
		100,00	*109,92*	*129,20*	*168,13*	*191,41*	*227,48*
	Estonia	16,14	14,17	15,29	17,17	16,92	15,06
		100,00	*87,79*	*94,73*	*106,38*	*104,83*	*93,31*
	France	11,61	11,61	13,97	15,76	15,82	17,25
		100,00	*100,00*	*120,33*	*135,75*	*136,26*	*148,58*
	Germany	10,69	14,84	17,57	21,43	26,28	27,7
		100,00	*138,82*	*164,36*	*200,47*	*245,84*	*259,12*
	Italy	42,36	45,26	50,08	61,49	68,12	71,53
		100,00	*106,85*	*118,22*	*145,16*	*160,81*	*168,86*
	Poland	5,53	6,11	7,87	10,92	12,15	12,13
		100,00	*110,49*	*142,31*	*197,47*	*219,71*	*219,35*
	Slovakia	11,71	13,09	15,22	22,18	21,8	21,99
		100,00	*111,78*	*129,97*	*189,41*	*186,17*	*187,79*
	Sweden	38,89	44,45	47,64	52,03	51,85	49,25
		100,00	*114,30*	*122,50*	*133,79*	*133,32*	*126,64*
	United Kingdom	1,46	2,3	3,32	4,62	7,17	9,22
		100,00	*157,53*	*227,40*	*316,44*	*491,10*	*631,51*
	EU before 2004	**23,15**	**25,9**	**29,61**	**32,97**	**37,86**	**37,22**
		100,00	***111,88***	***127,90***	***142,42***	***163,54***	***160,78***
	EU after 2004	**13,62**	**13,58**	**14,71**	**18,55**	**18,71**	**20,56**
		100,00	***99,71***	***108,00***	***136,20***	***137,37***	***150,95***
	EU total	**20,00**	**22,09**	**24,74**	**30,76**	**34,03**	**34,31**
		100,00	***110,47***	***123,69***	***153,82***	***170,15***	***171,53***

Source: own study based on EUROSTAT

SUMMARY

European Union actions towards environmental safety are manifested by reduction in primary energy production, reduction of greenhouse gas emissions and increasing share of energy from renewable sources. These actions from the point of view of ecological safety should be considered as positive steps to protect the environment.

The analysis comes down to the following observations:

1. The analyzed period is characterized by a decrease in total primary energy production. As a result of reducing the traditional sources, greenhouse gas emission is also reduced. During the period, it decreased by 15%.
2. Energy requirements for all countries are huge and they must seek other ways of its acquiring, which include the use of renewable energies. Such actions are visible in EU countries. Across the European Union, renewable energy represents 34,31% of the total energy produced.
3. Poland as a producer of primary energy in the European Union generated in the majority on the basis of conventional methods is essentially important. Taking into account the acquisition of energy from renewable sources, a lot less than in western Europe is produced, but this share is increasing.
4. There are growing imbalances in the energy situation between the countries which are members of the EU from before 2004 and the countries that joined the European Union structures in 2004 and later. While in countries of "Old EU" primary energy production is reduced while increasing the energy production from renewable sources, in countries of the "New EU" primary energy production does not show such regularity.

REFERENCES

1. Dziamski Z., Nowosielski W. (2012), Teoretyczne założenia bezpieczeństwa. Prace Naukowe Akademii im. J. Długosza w Częstochowie. SERIA: Edukacje Techniczne i Informatyczne, No. VII, pp. 201-216.
2. Kruk H. (2012),Wykorzystanie źródeł energii a bezpieczeństwo energetyczne i ekologiczne Polski. Zeszyty Naukowe Akademii Morskiej w Gdyni, No. 72, pp. 23-30.
3. Strategia bezpieczeństwo energetyczne i środowisko – perspektwa do 2020 r. Monitor Polski, poz. 468, pp. 56-64.
4. Surówka A. (2012), Bezpieczeństwo ekologiczne a gospodarowanie odpadami w świetle prawa konstytucyjnego. Przegląd Prawa Konstytucyjnego, No. 4, pp. 151-167.
5. Zacher Z. (1991), Bezpieczeństwo ekologiczne- wymiary polityczne, międzynarodowe i globalne, [in.] Międzynarodowe bezpieczeństwo ekologiczne. Lublin, p. 98.
6. ec.europa.eu/eurostat [access 2015.07.20]
7. www.kgsit.wse.edu.pl [access 2015.08.04]

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BIODIVERSITY AS AN ECOSYSTEM SERVICE AND METHODS OF ITS EVALUATION

Abstract: Ecosystem services have become a top research issue in ecology, economy, environment management, and policy. One of the important ecosystem services is biodiversity. Agricultural biodiversity ensures very important functions, such as: pollination, biological crop protection, maintenance of proper structure and fertility of soil, protection against erosion, nutrient cycling, control of water flow. The aim of the paper was the assessment of the influence of different agricultural systems on biodiversity using various indicators. The study showed that organic system was more conducive in maintaining biodiversity of flora, earthworms and ground invertebrates than conventional and integrated system. Developing of organic system may increase the level of different ecosystem services necessary for human (pollination, soil structure, biological control, cultural values, human health). Cultivation of perennial energy crops: willow and miscanthus negatively influenced earthworms abundance which may affects the productive and retention functions of soil.

Key words: biodiversity, ecosystem services, weed flora, earthworms, invertebrates, agricultural systems, perennial plants for energy purposes

INTRODUCTION

Biodiversity may be treated as primary regulator of ecosystem processes, final product i.e. ecosystem service and good itself [Mace at al. 2012]. In modern world, biodiversity is threatened by human activities, including the intensification of agricultural production [Matson et al. 1997]. Agriculture not only produces crops but also have environmental impacts on a wide range of ecosystem services, including pollination, water quality, nutrient cycling, soil retention, carbon sequestration, and biodiversity conservation [Dale and Polasky 2007]. Understanding how agriculture influence ecosystem services, which in turn affect agricultural productivity, is of particular importance because of agriculture is a dominant form of land management. Modern agriculture should combine productive, economic and environmental goals in order to protect biodiversity. Maintaining high biodiversity in agroecosystems makes agricultural production more sustainable and economically viable [The economics…2008]. The aim of the study was a review of different indicators and methods to measure ecosystem services, especially biodiversity. The own research on the effect of different agricultural systems on biodiversity and other ecosystem services was presented.

THE METHODS OF ECOSYSTEM SERVICES ASSESSMENT

Ecosystem services are defined as the benefits that humans obtain from ecosystems [Costanza et al. 1997]. According to the classification from Millennium Ecosystem Assessment [MEA 2005] there are four basic types of services:

- provisioning (production of food, wood, fuel, water supply),
- regulating (regulation of air, climate, contamination, biological processes),
- supporting (nutrient cycles, primary production, soil formation, habitat function, hydrological cycle),

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- cultural (recreational, esthetic, cultural, and educational functions).

Ecosystem services, until recently, were primarily public goods, not being a market product or having a monetary value [The economics…2008]. It is a need to develop the indicators and methods of measuring the impact of different agricultural practices on ecosystem services and of ecosystem services on agricultural production [Dale and Polasky 2007]. These studies should be comprehensive and conducted by experts from different disciplines in order to properly assess the value of biodiversity and ecosystem services, and create a strategy for the development of environmentally friendly agriculture and sustainable development of rural areas. The approaches to mapping and modelling ecosystem services are many and varied [Crossman et al. 2013]. Consequently, there is much uncertainty in what is mapped and the methods used to map the services. Authors call for standardized methods to measure the ecosystem services [Daily and Matson 2008, Crossman et al. 2013].

In the first study of Costanza et al. [1997] the values of 17 basic services produced by ecosystems all over the world were assessed. It was estimated at 33 billion $ per year, so almost twice of the gross national product of USA. The analysis were based on the assessment of production per hectare of each service and types of ecosystems and approximate "price" of services, resulting from “willingness to pay". According to the authors of this valuation nutrient cycling as a regulating function has the greatest monetary value of all examined ecosystem services. Since then, a number of different methods of assessment were developed that Solon [2008] scored for 11 major categories: market prices, costs of replacement, costs of production, hedonic prices, travel expenses, changes of travel expenses, border prices, modeling of choice, costs of restoration, public ranking, evaluation of health values. Liziński [2010] distinguished the following methods of valuation of environmental goods and services: Willingness to Pay (WTP), Willingness to Accept (WTA), Contingent Valuation Method (CVM), Cost of Illness Method (COIM), Travel Cost Method (TCM), Hedonic Price Method (HPM). These methods of valuation of non-market goods and services (CVM COIM , TCM , HPM) can be used as a single economic tool, or may be a part of the analytical method named Cost - Benefit Analysis (CBA). CBA is used in projects or investments influencing the state of natural resources. In Poland there are examples of practical use of such valuation for natural resource owners [Żylicz 2012].

The valuation of each group of ecosystem services should be performed using different methods (Figure 1).

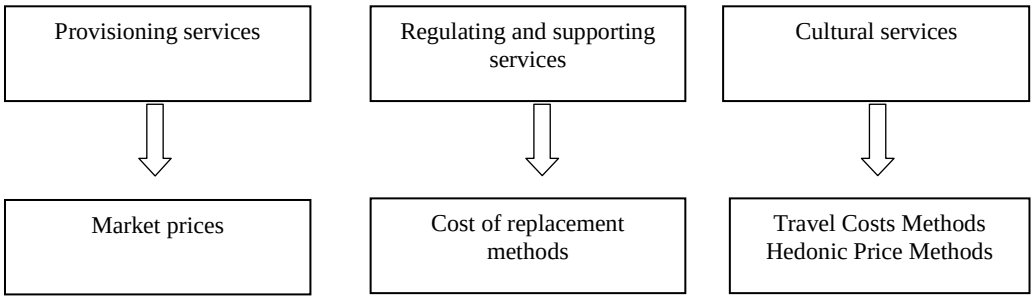

Figure 1. The usefulness of different methods for the valuation of ecosystem services

Source: own elaboration on the bases of de Groot et al. [2002] and Solon [2008]

The easiest and the best quantified service from agriculture is crop and livestock production [Dale and Polasky 2007, Solon 2008]. These production benefits are typically measured as the yield per area or per effort expended. According to Mace et al. [2012] the value of provisioning services, for example production of wheat, is not equal to the final price of wheat grain, because the value must be reduced by the value of the means of production and work of farmer. Cultural services provided by ecosystems (aesthetic, recreational and educational) can be valued using travel costs, i. e. how many tourists are willing to pay for a trip to the site. Another way to monetize environmental services is measuring the replacement costs, i. e. how much it would cost on open market the same or similar service to that provided by the environment [Solon 2008]. Economic assessment of the value of the services provided by the environment is difficult, time-consuming, and flawed.

BIODIVERSITY IN ECOSYSTEM SERVICES CONCEPT

Biodiversity is the variability among living organisms inhabiting all environments and ecological systems and may be considered at the genetic, species, and ecosystem levels, although the links between these levels exist [United Nations… 1992, Duelli and Obrist 2003]. According to Clergue at al. [2005] biodiversity serves three basic functions in agroecosystems: genetic, agricultural, and ecological one. The connections between biodiversity and ecosystem services are perceived in a different way. Some authors treat these concepts as one, which means that if the ecosystem services are managed properly, the biodiversity will be preserved and vice versa ("ecosystem services perspective"). Others claim that biodiversity is one of ecosystem services and the conservation of the diversity of wild species, especially the endangered ones, is one of the goods which ecosystem should deliver ("conservation perspective") [Mace et al. 2012].

Biodiversity plays a very important role in each group of ecosystem services. It is considered as one of the provisioning services, which can provide: genetic resources for breeding new cultivars of plants or animal breeds, new active substances for medicine and cosmetology, or new ornamental plants [Crossman et al. 2013]. Biodiversity determines most of the basic functions of the ecosystem, such as the distribution and circulation of elements, primary production, resistance to stresses. In cultural services biodiversity meets the aesthetic, recreational, spiritual functions [Solon 2008]. According to some authors, at present we are not able to fully assess the relationship between biodiversity and ecosystem services which it provides which is very important issue for our ecological security [The UK… 2011].

INDICATORS, LEVELS AND METHODS OF BIODIVERSITY ASSESSMENT

The complexity of biodiversity reflects in the variety of indicators and methods to measure it [Duelli and Obrist 2003]. In the assessments of biodiversity of agroecosystems the following taxonomic groups are mostly examined: vascular plants, wild species of pollinators, spiders, butterflies, earthworms, birds [Herzog et al. 2012]. A review of the literature shows that the most commonly used biodiversity indicators are: number of species on field and farm level, number of individuals per unit area, percentage coverage of area, Shannon diversity index and Simpson dominance index [Shannon 1948, Simpson 1949, Falińska 2004]. Studies have shown that indicators based on species richness of different groups of organisms are relatively inexpensive and easy to use to assess biodiversity at farm, region and country level [Herzog et al. 2012].

Another approach to determine the available ecosystem services is based on ecological analysis, which aims to identify the part of ecosystem responsible for the production of services, named "functional unit" [Kremen 2005] or "service providing unit" (SPU) [Luck et al. 2003]. Such unit can be a species, systematic group, trophic level or other biocenosis segment, which is a producer and service provider. For example, pollination service is provided by bees and bumblebees, and the measure of service value can be for example the size of pollen deposition during one visit to the plant [Solon 2008].

Examples of ecosystem services provided by biodiversity that can be evaluated:

I. Provisioning:
- Diversity of crops and wild plants as food and fodder
- Genetic, medicinal and ornamental resources. Natural biodiversity provides the genetic and biochemical resources that allow agricultural and pharmaceutical innovations. Use of the genetic diversity is estimated to contribute $1 billion in annual increases in crop productivity [Dale and Polasky 2007].

II. Regulating:
- Pollinators (density, pollinator habitats, replacement costs of supplementary pollination, crop yields). Pollination services by the nonnative honey bees (Apis mellifera) are critical for about 90 crops in the US and 300 crops worldwide, and value of this service in the US is estimated to be about 18 billion dollars [Dale and Polasky 2007] and 100 billion dollars a year around the world [Gallai et al. 2009]. This service is under increasing threat from agricultural intensification [Kremen 2002].
- Biological protection (e. g. pest density, coverage of area, density of trees, bushes)
- Increasing the resistance of ecosystem on natural disaster

III. Supporting:
- habitats
- maintaining of genetic diversity (e. g. abundance of rare species and species valuable for human).

IV. Cultural:
- the value of places of high biodiversity (willingness to pay willingness for visiting: number of tourists, costs of travel, accommodation, number of tickets which was sold etc.)
- aesthetic information (questionnaires, interviews on personal preferences, calculation the marginal price people are willing to pay for a property with a view or in a favoured holiday location) [Crossman et al. 2013].

The review of literature indicates different levels of assessment of ecosystem services connected with biodiversity:
- global [Costanza et al. 1997]
- country – e. g. the framework concept of ecosystem services evaluation in Poland [Mizgajski and Stępniewska 2012]
- region – e. g. assessment of tourist value of Augustow Canal [Liziński 2010]
- city/village [Kronenberg 2012]
- farm/private investments [Liziński 2010, Żylicz 2012]
- group of organisms:
  - trees in cities [Kronenberg 2012]
  - pollinators [Kremen et. al. 2004, Dale and Polasky 2007]
- species:
  - stork [Kronenberg et al. 2013]
  - elderberries [Kostecka et al. 2012]

The data on an appropriate scale are needed. The valuation of biodiversity is difficult and complex due to:
- different levels of biodiversity (genetic, species, ecosystem) and connections between them,
- the role of biodiversity in different types of ecosystem services (importance in agriculture, medicinal products, cultural and aesthetic value, protection of valuable species),
- multiple functions of biodiversity (regulation of ecosystem processes, the final ecosystem service and good itself).

METHODOLOGY OF RESEARCH

One of the most important factors affecting agroecosystem biodiversity is the system of agricultural management and land use. Agricultural systems which are used in modern agriculture may differently affect the environment, including biodiversity. The research on flora and fauna diversity were conducted in winter wheat cultivated in organic, integrated, conventional systems and monoculture as well as crops cultivated for energy purposes, in the years 2011-2015 (tab. 1). The experiment was established in the Experimental Station of IUNG-PIB at Osiny (51°28′ N, 22°04′ E), on *Luvisol* soil, with texture of loamy sand, characterized by slightly acid reaction (pH_{KCl} = 5.6), the average phosphorus content (43.6 mg · kg^{-1} P), low potassium level (63.1 mg · kg^{-1} K) and humus content of 1.6%. The area of each winter wheat field was 1 ha, and perennial plants for energy purposes - 200-700 m^2.

Table. 1. Agricultural practices in winter wheat cultivated in different farming systems (1996-2015) and crops for energy purposes (2004-2015)

Items	Agricultural systems				
	Organic	Integrated	Conventional	Monoculture	Energy crops
Crops	crop rotation: potato, spring wheat + undersown crop clovers and grasses (1 year), clovers and grasses (2 year), winter wheat	crop rotation: potato, spring wheat + catch crop faba bean or blue lupine, winter wheat	crop rotation: winter rape, winter wheat, spring wheat	winter wheat (from 1994)	willow miscanthus virginia mallow
Organic fertilization	compost (30 t·ha^{-1}) under potato + catch crop	compost (30 t·ha^{-1}) under potato + 2 × catch crop	rape straw, winter wheat straw	wheat straw (every 2 years)	-
Mineral fertilization (kg·ha^{-1})	allowed P and K fertilizers: 75 kg K_2O, 42 kg P_2O_5	NPK (85+55+65)	NPK (140+60+80)		NPK (80+60+80)
Fungicide	-	2 x	2 – 3 x		-
Retardants	-	1 – 2 x	2 x		-
Weed control	weeder harrow 2-3 x	weeder harrow 1x herbicides 1-2 x	herbicides 2-3 x		-

source: own elaboration

The assessment of biodiversity of weed flora, ground invertebrates and earthworms were carried out in winter wheat cultivated in organic, integrated, conventional system and in perennial crops cultivated for energy purposes: willow, miscanthus, and virginia mallow. Diversity of flora was analyzed in June 2011-2013, on 5 plots of 1 m^2 on each field. Number of weed flora species and individuals were measured.

Assessment of the earthworms abundance was done in April 2014 and 2015. The blocks 25 cm × 25 cm × 25 cm were dug out, place on the sheet and earthworms were determined visually, in 5 replication on each field. Earthworms were collected and transported to the laboratory, counted, washed and weighed. The number and biomass of earthworms were calculated per 1 m^2.

Invertebrate biodiversity studies were conducted continuously from 1 June to 21 July 2011. For this purpose, 10 pitfall traps with ethylene glycol were located on each of the fields. Every 2-3 weeks traps were emptied and invertebrate specimens were collected and weighed.

The structure of weed flora was analyzed using ecological indices: Shannon's diversity index: $H'=-\sum P_i \ln P_i$ (Shannon 1948) and Simpson's dominance index: $SI=\sum P_i^2$ (Simpson 1949), where P_i is the probability of species occurrence in the sample. The significance of differences between treatments was verified using Kruskal - Wallis test at $p \leq 0.05$.

RESULTS AND DISCUSSION

The study showed the largest richness of weed flora species in winter wheat cultivated in organic system (Figure 2 A). Weed flora diversity was the smallest in winter wheat cultivated in conventional system and monoculture.

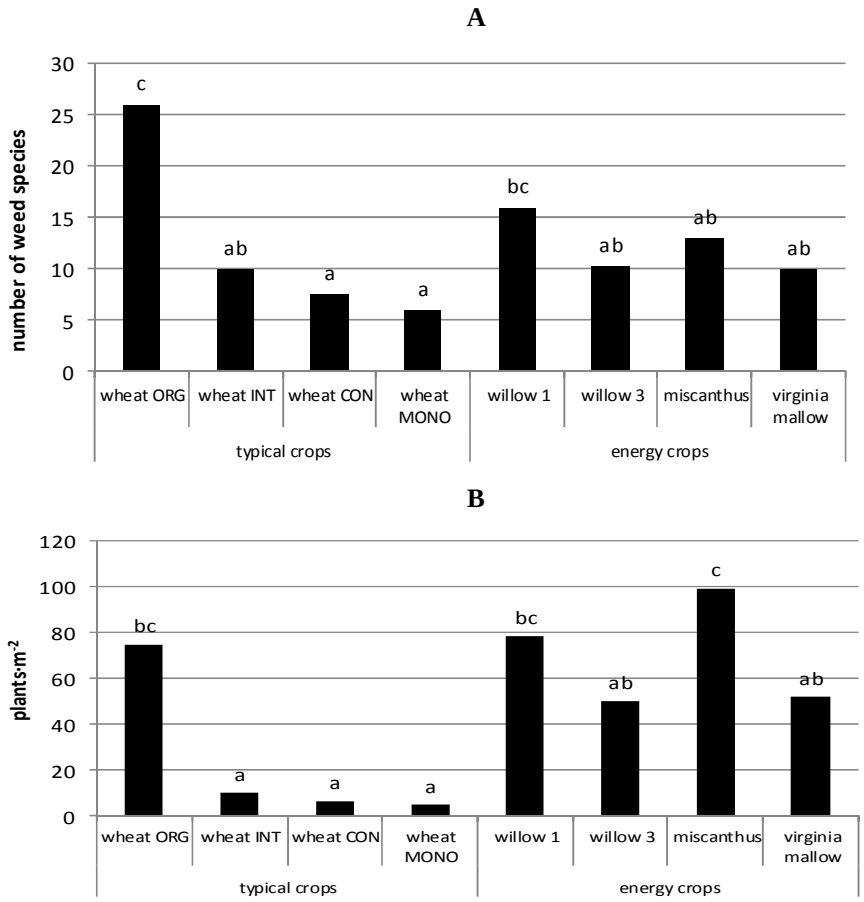

Figure 2. The diversity of weed flora in crops cultivated in different agricultural systems (mean from 2011-2013): A – number of weed species, B – weed abundance (ORG – organic system, INT – integrated system, CON – conventional system, MONO – monoculture of winter wheat, willow 1 – cut every year, willow 3 – cut every 3 years)

Source: own research

Chemical weed control in conventional and integrated system as well as in monoculture of winter wheat influenced significantly the weed flora abundance (Figure 2 B). In perennial crops cultivated for energy purposes species diversity of flora was lower than in cereals in organic system but higher than in conventional system. These crops were rich in wild flora, especially miscanthus and willow harvested every year (Figure 2 B).

Shannon's index values confirmed the greatest variety of weed flora in willow and wheat grown in organic system (2.4-2.6) (Figure 3). The index depends not only on the number of species in the community, but also the proportions of the individuals. The lowest values of this index were noted for flora communities in miscanthus and wheat grown in monoculture and integrated system. These crops were characterized by the highest value of Simpson's index which indicated the dominance of one or more weed species in the community (Figure 3).

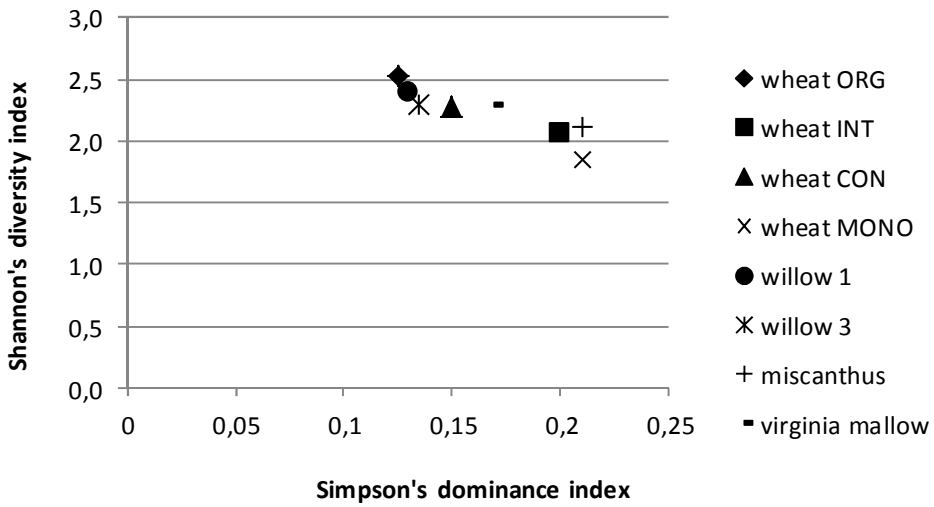

Figure 3. Shannon's diversity index and Simpson's dominance index for weed flora in crops cultivated in different agricultural systems (mean from 2011-2013) (ORG – organic system, INT – integrated system, CON – conventional system, MONO – monoculture of winter wheat, willow 1 – cut every year, willow 3 – cut every 3 years)

Source: own research

In modern agriculture weed flora is perceived not only as the competitors to arable crops, but also as an element which increases the biodiversity in agroecosystems [Marshall et al. 2003]. Weeds constitute the source of food, as well as the habitats for animals, including useful, pollinating insects and other valuable insects (pest predators and parasites), thus supporting the natural pest control [Rosin et al. 2011]. The own study showed the biggest biomass of ground invertebrates in wheat cultivated in organic system (Figure 4) which suggests that this system of agricultural production promotes biodiversity of agroecosystems. In wheat cultivated in conventional and integrated system this indicator were 2.5-3 times lower.

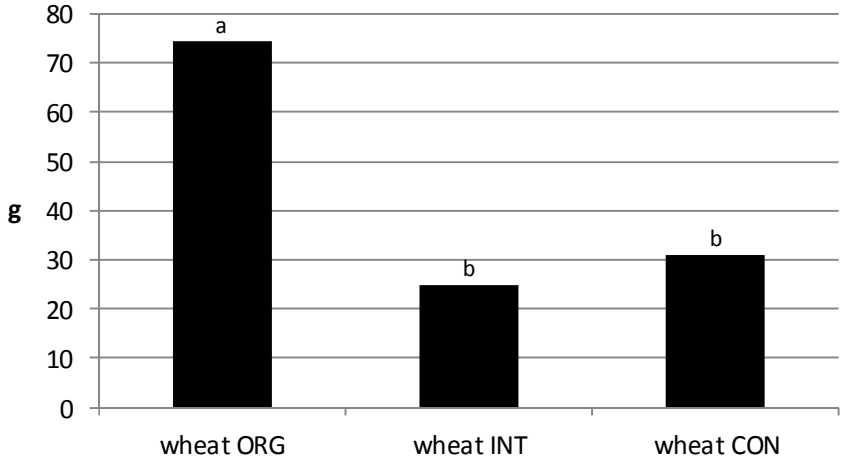

Figure 4. Biomass of ground invertebrates in winter wheat cultivated in different agricultural systems in 2011 (ORG – organic system, INT – integrated system, CON – conventional system).
Source: own research

In wheat cultivated in organic system the largest number of earthworms and their biomass were observed (Figure 5). These indicators were 10 times smaller in soil under willow and miscanthus which suggests that these perennial crops cultivated for energy purposes are not conducive to biodiversity of agroecosystems. In wheat cultivated in monoculture 5 times smaller number and mass of earthworms than in organic system were noted.

The results of biodiversity assessment in different agricultural systems suggest that organic system is more conducive in maintaining biodiversity than conventional and integrated system (Figures 2-5) and may increase the level of different ecosystem services suitable for human (service of pollinators, maintenance of proper soil structure, protection against erosion, biological protection against pests, aesthetical value). In other studies the positive effects of organic farming on diversity of flora and fauna on arable lands and grasslands were pointed [Bengtsson et al. 2003, Marshall et al. 2003]. The analysis of Bavec and Bavec [2015] indicates that organic farming increased species richness by about 30%. This is the effect not only no using of synthetic mineral fertilizers and chemical plant protection products in organic system, but also environment friendly practices. The yields of winter wheat in organic system in this experiment were from 30 to 45% lower than in conventional and integrated system. According to Seufert et al. [2012], crop yields in organic farming are from 5 to 34% lower than those in conventional farming and differences depend on plant species, soil type, fertilization, agriculture level and economic development of the country. It may influence the level of provisioning services connected with food and fodder. On the other hand some authors suggest that the quality of products from organic production is better than products from conventional intensive agricultural system [Lundergardh and Martensson 2003].

The own research showed that production of cereals in conventional and integrated systems did not protect the biodiversity of flora and invertebrates. According to other authors intensive agriculture causes the loss of biodiversity of different groups of organisms: soil microorganisms, weed flora, earthworms, insects, spiders, birds and mammals [Ewald and Aebischer 1999, Hyvönen et al. 2003, Urmler 2010, Flohre et al. 2011] which can influence important ecosystem services: pollinators, biological crop protection, decomposition process, nutrient circulation, and the resistance to invasive organisms [Donald 2004, Mace at al. 2012].

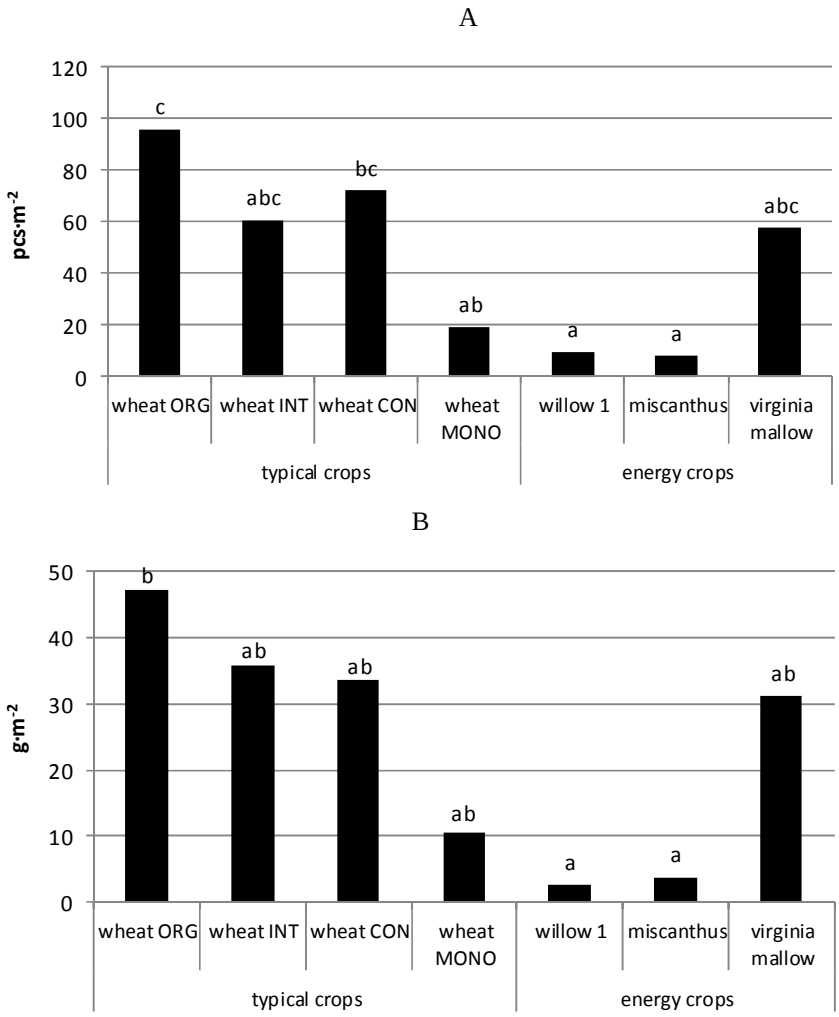

Figure 5. The diversity of earthworms in crops cultivated in different agricultural systems (mean from 2014-2015): A – number of earthworms, B – biomass of earthworms (ORG – organic system, INT – integrated system, CON – conventional system, MONO – monoculture of winter wheat, willow 1 –cut every year)

Source: own research

Biodiversity in perennial crops cultivated for energy purposes depended on the crop species and group of tested organisms, similarly to the study of Rowe et al. [2009]. Diversity of weed flora accompanying crops was the largest in willow harvested every year and miscanthus. In virginia mallow high number and biomass of earthworms were observed. Willow and miscanthus were not conducive for earthworms abundance which suggests that cultivation of such plants may negatively influence some ecosystem services connected productive and retention functions of soil

[Felten and Emmerling 2011]. On the other hand such perennial crops may positively influence carbon sequestration and protect against erosion [Faber 2008].

The analysis of the trends in use of ecosystem services in European scale between 2000 and 2010 showed that many provisioning services (food and fodder) increased [Mapping… 2015]. More organic food was produced, but in contrast, the trends of ecosystem services indicators that are directly related to biodiversity, pollination, and habitat quality were worsening. In Poland relatively small changes in ecosystem services were noted (increasing biomass built up and slightly negative trends in several services, including pollination potential).

CONCLUSIONS

The study showed that different agricultural systems (organic, conventional, integrated, energy crops) affect biodiversity and thus may influence a wide range of ecosystem services connected with biodiversity, including food, soil quality, pollination services, habitat condition. Organic system was more conducive in maintaining biodiversity of flora, earthworms and ground invertebrates than conventional and integrated system. Developing of organic system may increase the level of different ecosystem services necessary for human (pollination, soil structure, biological control, cultural values, human health). Biodiversity of perennial crops cultivated for energy purposes depended on the crop species and group of tested organisms. Cultivation of willow and miscanthus negatively influenced earthworms abundance which may affects the productive and retention functions of soil, but increases carbon sequestration and protection against erosion. There is a need to develop simple and comprehensive, standardized methods to measure biodiversity and ecosystem services.

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REFERENCES

1. Costanza R., D'Arge R., De Groot R., Farberk S., Grasso M., Bruce Hannon B., Limburg K., Naeem S., O'Neill R.V., Paruelo J., Raskin R.G., Suttonkk P., van den Belt M. (1997), The value of the world's ecosystem services and natural capital. *Nature*, 387, s. 253–260.
2. Crossman N.D., Burkhard B., Nedkov S., Willemen L., Petz K. et.al. (2013), A blueprint for mapping and modelling ecosystem services. *Ecosystem Services*, 4, s. 4–14.
3. Daily G.C., Matson P.A. (2008), Ecosystem services: From theory to implementation. *Proc. Natl. Acad. Sci. U.S.A.*, 105, s. 9455–9456.
4. Dale V.H., Polasky S. (2007), Measures of the effects of agricultural practices on ecosystem services. *Ecological Economic*s, 64, s. 286-296.
5. de Groot R. S., Wilson M. A., Boumans R. M.J. (2002), A typology for the classification, description and valuation of ecosystem functions, goods and services. *Ecological Economics*, 41, s. 393–408.
6. Gallai N., Salles J.M., Settele J., Vaissičre B.E. (2008), Economic valuation of the vulnerability of world agriculture confronted with pollinator decline. *Ecological Economy,* 68, s. 810–821.
7. Kremen C., Williams N.M., Bugg R.L., Fay J.P., Thorp R.W. (2004), The area requirement of an ecosystem service: crop pollination by native bee communities in California. *Ecol. Lett.*, 7, s. 1109-1119.
8. Kremen C. (2005), Managing ecosystem services: what do we need to know about their ecology? *Ecology Letters,* 8, s. 468-479.

9. Liziński T. (2010), *Podstawy ekonomii środowiska i zarządzania środowiskiem*. Wyd. Państwowej Wyższej Szkoły Zawodowej w Elblągu, ss. 260.
10. Mace G.M., Norris K., Fitter A.H. (2012), Biodiversity and ecosystem services: a multilayered relationship. *Trends in Ecology and Evolution*, 27(1), s. 19-26.
11. Marshall E.J.P., Brown V.K., Boatman N.D., Lutman P.J.W., Squire G.R., Ward L.K. (2003), The role of weeds in supporting biological diversity within crop fields. *Weed Res.*, 43(2), s. 77-89.
12. Matson P.A., Parton W.J., Power A.G., Swift M.J. (1997), Agricultural intensification and ecosystem properties. *Science*, 277(5325), s. 504–509.
13. Solon J. (2008), Koncepcja „Ecosystem services" i jej zastosowania w badaniach ekologiczno-krajobrazowych. W: Chmielewski T.J. (red.) „Struktura i funkcjonowanie systemów krajobrazowych: meta – analizy, modele, teorie i ich zastosowania" *Problemy Ekologii Krajobrazu*, 21, s. 25-44.
14. United Nations (1992), Convention on Biological Diversity. *United Nations Treaty Series*. Rio de Janeiro. 5 June 1992; 1760, I-30619, s. 143-382.
15. *Mapping and Assessment of Ecosystems and their Services: Trends in ecosystems and ecosystem services in the European Union between 2000 and 2010* (2015), European Commission – Joint Research Centre – Institute for Environment and Sustainability, Organic Farming, Luxembourg: Publications Office of the European Union, ss. 131.
16. MEA (2005), *The Millenium Ecosystem Assessment, Ecosystems and Human Well-being: Synthesis*, Island Press, Washington, DC.
17. *The economics of ecosystems and biodiversity* (2008), European Communities, Luksemburg, 64 ss. ISBN-13 978-92-79-08960-2. http://ec.europa.eu/environment/nature/biodiversity/economics/pdf/teeb_report.pdf (Accessed 29 September 2015).
18. *The UK National Ecosystem Assessment: Synthesis of the Key Findings* (2011), UNEP-WCMC, Cambridge, ss. 85. ISBN: 978-92-807-3165-1.

Jakub Gołaś[3]

LEGAL AND ECONOMIC ASPECTS OF FINANCIAL MANAGEMENT IN THE STATE FORESTS

Abstract: The aim of this article is to present legal and economic aspects of financial management in the biggest domestic forestry market participant - the State Forests National Forest Holding. In the economic aspects, the analysis mainly concerns on such factors and issues as structure and trends related to revenues and costs of the State Forests or the Forest Fund. The economic analysis was based on data obtained from statistical reports of the Polish Central Statistical Office (CSO) and the State Forests' financial reports. In terms of legal aspects concerning financial managements in the State Forests, the article focuses particularly on the Forests Act of 1991 and on the Regulation on detailed rules of financial management in the State Forests of 1994. The legal analysis presents brief characteristic of current regulations shaping basic directives and principles of financial management in the State Forests.

Key words: forestry, State Forests National Forest Holding, State Forests, financial management, finances, revenues, costs, Forest Fund, law, regulation, Poland

INTRODUCTION

The State Forests National Forest Holding, as the biggest participant of domestic forestry market, manages assets estimated at billions euro, generates billionaire revenues and employs thousands of workers. Financial results of the State Forests have significant influence on gross domestic product (GPD) levels and on state budget, which is powered by part of enterprise's revenues. Both size and strength of the State Forest have also vital impact on both European and global markets.

The economic size of business undertaking managed by the State Forests also results in fact that this organizational unit of the State Treasure has enormously complex financial structure. The management of billionaire resources requires applying precise and professional solutions and measures. The complexity of the ownership structure, revenues and costs components of the State Forests or in the Forest Fund translate to basic necessity of creating relevant and effective legal frameworks of financial management. This is why financial management in the State Forests is fully regulated by separate legal acts constituting mandatory rules, principles and directives.

The basic aim of the article is to present legal and economic analysis of the financial management in the State Forests, with a special focus on financial results and structure of revenues and costs in both the State Forests National Forest Holding and in the Forest Fund. The article submits chosen statistical data showing changes and trends in the structure of revenues and costs of listed above subjects. The author also presents an analysis regarding the Forest Act of 28th September 1991 and the Regulation of 6th December 1994 on detailed rules of financial management in the State Forests [Act…1991; Regulation…1994]. Specified legal acts should be considered as direct legal basis of basic aspects and principles of financial management in the State Forests and in the Forest Fund. It is also worth mentioning in the introduction that the national legislator has introduced specific and precise legal frameworks of financial management in the State Forests, constituting vast and exhaustive catalogue of principles, rules, directives and prerogatives.

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GENERAL LEGAL PRINCIPLES OF FINANCIAL MANAGEMENT IN THE STATE FORESTS

Legal frameworks of financial managements in the State Forests are integrally and comprehensively regulated by two legislative texts - the Forest Act of 28th September 1991 and the Regulation of 6th December 1994 on detailed rules of financial management in the State Forests [Act…1991; Regulation…1994]. It is worth highlighting that given acts regulate basically all aspects of financial managements, shaping such issues as rules of conducting business activity, financial prerogatives of specified subjects, principles of creating financial plans, resources components, directives of estimating revenues, costs and financial results or rules of managing the Forest Fund.

The State Forests National Forest Holding is one of state's organizational unit, which was created to represent the Polish State Treasury's rights and obligations related to administration of national forest resources and properties (art. 32(1) of the Act 1991). In fact, the State Forest should be considered not as one unit but as a sort of organizational units' holding consisting of four types of units: the State Forests Directorate-General, the State Forests regional directorates, forest inspectorates and other organizational units without legal personality (art. 32(2) of the Act of 1991).

Characterizing legal principles of State Forests' financial management is should be firstly noted that the Forest Act constitutes relatively simple rules of running economic activity by the State Forests. According to art. 50(1) of the Forest Act, economic activity of the State Forests relies on financial independence [Act…1991]. It simply means that the State Forests are financially self-reliant. The financial independence is also expressed by assuring that the State Forests make autonomous financial and economic decisions [Rakoczy…2011]. What is more, financial managements decisions should be made pursuant to principles of economic outturn (§3 of the Regulation 1994).

Financial independence is also manifested by regulation indicating that the State Forests cover its costs only with generated revenues (art. 50(1) of the Act 1991). It simply means that the State Forests manage its revenues and costs independently and should not expect any grants for operational activity from state budget. As it appears from the above, the State Forests enjoy sort of financial independence mainly expressed by self-maintenance. However, there is one exception to the principle of the State Forests' financial independence. As the art. 54 of the Forest Act and §5 of the Regulation 1994 indicate, the State Forests can obtain targeted grants from national budget for covering costs of assigned tasks by the State[4]. Moreover, any unused in given financial year resources from obtained grants should be returned to the state's budget (§5 of the Regulation 1994)[5]. In this respect, it can be noted that the State Forest can obtain specified state's budget only for cost coverage of assigned task by the State. Obtaining any financial resources for other tasks should be considered as unlawful.

The Forest Act also introduces the term of fiscal year, which length equals to length of calendar year (art. 51 of the Act 1991). This is particular term for the Forest Act, and its actual counterpart is reporting period defined in of the Accounting Act (1994). It is worth noting that the State Forests' accountings should be kept in accordance with rules of the Accounting Act (art. 50(3)

[4] *Assigned tasks are mainly related to: land and forest buyouts, fulfilling forestation plans, forest protection, large inventories, designing protection programs for nature reserves in the Nature 200 network, fulfilling and inspection of the programs, financing forest education of the society and fulfilling tasks co-financed from foreign resources (art. 54 of the Act 1994).*

[5] *It should be also highlighted that the Director-General of the State Forests, regional directors and chief foresters are the sole administers of the targeted grants. The expenditure of targeted resources can be carried out only with accordance to regulations of public finances (art. 55 of the Act 1991).*

of the Act 1991). According to art. 3(1)(8) of the Accounting Act, the reporting period is a period for which financial report is drawn up [Act…1994]. As a consequence of the above, the reporting period in case of the State Forests should be equal to calendar year [Rakoczy…2011].

Financial operations of the State Forests are based on three basic types of activities – administrative, economic and additional. Administrative activates are exercised by the Directorate-General, regional directorates and forest inspectorates (§4 of the Regulation 1994). Economic activity is sole prerogative of forest inspectorates and is divided to:

a) basic activity based on forest managing and protection, maintaining and enlarging resources and forest plantations and obtaining and sale of unprocessed wood and

b) auxiliary activity based on game managing, obtaining resin, pines, stumps, barks, games and groundcover's products and sale of the unprocessed products (§4(1)(2) of the Regulation 1994).

Finally, additional activity is based on production and services for forestry, which are subjected to corporate tax (§4(1)(3) of the Regulation 1994).

During discussion about general legal frameworks of the State Forests' financial managements it is also worth to focus on importance of the financial plan. This annually drawn up document is direct and fundamental legal basis for current financial management of all the State Forests' organizational units (§6 of the Regulation 1994). Content of the document should present sufficient data regarding such issues as activities scheduled for given year, expected sale revenues, costs of economic activates and financial results (§6 of the Regulation 1994). As it appears, presented document should be considered as both direct basis of future the State Forest's activities and as a sort of financial forecast determining management strategy for given year.

It should be also highlighted that financial policy of the State Forests' organizational units is linked with various informational obligations. It is necessary to note that each organizational unit is legally obliged to provide higher management with sufficient data regarding results of pursued financial policy. Consequently, each chief forester has to submit expected report to regional directors, who in turn should submit their financial reports to the Director-General (§7 of the Regulation 1994). Eventually, the Director-General is legally obliged to present general financial and economic reports in front of the Environmental Minister (§7 of the Regulation 1994)

RESOURCES OF THE STATE FORESTS

Financial management of the State Forests is based on resource management and administration. All resources administered and managed by the State Forests belong to the category of the State Treasury's property. Each organizational unit of the State Forests has legal duty to keep quantity and value records of managed resources (§10(1) of the Regulation 1994) . It is also necessary to stress that national regulations significantly limit freedom of transferring administered property between individual organizational units. Such transfers of resources (state's property) can take place only at units' formal request and by consent of:

a) the Director General – for transfer of resources administered by regional directorates and other resources subjected to the Director and

b) competent regional director- for transfer of resources administered by forest inspectorates and other subjected resources (§ 10(1) of the Regulation 1994).

There is also one another legally accepted form of resource transfer. According to § 10(2) of the Regulation 1994, the State Forests' resources can be accomplished by formation, liquidation, merging or division of the organizational units. It should be also noted that disposal of fixed assets can be carried out only in the form of public tender (§ 13(1) of the Regulation 1994)

It is worth highlighting that legal regulations also shape detailed catalogues of components, which can cause increase or decrease in value of the State Forests' resources. As it is indicated in the § 9 of the Regulation 1994, the resources' value can be increased by:

a) balance sheet profit,
b) depreciations on fixed assets,
c) amounts increasing value of fixed assets resulted from overestimation,
d) targeted grants,
e) transmitted real estates,
f) real estates obtained in the result of accomplishing common investments and
d) means from other sources.

Concurrently, the value of resources can be decreased only by: balance sheet loses, amortizations on fixed assets, amounts decreasing value of fixed assets resulted from overestimation and value of transferred fixed assets (§ 9 of the Regulation 1994).

FINANCIAL RESULTS IN THE STATE FORESTS

PRINCIPLES FOR ESTAMIATION OF REVENUES, COSTS AND FOR DRAWING UP FINANCIAL RESULTS

National legislator has also presented clear principles for estimating revenues and costs and for calculating financial results of the State Forests. The revenues of whole the Forests States National Forest Holding equals to the sum of revenues generated by its all organizational units (§ 14(1) of the Regulation 1994). The Regulation 1994 also lists potential sources of revenues, which include income from:

a) sale of, inter alia, wood, seeds, cuttings, pines, forest products and other materials and fixed assets,
b) lease or rent of forest, land or real estate,
c) touristic and holiday development and
d) financial operations and other sources.

Among costs of economic activity, the Regulation 1994 distinguishes: basic deduction for the Forest Fund, expenses for activity and forest tax (§ 14 of the Regulation 1994).

It is also worth to stress that the State Forests are legally obliged to transfer part of its annual revenues to the State Treasury. As art. 58(a) of the Forest Act indicates, the Directorate-General of the State Forests shall make specific payment to the account of the Environmental Minister for each quarter of calendar year. The payment charge is fixed to 2% of wood sale revenues' value (art. 58(a) of the Act 1991).

As it is in the case of revenues, the financial result of the State Forest equals to the sum of financial results of all subjected organizational units. Financial result estimations are based on calculation of difference between revenues and costs of the State Forests' economic activity (§18 of the Regulation 1994). It should be also noted that each forestry inspectorate is authorized to set aside up to 15% of its financial result's value and spent theses resources on additional awards, company funds of social security benefits or other community service purposes (§18 of the Regulation 1994).

STRUCTURE OF REVENUES AND COSTS OF THE STATE FORESTS IN YEARS 2011-2014

Table 1 presents data regarding trends and structure of revenues of the State Forests in years 2011-2014, coming from the reports of the Directorate-General of the State Forests [State Forests…2011;2012;2013;2014;2015]. General analysis shows that total value of generated revenues of the State Forest has increased from 7464,4 mln zł in 2011 to 8020,9 mln zł in 2014. However, it should be noted that total revenues in analyzed period also experienced some minor fluctuations, which were observed in 2012 (decrease of 129,1 mln) and 2013 (decrease of 52,3 mln). Similar trends can be also observed in case of revenue's biggest component (basic and administrative activity) where in given period revenues has increased by 532,1 mln zł (from 6641,6

mln zl in 2011 to 7173,7 mln zl in 2014). Concurrently, revenues levels of basic and administrative activity also experienced minor negative fluctuations in years 2012 and 2013. In terms of other components of total revenues, there have been noted minor fluctuations, yet their shares in total revenues level is negligible (from 0,1% for revenues from additional activity to 1,5% for revenues generated from other resources sales).

Table 1. Revenues of the State Forests in years 2011-2014

Specifi-cation	Revenues							
	Total	Basic and administrative activity (including timber sales)	Auxiliary activity	Additional activity	Other resources sales revenue	Targeted grants	State funds for forest control	Social activity
	in mln zł and in % of total							
2011	7 464,4	6 641,6 (89%)	54,0 (0,7%)	9,8 (0,1%)	87,5 (1,7%)	3,2 (0,04 %)	17,0 (0,2%)	47,1 (0,6%)
2012	7 335,3	6 400,6 (87,3%)	62,4 (0,9%)	9,1 (0,1%)	107,2 (1,5%)	3,3 (0,05%)	17,1 (0,2%)	47,5 (0,7%)
2013	7 283,0	6 398,9 (87,9%)	58,1 (0,8%)	8,9 (0,1%)	110,6 (1,5%)	0,92 (0,01%)	17,3 (0,2%)	44,0 (0,6%)
2014	8 020,8	7 173,7 (89,4%)	63,7 (0,8%)	8,1 (0,1%)	117,1 (1,5%)	0,99 (0,01%)	17,1 (0,2%)	43,2 (0,5%)

Source: data of Directorate-General from financial reports, Directorate-General,

Similar trends may be observed in terms of the structure of the State Forests' costs. (Table 2). Despite minor fluctuations in analyzed period, total costs have increased by 964,5 mln zł (from 6603,9 mln zł in 2011 to 7568,4 in 2014). Two basic components - administrative activity costs (43,2% in 2014) and basic activity costs (47,6% in 2014) – had biggest influence on both the structure of total costs and of observed increase. It should be also noted that fluctuations in levels of listed above components have been reflected in trends of total costs levels. At the same time, other components – costs of auxiliary and additional activity have experienced minor fluctuations and their shares in total costs were negligible. Taking into consideration both total costs and revenues, it is also necessary to focus on the fact that in each year of analyzed period, the State Forests experienced significant revenue surplus. However, due to the faster growth rate of total costs, the revenue surplus have significantly decreased on an annual basis. As it appears from the data, in 2014 the surplus equaled to 452,5 mln zł, while in 2011 it had been estimated to 861,6 mln zł (over 90% more).

Table 2. Costs of the State Forests in years 2011-2014

Specification	Costs				
	Total	Administrative activity	Basic activity	Auxiliary activity	Additional activity
	in mln zł and in % of total				
2011	6 603,9	2 828,0 (42,8%)	3 059,7 (46,3%)	44,5 (0,7%)	16,1 (0,2%)
2012	7 053,7	3 043,9 (43,2%)	3 289,9 (46,6%)	51,1 (0,7%)	17,3 (0,3%)
2013	6 944,7	3 119,5 (44,9%)	3 049,0 (43,9%)	51,2 (0,7%)	18,0 (0,3%)
2014	7 568,4	3 268,4 (43,2%)	3 605,1 (47,6%)	52,3 (0,7%)	17,2 (0,2%)

Source: data of Directorate-General from financial reports, Directorate-General,

THE FOREST FUND

LEGAL ASPECTS OF FOREST FUND MANAGEMENT

The Forest Fund is kind of targeted fund, which funds have to be spent on legally defined purposes related to national forestry [Rakoczy…2011]. Funds accumulated in the Forest Fund cannot be spent in arbitrary way, as they should be considered as separately assigned public resources, assigned to fulfil clearly defined tasks and prerogatives of the State Forests. It is also worth mentioning that the Director-General is the sole subject entitled to administer funds accumulated in the fund (art.56 of the Act 1991).

The Forest Act clearly regulates two basic and fundamental aspects of functioning of the Forest Fund. The Act directly defines legally accepted sources of increase of the funds and lists tasks, on which funds can be spent. In accordance with legal writhing, the Forest Fund can be endowed by defined resources, of which exhaustive list can be found in the art. 57 of the Forest Act [Rakoczy…2011]. As it is indicated in the act, the Forest Fund can be endowed only by:

a) basic deductions from wood value,
b) liabilities, fines and fees related to production closure of forest lands
c) liabilities due to compensations of damages done to forest resources,
d) incomes related to shareholding or share sale in forest companies,
e) state budget grant (except targeted grants) and
f) other incomes generated for the Forest Fund (art. 57 of the Act 1991).

It is also worth stressing that unused funds are qualified as the income of the fund in next calendar year (art. 57 of the Act 1991).

It should be reminded here that the Forest Fund, as the targeted fund, can be used only for legally listed purposes. The forest inspectorates shall be considered as major beneficiary of the fund, as each inspectorate obtains sufficient funds meant to fulfil tasks of forest management (Art. 58 of the Act 1991). Moreover, the Forest Act clearly defined exhaustive list of other legally accepted purposes, which are:

a) common undertakings of the State Forests' organizational units,
b) scientific researches,

c) creating infrastructure necessary for forest management,
d) preparing forest arrangement plans,
e) forecasting and evaluation of forest resources and
f) other tasks related to forest management (art 58 of the Act 1991).

Notwithstanding the above, part of the fund's resources can be set aside in order to create stability fund, which purpose is to cover costs generated by eliminating extraordinary risks to forests (art. 58 of the Act 1991). As it appears, both structure and management of the Forest Fund have complex character and demand application of precise measures and solutions.

STRUCTURE OF THE FOREST FUND IN YEARS 2010-2014

Table 3 presents data regarding trends related to structure of the Forest Funds in years 2010-2014, coming from the report of the Polish Central Statistical Office [CSO…2015]. Their analysis shows that value of funds accumulated on the fund has experienced varied fluctuations and that fund's structure is reliant on numerous components. Firstly, it is worth observing that both total funds' increases and decreases experienced significant growth in the given period (for increases – from 681,9 mln zł in 2010 to 1206,1 mln zł in 2014; for decreases – from 546,6 mln zł in 2010 to 1047,6 in 2014). The basic deduction burdensome costs of forest districts should be considered as the biggest component of the fund's increases (from 77% in 2011 to 85,1% in 2014). At the same time, the compensate for shortage of funds was the biggest component of the fund's decreases (from 72,4% in 2011 to 61,2% in 2014). It is also worth highlighting that funds levels at the end of each studied year were higher than in the beginning of given calendar year. As the consequence of indicated trend, funds accumulated on the Forest Funds increased in years 2010-2014 (as of 31.XII) from 741,9 mln zł to 822,5 mln zł, i.e. aprox. 11%.

Table 3. Forest Fund in years 2010-2014

Specification	Funds as of 1.I in mln zł	Increases of fund					Decreases of fund					Funds as of 31.XII in mln zł
		Total	of which				Total	of which				
			Basic deduction burdensome costs of forest districts		Additional revenue			Compensate for shortage of funds		Funding forest management plans		
		in mln zł		*in % of total*	*in mln zł*	*in % of total*	*in mln zł*		*in % of total*	*in mln zł*	*in % of total*	
2010	624,6	681,9	525,4	77,0	109,4	16,0	564,6	408,7	72,4	49,1	8,7	741,9
2011	741,9	846,5	656,6	77,6	141,4	16,7	804,2	524,7	65,2	46,5	5,8	784,3
2012	784,3	1132,1	916,3	80,9	114,2	10,1	1123,7	743,7	66,2	51,2	4,6	792,7
2013	792,7	1138,6	913,1	80,2	114,1	10,0	1267,4	946,6	74,7	61,2	4,8	664,0
2014	664,0	1206,1	1026,9	85,1	119,0	9,9	1047,6	640,7	61,2	68,6	6,5	822,5

Source: Forestry 2015, CSO,

CONCLUSIONS

In recent years levels of both revenues and costs of the State Forests have increased significantly. However, the revenues growth pace was considerably lower than in the case of costs, with the consequence that revenues levels were constantly decreasing. Despite the abovementioned

trend, the State Forests were still generating considerable income, which value has exceeded 450 mln zł in 2014. Such income levels create feeling of financial security and allow introducing constant innovations and modernizations. It is also worth highlighting that management of such financial resources enables to continue stable employment policy.

Evaluating financial management in the State Forest it is also worth focusing on considerable and constantly growing financial resources of the Forest Fund, which are used to accomplish the State Forests' tasks. In the analyzed period, levels of both fund's increases and decreases experienced apparent growth which can indicate that the State Forests expand financial ability of their economic activity. Managing bigger financial resources allows the State Forests to move more resources and accomplish more commissioned tasks. Accordingly, it can be regarded that in financial terms role of the State Forests is constantly growing.

On the other hand, taking into consideration legal aspects constituting financial and economic policies of the State Forests, firstly it should be highlighted that binding regulations are relatively complex. It appears that both the Forest Act and the Regulation of 1994 should be considered as direct source of principles, rules and directives shaping standards of financial managements in the State Forests. Such thorough provisions leave little freedom to the administers of the State Forests in the terms of financial management. Policy of national legislator can be evaluated positively, as it should be noted that managing billionaire assets requires unique precision, responsibility and transparency.

REFERENCES

1. Central Statistical Office, Forestry 2015, 2015, http://stat.gov.pl/obszary-tematyczne/rolnictwo-lesnictwo/lesnictwo/lesnictwo-2015,1,11.html, [access: 29.01.2016]
2. Radecki W., Ustawa o lasach. Komentarz, Warszawa, 2004.
3. Rakoczy B., Ustawa o lasach. Komentarz., LEX, 2011/el.
4. Lasy Państwowe, Sprawozdanie finansowe za rok 2014, http://www.lasy.gov.pl/informacje/publikacje/informacje-statystyczne-i-raporty/sprawozdanie-finansowo-gospodarcze-pgl-lp/sprawozdanie-finansowo-gospodarcze-za-2014-rok/view, [access: 31.01.2016].
5. Lasy Państwowe, Sprawozdanie finansowe za rok 2013, http://www.lasy.gov.pl/informacje/publikacje/informacje-statystyczne-i-raporty/sprawozdanie-finansowo-gospodarcze-pgl-lp/sprawozdanie-finansowo-gospodarcze-za-2013-r/view, [access: 31.01.2016].
6. Lasy Państwowe, Sprawozdanie finansowe za rok 2012, http://www.lasy.gov.pl/informacje/publikacje/informacje-statystyczne-i-raporty/sprawozdanie-finansowo-gospodarcze-pgl-lp/sprawozdanie-finansowo-gospodarcze-za-2012-r/view, [access: 31.01.2016].
7. Lasy Państwowe, Sprawozdanie finansowe za rok 2011, http://www.lasy.gov.pl/informacje/publikacje/informacje-statystyczne-i-raporty/sprawozdanie-finansowo-gospodarcze-pgl-lp/sprawozdanie-finansowo-gospodarcze-za-2011-rok/view, [access: 31.01.2016].
8. Rozporządzenie Rady Ministrów z dnia 6 grudnia 1994 r. w sprawie szczegółowych zasad gospodarki finansowej w Państwowym Gospodarstwie Leśnym Lasy Państwowe, Dz. U. z 1994 r. nr 134, poz. 692.
9. Ustawa z 28 września 1991 roku o lasach, Dz. U. z 1991 r. nr 101, poz. 444, z późn. zm.
10. Ustawa z 29 września 1994 r. o rachunkowości, Dz.U. z 1994 r nr 121, poz. 591z pożn. zm.
11. Ustawa z 27 sierpnia 2009 r. o finansach publicznych, Dz. U. z 2009 r. nr 157, poz. 1240 z późn. zm.

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ECOLOGICAL SAFETY OF THE BALTIC SEA IN THE LIGHT OF THE FINDINGS OF WATER RESEARCH CONDUCTED IN DEMONSTRATION FARMS PARTICIPATING IN THE *BALTICDEAL* PROJECT

Abstract: The paper presents findings of the research of water samples taken from the area of demonstration farms established under a cooperation network in the *BalticDeal* project. The main goal of the project was to promote good practices with regard to management of fertilizer components and minimize fertilizing losses based on the conducted water quality research and soil fertilizing needs. As a result of the research, it may be concluded that ground waters are still largely contaminated with compounds of nitrogen and phosphorus from agricultural sources. The obtained findings indicate a great need to promote environmentally friendly agricultural practices in the drainage area of the Baltic Sea.

Key words: Baltic Sea, ecological safety, water research, demonstration farms

INTRODUCTION

One of the first definitions of ecological safety related to actions aimed to eliminate or reduce hazards arising as a result of conscious or unconscious human action [Ciechanowicz-McLean 2014]. Currently, sustainable management of natural resources is the issue, and ecological safety is defined more and more often as "a continuous and permanent process aiming to achieve the desired ecological condition, protecting calm and healthy existence of all the ecosystem elements, using measures compliant with the principles of internal coexistence and international communities" [Śladkowski 2004].

Water is one of the most important abiotic elements of the ecosystem. The water policy occupies a prominent place throughout the world owing to the priority character of water resources. In the European Union, it is governed by the Water Framework Directive, which promotes balanced use of water resources in Europe and protection of aquatic ecosystems' cleanliness. The ecosystem common for many countries is the Baltic Sea whose cleanliness is affected by activities executed in the Baltic countries [Ciechanowicz-McLean 2014].

A sudden growth in contamination of the Baltic Sea was recorded after World War II, and the greatest degree of contamination was recorded in 1980. As indicated by the findings of the conducted research, ever since this level has been lowering each year, but is still high [*Przyszłość Morza Bałtyckiego – tendencje rozwojowe*, Berkowska et al 1993]. Water eutrophication is considered as the main environmental problem of the Baltic Sea. The main cause of this phenomenon is excessive inflow of nutrients, such as nitrogen and phosphorus, to the Baltic Sea (through rivers and from atmospheric deposition). The largest part of these components comes from agricultural production [Zielińska 2012, Berkowska et al 1993, Igras, Jadczyszym 2008]. To decrease contamination of the Baltic Sea and prevent its further contamination, it is important to introduce sustainable practices, first of all in agriculture [Pietrzak 2013]. Therefore, activities are promoted which are aimed to reduce the level of eutrophication of waters by balanced management

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of fertilizers in agricultural farms in accordance with the definition of ecological safety. The Project that was focused on the protection of the Baltic Sea water was the project under the name *BalticDeal* [www.baltic.cdr.gov.pl].

The *BalticDeal* was an international project implemented under the Strategy of the European Union for the Baltic Sea Region, financed from the Program of the Baltic Sea Region 2007-2013 (European Regional Development Fund) and also by NEFCO/NIB, Baltic Sea Action Plan. The project was gathering farmers, advisory organizations as well as scientists towards raising awareness and promoting practices and actions aimed to protect the environment, with a particular focus on waters. The primary purpose of these actions was to limit losses of nutrients in agricultural farms and optimize fertilizing, simultaneously maintaining production and competitiveness of agricultural farms. The project was executed by seven organizations from seven countries: two federations of farmers and five advisory organizations. The partner from Poland was the Agricultural Advisory Center in Brwinów, Branch in Radom. Additionally, the project involved participation of 30 other partners from nine countries concentrated around the Baltic Sea [www.baltic.cdr.gov.pl].

Within the Baltic Deal project, implemented in the years 2010-2013, on the basis of the data collected in the network of demonstration farms, a catalogue of good agricultural practices, limiting water contamination, was developed. In nine groups of activities concerning, among others, fertilizing, management of natural fertilizers, management in the naturally valuable areas and waterlogged areas, methods of soil cultivation, etc. 75 agricultural practices were identified which limit the eutrophication of fresh waters and of the Baltic Sea. These practices were arranged in thematic groups [www.baltic.cdr.gov.pl]:

- fertilization,
- management of natural fertilizers,
- cultivation and structure of soil,
- soil cover and buffer zones,
- natural and grass areas,
- precision agriculture,
- management of non-agricultural areas,
- selected methods including, management of animal feeding.

One of the project tasks was training and educational activities. In Poland three scientific conferences and 92 seminars were organized, attended by 2064 individuals. Examples of good practices were used when developing the principles of management for new Particularly Vulnerable Areas in Poland. Then advisors collaborating under the project were organizing trainings for farmers in new Particularly Vulnerable Areas. An essential part in this case was not only reaching farmers, but also local governments. A very utilitarian achievement of the project was a catalogue of pro-environmental investments that was incorporated to the Rural Development Program in the last year of the action "Modernization of agricultural farms". The project data were widely used when programming the actions "Balanced agriculture", "Protection of soils and waters", "Action in the Natura 2000 areas" [www.cdr.gov.pl].

CHARACTERISTICS OF DEMONSTRATION FARMS

Within the project a network of farms was created, where scientific research was carried out as was well as new methods and tools were tested. These farms were called demonstration farms. They were the place of scientific research (mainly of water and soils), with close cooperation of farmers with agricultural advisors. Cooperation of advisors with the farmer in a demonstration farm consisted, first of all, of testing and implementing actions aimed to restrict losses of fertilizing components and in monitoring the effects of these actions. The consultant together with the farmer

were preparing a balance of fertilizing components in a farm and then were determining doses of necessary fertilizers. Then, on this basis, economic results of the farm were measured: they included management of fertilizers in an agricultural farm.

Within the project, a network of 117 demonstration farms was created in the Baltic countries, most of which were located in Poland - as many as 47. Each province features 2 to 5 demonstration farms incorporated into the cooperation network with regard to promoting actions aimed to limit fertilizing losses [www.baltic.cdr.gov.pl].

The farms incorporated into the project are mostly large, managed by active farmers who voluntarily joined the project. They are competitive in relation to other in their regions and their owners can be termed as innovators or pioneers. Demonstration farms differ from one another by size of arable lands, economic results, production intensity and agricultural type. The biggest of them are located in the provinces: Warmińsko-Mazurskie, Wielkopolskie, Zachodniopomorskie and Pomorskie, whereas the smallest in the provinces: Świetokrzyskie, Dolnośląskie and Podkarpackie. The smallest demonstration farm was managing 7.5 ha (Lubelskie) and the largest was managing approximately 1700 ha (Zachodniopomorskie). The average area of a demonstration farm in the analysed sample was large and was 147 ha (tab. 1).

Table 1. Number of demonstration farms and their average areas [in ha]

No.	Province	Number of demonstration farms	Average area of a demonstration farm	Average area of an agricultural farm in 2014
1	Dolnośląskie	3	41.2	16.22
2	Kujawsko-Pomorskie	4	89.3	15.30
3	Lubelskie	3	73.2	7.54
4	Lubuskie	2	88.8	20.92
5	Łódzkie	2	115.0	7.61
6	Małopolskie	2	71.5	3.95
7	Mazowieckie	5	90.5	8.55
8	Opolskie	2	136.7	18.22
9	Podkarpackie	2	40.5	4.63
10	Podlaskie	3	67.1	12.24
11	Pomorskie	3	335.6	19.00
12	Śląskie	2	71.4	7.37
13	Świętokrzyskie	2	27.5	5.57
14	Warmińsko-Mazurskie	4	313.9	22.92
15	Wielkopolskie	5	72.2	13.51
16	Zachodniopomorskie	3	616.3	30.29
X	Total/Average	47	147.0	10.48

Source: prepared by the Authors on the basis of data of the Agricultural Advisory Center in Brwinów, Branch in Radom, www.baltic.cdr.gov.pl (access on 2.06.2015) and data from the Management Information System ARiMR (access on 20.06.2015)

As it appears from the data presented in table 1, the area of demonstration farms significantly exceeded average areas of agricultural farms in particular provinces. Considering the diversity of provinces, the acreage of crops in the analysed farms was much larger than the average value for the country and for particular provinces (tab. 1).

The farmers in the demonstration farms were managing, first of all, arable lands and permanent grasslands. Several farmers had orchards and forests or forested arable lands. The discussed group featured six ecological farms, and in 18 farms farmers were performing agri-environmental scheme.

In the analysed farms, poor soils were dominating (3rd or 4th class). Only in some cases, soils were good or very good (mainly 2nd class).

Farms dominating in the analysed sample were farms with plant production: cereals, rapeseed, potatoes, power plants, vegetables, and with animal production: swine in the closed cycle. Mixed farms (with plant and animal production), without specialization, were a large group. In many farms a significant diversification of agricultural production could be noticed (production of poultry and milk; orcharding and poultry; turkeys and meat cattle; etc.) (Fig. 1).

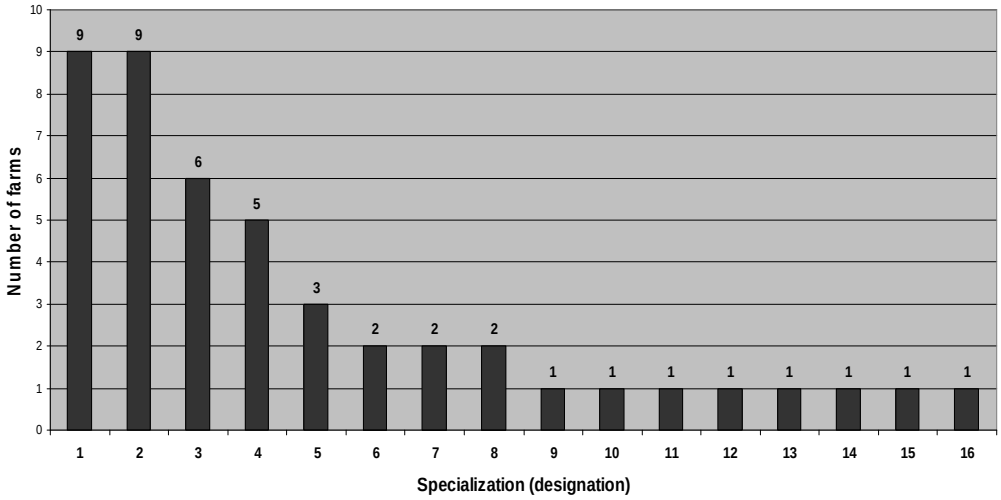

Fig. 1. Number of the analysed farms with breakdown into specialization

Source: prepared by the Authors on the basis of data of the Agricultural Advisory Centre in Brwinów Branch in Radom, www.baltic.cdr.gov.pl (access on 2.06.2015)

Designation: 1: Plant production (cereals, rapeseed, potatoes, energy plants, vegetables), 2: Animal production (pigs in closed cycles), 3: Animal and plant production, 4: Animal production (dairy), 5: Plant production (cereal sowing material), 6: Plant production (vegetables and milk), 7: Animal production (pigs in closed cycles and dairy), 8: Animal production (meat cattle), 9: Plant production and poultry, 10: Animal production (turkey and Limousine cattle), 11: Production of milk and cattle for slaughter, 12: Orcharding production and poultry, 13: Animal production (goats and goat milk), 14: Animal production (sheep), 15: Orcharding, 16: Ericaceae production.

The demonstration farms are not only the place of scientific research and trainings. They are to be an example of good practices with regard to environmental protection, with particular focus on waters. The farmers-owners of these farms were implementing many investments, related first of all to the construction of infrastructure protecting fertilizing components from washing out to the environment. All farms were equipped with tanks for liquid manure and manure storage pads. Several of them had also home sewage treatment plants and ecological boiler rooms. In addition, the farmers were observing the principles of the Good Agricultural Condition, and keeping

documentation related to fertilization management, i.e. they were recording cultivation treatments, preparing balances of nitrogen and fertilization plans as well as regularly conducted tests of soil.

Other pro-environmental actions implemented by the farmers in the demonstration farms include:

- use of dolomite lime, basalt meal and EM,
- fertilization of meadows and pastures with compost from own farms,
- use of "effective microorganisms",
- use of cover crops and winter aftercrops,
- protection of midfield natural waterholes and trees, creation of ecological corridors,
- use of renewable energy sources (most often solar collectors),
- new technologies, modern machines and devices (e.g. position for washing and filling spraying machines).

Thanks to introducing innovative solutions, the demonstration farms became a place of dissemination of good practices related to ecosystem protection. The results of those actions are greater awareness of farmers with regard to the possibilities of implementing these actions in their farms as well as proving that the use of pro-environmental fertilizers management methods will not cause reduction in effectiveness or competitiveness of agricultural production. In the innovation implementation process a critical role is played by a network of contacts created under the project (cooperation network, cooperation platform), which is of constant character. It combines experience of farmers, scientists and agricultural advisors for the promotion of pro-environmental practices in agricultural production [Kiełbasa 2015].

FINDINGS OF WATER RESEARCH IN THE DEMONSTRATION FARMS

The *BalticDeal* project assumed the implementation of various actions in practice: they were based on findings of the conducted research of water and soil. The evaluation of the quality of shallow ground waters and in courses within the demonstration farms was conducted by the Institute of Technology and Life Sciences in Falenty. The Institute was also in charge of a training cycle for farmers in the possibilities of limiting water contamination with biogenic substances of agricultural origin by using various pro-environmental methods.

The water research was conducted in all demonstration farms. In the research emphasis was put mainly on water contamination with nitrogen and phosphorus. The findings are presented in table 2 in the form of a ranking by the content of nitrate nitrogen and ammonium nitrate and phosphate phosphorus.

The obtained research findings allowed concluding that the greatest contamination with nitrate nitrogen was present in water samples taken from farm wells and reservoirs of shallow ground waters (piezometers). Large concentration was present also at the outlets of drains. As regards ammonium nitrogen, its greatest average concentration was recorded in canals and also in ground waters. Significant concentration of ammonium nitrogen was present also in samples taken from located in midfield waterholes (tab. 2). The concentration of phosphate phosphorus was greatest in the water samples taken from canals, shallow ground waters and ponds (tab. 2)

The analysis of the concentration of nitrogen and phosphorus in the taken samples shows substantially exceeded limit values stated in the Regulation of the Minister of Environment of 23 December 2002 on the criteria of determining waters sensitive to contamination with nitrogen compounds from agricultural sources Journal of Laws of 2002 No. 241 item 2093. It was observed especially in the samples taken from shallow ground waters, canals and outlets of drains with exceeded limit values of both nitrogen and phosphorus (tab. 2). The research proved that contamination of farm wells and melioration ditches with nitrate is usually significantly greater in farms focused on animal production than in farms with plant production, due to the use of large

doses of natural fertilizers. Similar conclusions were drawn after analysing the fertilizing components taken from midfield ponds and waterholes.

Table 2. Ranking of the level of contamination of samples with nitrogen and phosphorus in the demonstration farms

Sample category	Average concentration of nitrate nitrogen	Place in ranking	Average concentration of ammonium nitrogen	Place in ranking	Average concentration of phosphate phosphorus	Place in ranking
Farm well	16.44	1	0.31	9	0.45	5
Shallow ground waters	14.03	2	3.54	2	1.00	2
Drain outlet	9.99	3	0.81	5	0.37	6
Drainage well	8.76	4	0.59	7	0.34	7
Melioration ditch	5.43	6	0.65	6	0.31	8
Other ditches	2.93	7	0.25	11	0.13	11
Natural watercourse	2.09	8	0.4	8	0.18	10
Pond	1.95	9	1.85	4	0.72	3
Canal	1.19	10	10.14	1	1.35	1
Water pipe	1.04	11	0.14	13	0.06	13
Midfield waterhole	0.33	13	1.94	3	0.57	4

Source: research of the Institute of Technology and Life Sciences in Falenty

The findings of the conducted research of water samples indicate that the largest values of exceeded nitrogen and phosphorus were present in shallow ground waters. These waters play an important role as they are used by the root system of plants and carry mineral components into surface waters and deeper layers of underground waters. Their quality is significantly affected by agricultural activities, including used doses of mineral fertilizers, method of management of natural fertilizers and cultivation practices. The level of concentration of nitrogen and phosphorus in ground waters shows indirectly the strength of the pressure exerted by agriculture on the water environment.

CONCLUSIONS

The presented research findings indicate still existing substantial contamination of ground waters on rural areas and small watercourses and water reservoirs with nitrogen and phosphorus compounds. Considering the impact of agriculture on the quality of waters flowing into the Baltic Sea, this problem substantially affects ecological safety of the Baltic countries. Therefore, it is necessary to promote and implement countermeasures on a large scale, initiate international cooperation as well as strengthen cooperation networks of farmers, agricultural advisors and scientists. These actions include many practices well known to farmers, such as e.g. the use of appropriate agri-technology, rational management of fertilizers based on soil needs as well as innovative practices, such as new technologies. They can significantly restrict losses of nitrogen and phosphorus from agriculture and favourably affect the quality of water.

One of the effective and low-cost ways of reduction in the content of biogenic components in soil and their escape into watercourses is the introduction of buffer zones (the so-called ecotones) along courses. The creation of ecotones, namely transitional zones between two ecosystems, consisting of various plants, allows capturing and transforming the excess of nitrogen and phosphorus from surface and subsurface drains from arable lands.

Considering the impact of agriculture on the quality of waters, it can be established that the popularization of good pro-environmental practices with regard to water protection may

significantly contribute to reduced contamination of the Baltic Sea with nitrogen and phosphorus from agriculture. It requires, however, involvement of not only farmers, but also agricultural advisors and scientists. This cooperation is necessary to achieve the intended long-term goals.

REFERENCES

1. Berkowska E. et al (1993), International cooperation for the protection of the natural environment of the Baltic Sea, Department of Economic and Social Analyses, Chancellery of the Sejm, Office of Studies and Expert Studies, report no. 46, pp. 1-11.
2. Ciechanowicz-McLean J. (2014), Impact of the Water Framework Directive on ecological safety of the Baltic Sea, Gdańskie Studia Prawnicze, Volume XXXII, pp. 85-97.
3. Igras J., Jadczyszyn T. (2008), Zawartość azotanów i fosforanów w płytkich wodach gruntowych w Polsce, Problemy Inżynierii Rolniczej nr 2/2008, pp. 91-102.
4. Kiełbasa B. (2015), Przykład dobrych praktyk doradczych – sieć współpracy, Wieś i Doradztwo no. 5 (81)/2015, Wydawnictwo Małopolskiego Stowarzyszenia Doradztwa Rolniczego w Krakowie.
5. Pietrzak S. (2013), Bilansowanie składników nawozowych i gospodarowanie nawozami naturalnymi, a ochrona jakości wody, Wydawnictwo Centrum Doradztwa Rolniczego w Brwinowie Oddział w Radomiu, pp. 4-17.
6. Pietrzak S., Wojcieszak Ł. (2013), Metody ograniczania dopływu zanieczyszczeń rolniczych do Bałtyku wynikające z realizacji projektu *Baltic Compass*, Wiadomości Melioracyjne i Łąkarskie 4/2013, pp. 179-180.
7. The Future of the Baltic Sea – Development Trends. WWF Program for the protection of the Baltic Ecoregion, pp. 28-29.
8. Śladkowski S. (2004), Bezpieczeństwo ekologiczne Rzeczypospolitej Polskiej, National Defense University, Warsaw, pp. 3-4.
9. Zielińska M. (2012), Wpływ działalności rolniczej na proces eutrofizacji Bałtyku, Biuletyn Analiz UKIE no. 19, pp. 1-19.
10. www.baltic.cdr.gov.pl, Agricultural Advisory Center in Brwinów, Branch in Radom (access on 15.05.2015)
11. www.cdr.gov.pl, Agricultural Advisory Center in Brwinów (access on 23.05.2015)

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ENVIRONMENTAL PROTECTION PROBLEMS IN FOOD INDUSTRY

Abstract: The food industry is associated with specific environmental damage identified mainly by the high consumption of water an generated sewage and waste, the emission of dust and gas, the consumption of energy and fuels. In accordance to the EU directives, the food production in Poland is done with significant modifications and improvements of technology, which give tangible results in environmental protection, but not enough to be able to rule on the no-claim production. Reading of statistics on food production indicates progress, specifying the environmental damage as minimal. Meanwhile, in the scale of production, the environmental damage is identified a few percent of untreated wastewater or emitted gases, dust, is the significant result and more important in the large-scale production. The structure of the industry is, therefore, an important factor for the solution of the dilemma, caused by the economic development against environmental protection.

Keywords: Environment, food industry, EU directives, water consumption, energy, waste, emission of dust and gases

INTRODUCTION

The food industry in Europe is the largest manufacturing sector, and at the same time the sector with the highest employment [KE 2014, p.3]. In Poland, this sector is the place of employment for less than 20% of the total employed in the industry, and it generates 24% of the sales value of the whole industry. This gives Poland a place in the forefront of countries – the largest food manufacturers [Knap-Stefaniuk 2010]. Thus, the food industry plays an important role in the economic development of the country, but on the other side, food factories are associated with various environmental hazards based on the consumption of large quantities of water and on the generation of noxious sewage and waste, the emission of undesirable gases and dust into the atmosphere.

In line with the declared principles of environmental protection, the European Union continues to raise the bar for manufacturing plants, demanding continuous improvement of technology in order to reduce the burden on the environment. Actions in this area have practically started with the adoption of the Council Directive of 27 June 1985 *on the assessment of effects of certain public and private projects on the environment* [Journal of Laws, EU L 1985]. The Directive assumes that if *the fest environmental protection policy consists rather of preventing the creation of pollution and hazard at source, rather than subsequently trying to counteract their effects; it has been confirmed that it is necessary to take into account those effects in the environment at the earliest possible stage in all processes of technical planning and decision-making; to this end, it has been predicted to implement procedures evaluating such effects.*

ENVIRONMENTAL INVESTMENTS HARMFUL IN THE POLISH LEGAL ACTS

In Poland, attempts to work out a suitable position on the impact of investments on the environment, have already been undertaken before the adoption of the membership of the Union. In 1985 in the Order of the *Minister-Head of the Office for Environmental Protection and Water Management of 27 March 1985 on the definition of types of investments particularly dangerous to the environment and human health* [M.P. 1985 No. 8, item 74], the term of the *environmentally harmful investments* has been defined, as well as 10 such investments have been described. This description has been based on the size of production of waste and sewage, the emission of dust and

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gases, the amount of intake and consumption of water, energy transmission, generation of noise of high intensity, the operation of the electromagnetic field and storage of the high activity radioactive substances in the investment area.

The above-mentioned set of investments has been changed (or more precisely: defined and expanded) several times. The sequentially applicable documents were adopted in 1990, 1995, 1998, 2002, 2004, while currently in force there is the *regulation of the Council of Ministers of 9 November 2010 on projects, which can significantly impact on the environment* [Journal of Laws No. 213, item 1397]. In relation to that first order (of 1985), currently it is a much more extensive document, as it specifies not only the amounts of the manufactured waste, wastewater or emitted gases, but it lists specific projects, highlighting those which can *always significantly impact on the environment* an those, which can *potentially impact the environment*. In total, over a hundred of projects is calculated in different fields, which could potentially affect the environment or they always cause this impact. Indeed, it would be difficult to point out a field or project, which covers the environment, food industry or one of the described sections. It defines its specificity, which translates into threats for the environment, i.e.: large consumption of water and generated sewage, production of waste (including organic ones), the emission of gases to the atmosphere and with the noise accompanying the production. Among the more serious threats we must also indicate the penetration of waste and wastewater into the soil.

The practical realization of the above-mentioned regulations resulted in the gradual limitation of environmental nuisance of food production. Both new technologies and new equipment meant that currently food products are manufactured with much less damage to the environment than in the 90s. On the other hand, the damage is not completely eliminated, while the production is on the increase, therefore, the damage, despite the limitations, still assumes threats which cannot be underestimated. Therefore, in the European Union, the *most important environmental issues are the ones related to the installations in the ford industry, the use and pollution of water, the use of energy and waste minimisation* [KE 2010, p.4.], what does not mean that air pollution, of odours, have been completely eliminated. In total, the specificity of each sector is associated with certain risks. And so, if all the key sectors of the food industry generate solid waste, waste water, as well as it is related to the considerable use of water and energy, the noise is related only to the dairy industry and with the functioning of breweries; air pollution is the result of production in the meat and poultry industry, as well as dairy, brewing and oil-fat (table 1).

Table 1. The selected sectors of the food industry in the context of problems in the field of environmental protection

Industries	Water consumption	Sewage	Gases and dust	Smell	Noise	Solid waste	Energy
Meat and poultry	x	x	x	x		x	x
Fruit and vegetable	x	x				x	x
Oil and fat	x	x	x	x		x	x
Dairy	x	x	x	x	x	x	x
Sugar	x	x		x		x	x
Brewing	x	x	x	x	x	x	x
Drinks	x	x		x		x	x

Source: Based on the table 1.6, KE 2010, p.55.

These issues are undertaken and matched to varying degrees with actions corresponding to the environmental protection in terms of water and wastewater economy, air pollution and energy produced. They will be briefly discussed based on the data provided by the CSO in two Statistical

Yearbooks of 2013 (data for 2012) and from 2014 (data for 2013). However, also data and information of other authors will be used. The data on food industry do not include data on the production of drinks, as also CSO presents this industry separately.

FOOD PRODUCTION IN TERMS OF WATER AND WASTEWATER ECONOMY

Water consumption is currently recognized as a global issue, so modern technologies have to allow for the more and more far-reaching savings in this respect.

Water is used in the food production as an ingredient or as an agent for cleaning materials and devices. The average water consumption in the production is approx. 70-80%, but in the fruit an vegetable industry even up to 50% of the total water consumption is used for washing [Malińska 2005, p.137]. While it would be difficult to plan savings in water consumption needed for the production of food products, this task is virtually an imperative in the hygiene and cleaning activities. Even more because the water consumption in these activities translates into the amounts of the waste water generated, which usually *contain high levels of COD and BOD, which /.../can be 10 - 100 times higher than in domestic waste water. The concentration of suspension ranges from small values to as high as 120000 mg / l. Untreated waste water from certain sectors, in which, e.g., meat, fish, dairy and vegetable oil are produced, contain high concentrations of oils and fats* [KE 2010, p.54].

Table 2. Income and revenue of water. Source: own study based on CSO 2014.

Section	2012		2013		Disposal 2012/2013
	Income	Expenditure	Income	Expenditure	
IU	hm^3		hm^3		%
Industrial processing	691,4	652,1	677,4	640,2	98,8
Manufacturing of food products	78,7	76,7	77,1	75,5	98,4

Source: own study based on CSO 2013, 2014.

Nevertheless, each industry generates a different kind of wastewater, requiring a different approach to their discharge. And so, in the wastewater of the fruit and vegetable industry there is mostly water from washing, but not only, as there is also organic waste from subsequent stages of production (some vegetables and fruit, peelings and pits, discarded vegetables and fruit, pomace from the concentration production). In the meat and poultry industry the wastewater contains *fats, residues of tissues and blood, which significantly increase the level of BOD_5 and COD. Then, there is also waste in the form of bones and scraps* [Kasztelan, Kierepka 2014, p.110].

In most companies of the discussed sectors, the projects that are implemented aim at the more water-efficient water management and even the comparison of water consumption of two years (table 2) shows that this is the direction implemented gradually, while the food industry in this scope achieves slightly better results than other sectors of manufacturing (in 2013 the food industries used 1,6% less water than in 2012, other manufacturing sectors showed the water consumption smaller by 1,2%). Results are brought by the use of closed water circulation systems, installation of float sensors and pressure control sensors. The installation is systematically monitored for leaks. The cleaning methods of the production locations are developed (with the initial dry organisation of the surface; pressure washers are introduced, etc.). It is also recommended to control the water use weekly, which is to result in savings from 20 to 50% of the water amount [Steinhoff-Wrześniewska, Rajmund, Godzwon 2013].

Results of savings in water management also reveal the decreasing amounts of the discharged waste water: in the period of 2000-2012 they were reduced by 7% in the food industry. Evidence of

rationalisation also includes the set of waste water from the food production with the overall amount of waste water in manufacturing sector: In 2012, the food industry discharged 11,4% of manufacturing waste water, [Kasztelan, Kierepka 2014, p.112], while in 2013 – 9,8% (table 3). Importantly, also the amount of untreated wastewater is progressively reduced: while in industrial wastewater they constituted 3,4%, 0,2% has been noted for the food industry.

Table 3. Food industry wastewater in the context of industrial processing wastewater in 2013

Section		Total	Discharged		Including the ones requiring treatment	
	IU		Directly to water/soil	To municipal sewage	Treated	Untreated
Industrial manufacturing	hm^3	732	660,1	71,9	422,7	24,9
	%	100	90,2	9,8	57,7	3,4
Production of food products	hm^3	71,6	41,4	30,1	36,5	1,6
	%	9,8	5,7	4,1	5,0	0,2

Source: own study based on CSO 2014.

The statement regarding the discharged wastewater also shows that while in manufacturing over 90% of wastewater is discharged directly to water or ground, in the production of food products this applies only to 5,7% of wastewater. It also means higher costs of wastewater discharge in food industries than in other sectors of the manufacturing industry. Among others, it is shown that in the dairy industry costs of wastewater discharge constitute less than 95% of the total costs incurred for environmental protection, while these costs in the period of 2004-2010 increased almost three times (558 thousand PLN in 2004, 1518 thousand PLN in 2010) [Juszczyk, Nowak 2011, p.119]. Therefore, if the rationalisation of the water and wastewater economy can significantly result in the reduction of costs even by 20%, what guarantees the improvement of competitiveness.

THE FOOD INDUSTRY AND AIR POLLUTION AND WASTE

The food production is associated with the generation of dust, volatile organic compounds and burdensome odours. *Refrigerants containing ammonia and halogen may be released accidentally* [KE 2010, p.54]. In relation to the pollution generated by the industry processing, the food industry is involved in 5,5% of the total emission (in 2012 this was approx. 3098 thousand tonnes of gases). While the industrial manufacturing manages to keep 99,6% of dust pollution and 68,4% of gas pollution in devices, the food industry has weaker results: 84,3% of dust pollution and 2,1% of gas pollution is retained [CSO 2014, p.462-463].

Among the discussed industries, the largest amounts of gas and dust pollutants is generated by sugar factories (their share in emissions of gases of the whole food industry is 41,2%). *In sugar plants fired by coal and coke the exhaust fumes are created. Dust emissions are formed during the transport of sugar, in silos storing sugar, while packing sugar (sugar powder) and briquetting (sugary powder). The big inconvenience of this industry includes odours created during the prolonged storage of sugar pulp. Moreover, the sugar industry generates waste occurring, among others, in the form of: leaves, debris and beet pulp* [Kasztelan, Kierepka 2014, p.109-112].

The specificity of waste generated in the food industry makes dealing with them more complex, as some of them are used for manufacturing animal feed, some is composted or stored. And so, waste of the animal origin (from the production and processing of meat) is used for producing technical fats or meat and bone meal; waste from processing of vegetables and fruit is

used for producing feeds, dried fruit, citric acid, flavourings and colourings, or fruit distillates, while fruit pits are used in the production of polishing wipes, etc. Some of the waste is the raw material foe the rendering industry, which is based on the development of food sections, however, its structure is a problem, which is based on small enterprises of low technological standard [Białecka 2008].

Generally, the food industry achieved better results in reducing waste amounts, and increasing amounts of waste are subjected to recovery (table 4), but this does not apply to all industries. As shown by Armand Kasztelan and Maria Kierepka [2014], the largest amounts of waste are produced while manufacturing sugar. However, in the longer term (comparison of results from 2000 and 2012), this industry has made significant progress by limiting the amount of waste from almost 8800 thousand tonnes in 2000 to almost 1600 thousand tonnes in 2012. This means a reduction of almost 82%. Meanwhile, in the vegetable and fruit processing, the amount of waste increased by approx. 40 % (from 392,2 thousand tonnes to 469,2 thousand tonnes), while in the meat processing the amount of waste increased 3,5 times (from 243,8 thousand tonnes to 839,6 thousand tonnes). On the other hand, considering the amounts of waste from the aforementioned industries, subjected to recovery, in the production of sugar no progress has been made, as the "percentage of recovery" dropped from 86,6% to 83,7% in 2012, while in the meat industry the recovery increased from 80,1% to 91,8%. In processing of vegetables and fruit the improvement in recovery was over 15% (from 79,8% to 96,6%), what means that this industry is approaching the excellence in the discussed field [Kasztelan, Kierepka 2014, p.115].

Table 4. Waste in the selected sectors of the food industry

year	2012			2013		
Section	Waste	Recovery	Recovery	Waste	Recovery	Recovery
IU	In thousand of tonnes		%	In thousand of tonnes		%
Industrial manufacturing	26760,5	20498,3	76,5	28204,3	20776,7	73,6
Production of food products	4280,1	3887,5	90,8	3802,2	3478,5	91,4

Source: own study based on CSO 2013, p.514; 2014, p.470-471.

The latest data on the amount of generated waste in the whole food industry in the period of 2013-2014, [CSO 2013, CSO 2014], show that the production of food products is implemented with the limitation of waste and with the improvement of the percentage of waste subjected to recovery. Meanwhile, in other sectors of the industrial processing more and ore waste is being produced, while the percentage of waste subject to recovery has decreased (table 4). The average of waste recovery in the food industry reaches over 90%, while in other processing industries this is less than 74%.

THE USE OF THE SELECTED FUELS AND ELECTRICITY

The comparison of the consumption of the selected fuels and electricity (table 5) shows that in the industrial processing the use of coal is declining (consumption in 2013 is approx. 97-98% of the consumption in 2011). While the consumption of electricity increases, and in the production of food products this increase is more significant (it amounts to 12%, while in the processing industry in general, this is an increase of 7%).

Table 5. The direct consumption of electricity and the selected fuels

Section	Coal (in thousand of t)			Electricity (in GWh)		
.	2011	2012	2013	2011	2012	2013
Industrial manufacturing	19889	19011	19524	44048	44996	47133
Production of food products	1184	1218	1154	4352	4673	4915
Section	Natural gas (in hm^3)			Nitrogen-rich natural gas (in hm^3)		
.	2011	2012	2013	2011	2012	2013
Industrial manufacturing	6588	7064	7409	510	528	545
Production of food products	471	518	549	39	37	34

Source: own study based on CSO 2013, p.436-437, 2014, p.388-399.

All processing industries also use more and more of natural gas, although, again, the increase in the food industry is greater (by 16%, compared to 12% for the manufacturing industry in general). Thus, the consumption of fuels and electricity indicates the greater food production, and therefore illustrates the development of this field.

PROBLEMS AND THE STRUCTURE OF THE FOOD INDUSTRY

In publications undertaking the discussed issue, the problem is usually identified as the structure of the Polish food industry, which is characterised by considerable dispersion of the companies: K. Malińska [2005, p. 147] notices that the *identification of the scale of problems and needs related to the environmental protection is somewhat difficult. In large food processing companies, which have a decisive impact on the environment, practices in the field of water and wastewater economy meet the basic instructions and requirements of the environmental protection /.../ In the case of small and medium-sized companies, compliance with regulations and recommendations concerning the protection of environment is not satisfactory.* If we assume that only small companies are a problem, it is possible that it will soon be minimised, because as it is noted by A. Knap-Stefaniuk [2010] *In the meat and dairy sector there was a desirable trend to industrialise the slaughter of animals for slaughter and processing of milk. The share of economic slaughter and domestic processing of milk was reduced. The share of industrial slaughter in the supply of pigs and cattle increased from 38% in 2000 to 48% in 2003, and of poultry, respectively, from 88% to 94%.*

The presented perspective is not evaluated unanimously. The issue is undertaken, among others, at the EU forum, where it is observed that *Approximately 80% of the global food production is sold at local markets, while in the West – where the setup is directed at the industrial food production on a mass scale – this is only 20%. New challenges, such as the prevention of shortages of food, feed and energy, and the limitation of environmental damage by the food industry, are becoming a strong argument for the re-strengthening of the local food systems within CAP* [Committee of Regions 2011]. Nevertheless, this kind of opinions are not sufficiently widespread, what is probably done by the sturdy and increasingly stronger large-scale lobby. Official statistics, cited in this article, seem to favour the logic and equity of the position of this lobby, as progress can be seen in them, while the scale of damages defined by a few percent, seems negligible. Meanwhile, in the environmental scale, the emission of thousands of gases and dust to the atmosphere cannot be indifferent.

CONCLUSIONS

The development of the food industry in recent years characterises the increase of production and the technological progress. The size of production increases almost every year by a few percent. Polish manufacturers appear to be sufficiently flexible that they successfully keep pace with the

changing consumption models, and even they themselves introduce new products to the market and identify new consumption models [Knap-Stefaniuk 2010].

The upward trends of production are logically associated with a higher consumption of water, energy and waste, dust or gases. The applicable legal acts (European and Polish) strongly commit to the implementation of the production with the reduced amounts of water intake, generated wastewater, gust, gases and waste. In the Polish food business, these obligations are fulfilled, while the reference of the results regarding these activities to the results achieved in other sections of the industrial processing that the food industry, in many respects, is a leader. The quoted statistics show, indeed, some differences between individual sectors, although the desired changes are clear. On the other hand, all described improvements and developments mean the increasing energy and fuel demands, and meeting these needs is connected with further costs of the environment. Also, these costs are generated by the mere increase in production. Although the production is performed with less and less environmental damage, they are not zero, and in total they create an area, in which even small damage (in proportion to the production) are a problem. Official statistics, in this regard, can suggest significant progress on the road to ecological safety, which in reality still is quite a distant goal. The chance would be to undertake an honest discussion about the structure of the food (and agricultural) production, but so far, we cannot observe greater chances for change in this area.

REFERENCES

1. Białecka B., Gospodarka odpadami z przemysłu rolno–spożywczego w województwie śląskim, w: Problemy Ekologii, vol. 12 , nr 1, styczeń–luty 2008.
2. Dyrektywa Rady z dnia 27 czerwca 1985 r. w sprawie oceny skutków wywieranych przez niektóre przedsięwzięcia publiczne i prywatne na środowisko naturalne, Dz.U.UE L z dnia 5 lipca 1985.
3. Juszczyk S., Nowak M.M., Poziom i zróżnicowanie kosztów ochrony środowiska w spółdzielniach mleczarskich w: Poziom i zróżnicowanie kosztów ochrony środowiska w spółdzielniach mleczarskich, Stowarzyszenie Ekonomistów Rolnictwa i Agrobiznesu, Roczniki Naukowe, tom XVI. zeszyt 3, s. 119.
4. Kasztelan A., Kierepka M., Oddziaływanie przemysłu spożywczego na środowisko w Polsce, Stowarzyszenie Ekonomistów Rolnictwa i Agrobiznesu, Roczniki Naukowe, tom XVI, zeszyt 2, 2014, s. 109.
5. Knap- Stefaniuk A., Przemysł spożywczy w Polsce, w: Zarządzanie zmianami, Biuletyn POU, maj 2010, nr 5(39).
6. Komisja Europejska (2010), Zintegrowane zapobieganie zanieczyszczeniom i ich ograniczanie Dokument referencyjny na temat najlepszych dostępnych technik w przemyśle spożywczym: https://ippc.mos.gov.pl/ippc/custom/BREF_spozy(1).pdf
7. Komisja Europejska, (2014), Zrozumieć politykę Unii Europejskiej – Bezpieczeństwo żywności: europa.eu/pol/pdf/flipbook/pl/food_pl.pdf (dostęp: 1.12.2015)
8. Komitet Regionów, (2011) Lokalne systemy żywnościowe katalizatorem rozwoju obszarów wiejskich oraz sposobem na lepsze funkcjonowanie WPR, komunikat prasowy, http://europa.eu/rapid/press-release_COR-11-3_pl.htm
9. Krzanowski S., Wałęga A., Paśmionka I., (2008), Oczyszczanie ścieków z wybranych zakładów przemysłu spożywczego w: Infrastruktura i ekologia terenów wiejskich, s. 85-86.
10. Malińska K., Problemy ochrony środowiska w przedsiębiorstwach przemysłu spożywczego, w: "Środowisko a zdrowie - 2005" : VII Ogólnopolska Sesja Popularnonaukowa, 2-3 czerwca 2005 r., Częstochowa, Jasna Góra.
11. Rozporządzenie Rady Ministrów z dnia 9 listopada 2010 r. w sprawie przedsięwzięć mogących znacząco oddziaływać na środowisko (Dz. U. Nr 213, poz. 1397).

12. Steinhoff-Wrześniewska A., Rajmund A., Godzwon J., (2013). Zużycie wody w wybranych branżach przemysłu spożywczego, w: Inżynieria Ekologiczna Nr 32.
13. Zarządzenie Ministra-Kierownika Urzędu Ochrony Środowiska i Gospodarki Wodnej z dnia 27 marca 1985 r. w sprawie określenia rodzajów inwestycji szczególnie szkodliwych dla środowiska i zdrowia ludzi (M.P. 1985 nr 8, poz.74)

Eugeniusz Kośmicki[10]

THE CATEGORY OF NATURAL HERITAGE AS A CHALLENGE IN THE PROCESS OF MANAGEMENT AND NATURE CONSERVATION

Abstract: Preservation and sustainable management of the natural heritage are considered to be basic socio-economic problems. Until recently they have not been extensively investigated by researchers, particularly in terms of sustainable social and economic development. In economic analyses this problem is discussed in terms of anthropogenic capital, natural capital, primary natural capital or cultivated natural capital. Primary natural capital constitutes the inviolable natural heritage. It provides several services: provisioning raw materials, production and transformation, regulating and waste treatment, provisioning space for human use, as well as educational and cultural services. We need to consider economic activity from the point of view of preservation and sustainable management of natural heritage. This paper discusses problems of preservation and sustainable use of natural heritage in agriculture, forestry and nature conservation. At present protection and sustainable management of natural heritage are the necessary pre-requisites for the maintenance of evolutionary processes, i.e. future existence of both the biosphere and mankind.

Key words: natural heritage, natural capital, anthropogenic capital, natural capital services, organic farming, forestry, nature conservation, sustainable development, unsustainable development.

INTRODUCTION

In view of the ecological and social crisis the preservation and sustainable management of natural heritage are considered to be main challenges of the modern times. So far, "*economic theories and economic indexes do not indicate how economy disturbs and destroys ecosystems*" [Brown, 2001, p. 19]. However, natural heritage is being rapidly degraded. At present many global boundaries are being crossed, e.g. climate change, loss of the Earth's integrity or changes in basic biogeochemical cycles [Gerten, Schellnhuber, 2015, pp.12-14]. Current changes in nature, particularly the biosphere, are becoming so profound that we need to acknowledge the emergence of a new geological era – the anthropocene [Crutzen, 2002, p.23]. To date natural heritage has not been thoroughly investigated by researchers in terms of sustainable social and economic development.

The concept of natural capital as applicable in the assessment of natural heritage use in economy

Treatment of natural resources as "natural heritage" is essential for specific ecological and economic purposes. Individual areas, including regions and countries, vary in terms of their available natural resources, thus they are equipped with a varied *natural heritage*. This is reflected in such concepts as world *natural heritage* adopted by the international UN agency, UNESCO, involved in scientific and cultural education. UNESCO passed the Convention of Concerning the Protection of the World Cultural and Natural Heritage. The category of "*world natural heritage*" comprises approx. 150 areas, including the Grand Canyon or the Danube Delta. However, the category of natural heritage is broader than it was assumed in the UNESCO Convention. The term *natural capital*, strictly connected with the category of *natural heritage*, is applied in economic sciences. Capital may be generally defined as the resource, which flows provide useful goods and services. Traditionally capital is defined as means of production necessary for the production of goods and such a capital is defined as anthropogenic capital. Thus we need to distinguish natural capital, which while not produced by

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humans, in the functional approach denotes a specific resource providing flows of useful goods and services. This constitutes specific natural heritage, i.e. a gift of nature used by humans. For example, it is assumed that the resource, population of trees or fish brings a flow of annual yields in the form of new trees or fish (as well as other services), while the same flow is permanent in character. Maintained permanent flow is a certain "*natural income*", but a resource, which brings the permanent flow, is "*natural capital*", providing various services such as recycling of waste or the accumulation of water and erosion control. Since the flow of ecosystem services relies on the functioning of the entire system, the structures and diversity of ecosystems are basic elements of natural heritage.

An important starting point in the analysis of the economic effect of human activity on natural heritage was proposed by J. T. Winpenny. In his opinion the overall capital should be understood in economics in terms of three basic categories [Winpenny, 1995, pp.19-21]:

- **Anthropogenic capital** – in conventional economics referring to e.g. buildings, factories, capital created by human activity, which volume may be regulated by people,
- **natural capital** – understood so far in conventional economics as natural resources, both renewable and non-renewable, which may be replaced or supplemented by other resources, e.g. anthropogenic capital,
- **primary natural capital** – comprising natural resources, such as e.g. the ozone layer, biodiversity, necessary for the society. It may not be replaced by other forms of capital – until recently never included in economic calculations and comprising natural heritage. As it is priceless and needs to be protected, natural capital automatically becomes a factor limiting the scope of economic processes, involving inviolable natural heritage.

Relationships between human activity and various types of capital may be presented as follows:

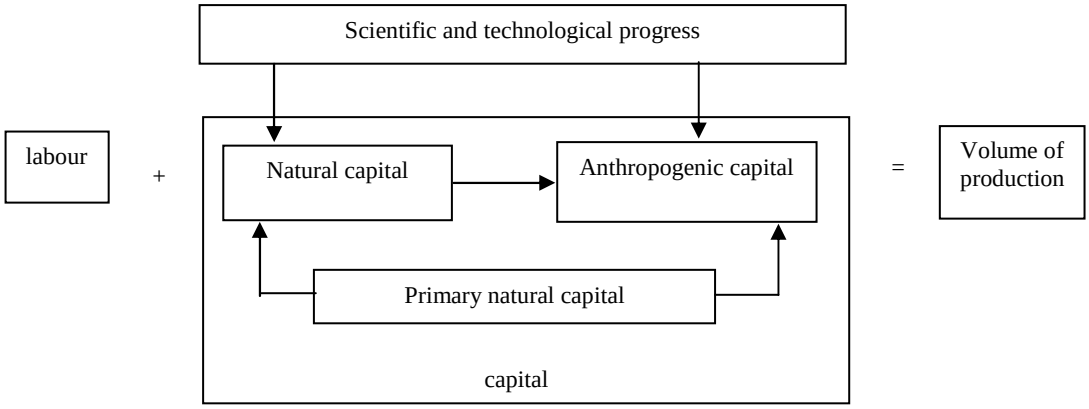

Fig.1. The dependence of economic activity on different types of capital.

Source: D. Pieńkowski, Natural capital in theoretical analyses of factors of production, Ekonomia i Środowisko 2002, no. 1, p. 14.

An intermediate concept between natural capital and anthropogenic capital is connected with the so-called *cultivated natural capital*. It comprises, among other things, commercial forests, reared animals, grown crops and fish living in fish ponds. *Cultivated natural capital* provides raw materials for the economy (input) in combination with anthropogenic capital. However, it does not provide such a wide range of natural environmental services as the primary natural capital (e.g.

eucalyptus plantations supply wood for sawmills and reduce erosion, but they do not provide a natural habitat for wild animals and they do not sustain biodiversity).

Primary natural capital operates by various ecosystem services, which generally do not have a price. However, being multifunctional it sustains life on Earth. This type of capital may not be substituted by any other capital type. At the same time, a threat to the inviolable natural heritage as primary natural capital poses a threat to productive functions of nature over a long time perspective. We may generally distinguish the following ecosystem services: **provisioning raw materials, production and transformation services, regulating and waste treatment services, provisioning space for human activity, educational and cultural services.**

The above-mentioned regulating and educational services are connected with the maintenance of inviolable natural heritage. In turn, raw material, production and transformation services as well as provisioning of space for human use are connected with natural capital, previously analysed by the neoclassical environmental economics and presently by the economics of sustainable development [Costanza, R., et al. 2014, p.158].

The primary problem is related to the dependencies between natural capital, which produces a specific flow of natural resources and services, which are next involved in the production process, and anthropogenic capital. A characteristic relationship is observed in this case: *Natural capital and anthropogenic capital are not substitutable, but complementary. The neoclassical premise of an almost complete substitution of natural resources with anthropogenic capital is an oversimplification and may not be justified by analytical simplicity*" [Constanza, Cumberland, Daly et al., 2001, p.212]. The complementary relationship between anthropogenic and natural capital leads to a great accumulation of the anthropogenic capital, which is based on the utilisation of increasing natural resources.

Preservation and sustainable use of natural heritage require specific actions in the entire system of operation of natural capital and its productive use: **minimised utilisation of natural resources**, i.e. raw materials, energy, area; **ecologisation of the economy**, i.e. the sustainable character of production and consumption; **actions leading to the limitation of anthropogenic economic effects** (e.g. waste, emissions, use and recycling of goods for final consumption, direct introduction of the present matter to the environment); finally, management is connected with **nature protection and minimised loss of natural heritage**. It may be presented based on selected examples of management.

THE PROBLEM OF PRESERVATION AND SUSTAINABLE USE OF NATURAL HERITAGE IN SELECTED MANAGEMENT AREAS

Contemporary environmental protection has been successful – to a considerable extent – in dealing with such classical environmental problems as protection of air and waters, or waste disposal. However, so far a comprehensive protection of natural heritage has not been possible. Protection of environmental resources (water, soil, air) is a necessary, but an insufficient condition for the protection of natural heritage. The theory of sustainable development is based on the potential to preserve natural capital and its sustainable use.

AGRICULTURE

Approximately 10 000 years ago the Neolithic revolution took place, consisting in the development of agriculture and animal rearing. It had a profound effect on human life, providing permanent food supply, which resulted in the transformation of the dispersed human population into a dominant species in nature. Grown crops and reared animals may be referred to by a common term of cultigens. There is a close dependence between humans and cultigens – it may be considered a type of symbiosis between species. It may also be observed that "*the decline of old civilizations always seems to be connected with the limitation of food supply (…) the problem of*

food supply may again prove to be a weak link in the interdependencies of the environment and the economy" [Brown, 2001, p.32]. Similarly as in the case of the Sumers, also the fall of the Mayan civilisation was closely connected with the drop in food production as a result of deforestation and erosion of farmland.

Since the early 19th century gradual and profound ecological, economic and production changes have been taking place. Traditional agriculture has been gradually replaced by intensive farming, also referred to as conventional agriculture. At present in developed countries agriculture is based on highly rationalised, labour-saving and capital-intensive production methods. Traditional agriculture, originating the time before commercial-scale production and nowadays frequently called "backward", used energy coming from renewable resources and as a whole had a positive energy balance. This meant that produced food contained much more energy than had been consumed for its production. Today the situation is completely different – agriculture may not function without artificial energy subvention in the form of inputs of energy, fertilisers, pesticides, machines and equipment. Agricultural ecosystems have practically lost the self-regulating capacity and are currently found in the state of a permanent loss of ecological balance. They may be maintained mainly by providing adequate material, energy and information inputs.

Agriculture is characterised by the following aspects: (i) ecological, consisting in the energetics of natural systems, which functioning depends on natural cycles and maintenance of soil fertility; (ii) economic and technological – agricultural activity is based on economic calculations, which should also include costs of maintaining an adequate status of the environment; (iii) sociological, agriculture alone constitutes a complicated system of human interactions, it is essential to maintain the sense of economic efficiency, responsibility and self-governance; and (iv) hygienic and sanitary – agriculture should guarantee healthy life in rural areas and provide quality food.

Contemporary intensive agriculture already has a highly negative environmental impact. The most important threats include:

- reduction, division and elimination of biotopes and landscape components of natural character;
- a threat to underground waters by nitrates and pesticides;
- a threat to soil components;
- a potential threat to surface waters;
- deteriorating food quality;
- air loaded with agricultural-origin contaminants;
- agriculture contributes to greenhouse emissions, e.g. methane, ammonia and nitrous oxide.

In many countries, including Poland, the intensive (industrial) type of agricultural production has become dominant [Kośmicki, 2009]. Development of this form of agriculture results from the continuously increasing demand for food and other agricultural produce observed in modern societies. The primary objective of such agriculture is to produce maximum amounts of food biomass for the growing human population. Progress in agriculture, as it is commonly stressed, is most frequently connected with industrial agriculture. **Ignorance of the mechanisms governing ecosystems and agri-ecosystems has led to the opinion that progress in agriculture is typically connected with negative environmental impacts.**

Industrial agriculture is rightly criticised from the ecological and social standpoint, since it leads to numerous threats and hazards. These include threats to soils, underground and surface waters, air pollution as well as greenhouse gas emissions, deteriorated food quality and undesirable changes in the landscape. Organic farming is a challenging alternative to conventional agriculture. To a considerable extent it utilises the natural potential and capacity of ecosystems, while industrial agriculture is inevitably burdened with an incomparably greater consumption of energy, matter and information of anthropogenic origin.

FORESTRY

At present we are observing a rapid decline of forests on a global scale. A practical decline of forested areas is reported in 25 countries, over 95% forested area has been lost in 18 countries, while 90% forested area has been lost in further 11 countries (the last 3 figures refer to a comparison of the present status to that in the 16th century). It may be stated that in the course of human history the area of forests has decreased from **6 billion ha** (8000 years ago) t**o the present-day 4 billion ha** [Der neue Fischer Weltalmanach, 2015, p.720]. The loss of valuable primeval forests (4 million ha annually) is a major problem, with the greatest losses of primeval forests recorded in Indonesia, Mexico, Papua-New Guinea, Brazil and Congo. The problem is aggravated by large-scale deforestation, caused by the transformation of tropical forests into agriculturally used land for cattle rearing and soy plantations, construction of hydroelectric power plants such as the Three Gorges Dam in China, the Itaipu Dam (Brazil and Paraguay) and the Belo Monte Dam on the Rio Xingu. New threats for tropical rainforests have also appeared due to the expansion of oil palm plantations, food and cosmetics production as well as the production of biofuels. A typical example may be provided by the threat to rainforests in Borneo – the loss of over 1 million ha annually for oil palm cultivation, if this trend continues, tropical forests will disappear by 2020 and thus posing a serious threat for the existing natural heritage [Der neue Fischer Weltalmanach, 2015, p.721]. We need to stress the effect of deforestation in Haiti with its characteristic history of forest depletion. Initially as much as 90% land area was covered by tropical rainforests. Clearing of forested areas started in the 17th century. This exploitation led to a situation when in 1950 forests accounted for 20% land area, while at present it is as little as 2%. The environmental impact of such a plunder economy at the expense of natural heritage leads to water shortage, erosion, catastrophic floods and the decline of agriculture.

At present we are facing a serious problem of illegal timber harvesting – 80% wood from the Amazon Basin comes from illegal (unauthorised) felling. A characteristic aspect is connected with a continuing lack of a global forest stewardship convention – while in 2000 the UN Forum on Forests (UNFF) was founded, it is not obligatory in character. As little as approx. 13% global forested area is covered by legal protection. A stronger incentive for the protection of forests is provided by the new global climate agreement (Paris 2015). In turn, forest damage in temperate zones is connected with decreased forest vitality, i.e. the symptoms of tree decline in central Europe from the 1970s, considered to be caused by atmospheric pollutions (*Waldsterben*).

NATURE CONSERVATION

Rapid transformation of the natural environment already in the 19th century brought about proposals to protect nature against the destructive anthropogenic impact. It is necessary for the normal functioning of the economy, as well as maintenance of human health and life, as it is epitomised in the popular slogan: "*Nature conservation protects man*". The primary objective of nature conservation should be connected with the establishment of a healthy environment, ensuring optimal conditions for human development, i.e. comprehensive maintenance of physical and mental health as well as social well-being.

Nature conservation in the broadest meaning of the term is the most important practical application of preservation and sustainable management of natural heritage. For this reason the concept of nature conservation is highly complex and covers highly diverse types of activities: nature conservation, protection of resources and management of human environment, protection of selected structural elements of the biosphere – ecosystems, protection of biodiversity and finally the protection of humans as biological organisms and socio-cultural beings.

Nature conservation comprises plant and animal species protection, nature monuments, reserves and national parks. A separate form is also connected with landscape protection, recently

introduced in Poland, and consists in the establishment of landscape parks and protected landscape areas as well as other protection activities. Protection of resources and management of the human environment include all conscious actions aiming at the maintenance of the status and quality of various elements of the natural environment we live in. No major successes may be observed in this area. Within the existing system of national economic development indexes, neither the reproduction of nature resources nor deterioration of their quality have been taken into consideration. Moreover, the use of many natural resources is dramatically inefficient.

Biodiversity is a term referring to the diversity of life forms in the biosphere in all its manifestations and interdependencies. Biodiversity comprises three areas: ecological diversity – the diversity of biomes, landscapes and finally ecological niches; diversity observed among organisms, i.e. diversity of taxonomic groups (e.g. families, genera), up to species diversity; genetic diversity as the diversity of populations through individual organisms up to genes. Genetic diversity is not distributed uniformly in nature. Almost 50% species are found in as little as 2% area, the so-called *hotpots*, located most typically in tropical countries [Baur, 2010, pp.51-54]. Loss of biodiversity is a primary ethical problem, since e.g. extinction of species and large-scale conversion of natural areas are irreversible. Maintenance (and thus nature conservation) and sustainable use of biodiversity continue to be the objectives of sustainable development, and thus preservation of natural heritage of mankind. At present approx. 1.8 million species of living organisms have been described, although their actual number may be well over 30 million species. Presently 20% all species of mammals as well as 10% plant species are threatened [Kleesattel, 2010, pp.7-8].

Problems with the preservation of certain structural elements of the biosphere, i.e. ecosystems, are gravely aggravated. Some of them (e.g. marshes or tropical forests) are threatened with complete destruction. However, artificial ecosystems (agri-ecosystems, and urban and industrial systems) may function provided a sufficient number of natural systems exist and serve important functions for the maintenance of their ecological equilibrium.

At present further existence of *Homo sapiens* as a biological species and a socio-cultural entity is seriously threatened. In view of rapid ecological and socio-cultural changes existing biological and cultural adaptations are no longer sufficient. For example, inhabitants of big cities live in an environment filled with trace amounts of numerous substances, which have never affected the human in the course of evolution, causing civilisation-related diseases.

Currently observed effects of nature conservation are far from promising. A vast majority of environmental damage and disturbance of the ecological equilibrium are a consequence of the dominance of production in the contemporary society.

We face a problem of what principles of nature conservation should be adopted as the foundation for human activity in nature. The following principles seem to be of paramount importance: the concept of sustainable use of land surface as the basis for landscape planning; the concept of interlinkage of biotopes, which should cover min. 10% - 20% Earth's protected area; comprehensive regulation of human interference in nature – without such a regulation the condition of the environment will deteriorate and areas covered by nature conservation schemes should be treated as equipotential areas; departure from the static and partially conservation-type environmental protection and the application of the concept of protection strongly focused on natural processes.

It may generally be assumed that the concept of natural heritage should stir a discussion on what may be irreversibly lost in the future. In this sense this concept is an element of insightful modernisation rejecting technocratic myths.

PROBLEM OF PRESERVATION AND SUSTAINABLE USE OF NATURAL HERITAGE – BASIC PROBLEMS

It needs to be stressed that generally speaking an analysis of the history of sustainability, i.e. sustainable development, has not been the topic for discussion in contemporary research. Selected problems concerning sustainability are occasionally mentioned in discussions along with simplified concepts concerning social history of mankind [Wilson, 2014, p.343].

Thus we have to reject the assumption that in the past economy up to the time of the Industrial Revolution was sustainable, since it is an oversimplification. In reality the phenomenon of unsustainability – although on a local scale – has been accompanying humanity for ages. However, the scale of threats has increased, which – as it was stated before – is global nowadays. An attempt to present a more comprehensive explanation of unsustainability as well as the potential for permanent and sustainable development was made by Diamond [Diamond, 2005, p. 517]. Collapse was a key concept in his considerations, since: "*The concept of collapse is understood as a drastic drop in the population size, as well as political-economic-social complexity, which extends over a greater area and last for a longer period of time"* [Diamond, 2005, p.15]. We may not be limited only to the description and explanation of decline of specific cultures, but we may also indicate positive effects of ecological, economic, social and political stabilisation in the case of societies previously threatened with collapse, i.e. Iceland, Japan or New Guinea. In those cases the societies interrupted the trend towards collapse and instead entered the path towards sustainable development. It is assumed that "*the decline of old civilisations always seems to be connected with the limitation of food supply (…) the problem of food supply may again prove to be a weak link in the interdependencies of the environment and the economy*" [Brown, 2001, p.32].

It may be stated that most cases of historical ecological as well as socio-economic decline were connected with overpopulation and plundering of natural heritage. However – in the case of collapse of specific societies – additionally certain development tendencies observed in the investigated societies also have to be involved. We may indicate here such factors as: (1) unsustainable treatment of such basic natural resources as water, soils, forests, shoals of fish; (2) climate change; (3) external enemies of a given society; (4) decline of current economic partners; (5) a lack of adequate response of the society to their own problems. At present additionally we also observe new burdens for ecosystems and the entire biosphere, which make the current situation of mankind even more dangerous than it was in prehistoric and historic societies [Wilson, 2014, p.355].

We are facing an important question: Why have certain societies been particularly susceptible to collapse? What were the specific processes, which in former societies led to ecological and social disaster? Response of societies to existing ecological and social problems results mainly from the existence of specific social institutions, as well as adopted social values and the scope of degradation of natural heritage. These institutions and assumed values determine whether a specific society may solve existing problems or whether this society is trying to understand and solve them in accordance with ecological and social requirements. In the history of mankind we may observe a positive transition from an unsustainable development, posing a direct threat of a social disaster to changes towards a permanent and sustainable development. This refers e.g. to Iceland or Japan. In Iceland initially the natural heritage was threatened, which led to the destruction of forests and a great threat to soils. Thanks to long-term consistent actions of inhabitants gradually the negative trends towards unsustainable development have been reversed to follow sustainable development.

Irrespective of the methods used by societies to manage their economies, some of them avoid excessive exploitation of their natural heritage, while others completely fail in this respect. Such contemporary examples indicate e.g. Ruanda, Haiti and the Dominican Republic. In the case of Ruanda conditions of sustainable development were drastically violated (huge birth rate, a lack of modernisation of the national economy, increasing poverty, destruction of natural heritage). This

resulted in a civil war, in which in the course of 6 weeks 800 000 inhabitants (11% population of that country) lost their lives as a result of mass slaughter. They were mainly representatives of an ethnic minority, the Tutsi. In turn, in the Dominican Republic undertaken adequate environmentally friendly activities prevented greater degradation of the environment and has preserved natural heritage of importance for mankind. Another country on the island of Hispaniola, i.e. Haiti, to a considerable extent destroyed its natural heritage, there is no economic development and the country has been rocked by numerous riots and social revolutions. The political structure remains exceptionally unstable. Dramatic challenges in the preservation and sustainable use of natural heritage are currently observed in China and Australia. For example, ecological problems of China are not only the greatest among all the large countries, but they are constantly deepening [Der neue Fischer Weltalmanach 2016, 2015, p.85].

CONCLUSIONS

In the era of globalisation all societies are closely interrelated with crisis phenomena, so that a risk appears for a rapid, global collapse of human civilisation. Long-term planning and willingness to change basic modes of operation (preservation and use of natural heritage) are of greatest importance determining success or failure of individual societies. This requires rejection of "a 90-day perspective" (characteristic of politics) and relying on principles of sustainable development, as well as rejection of the previously adopted principles of management and attitude to nature conservation.

Currently it is considered to be the primary objective to ensure preservation and sustainable use of natural heritage as the foundation for the protection of evolutionary processes. The final objective of protection actions is to sustain natural processes – further evolutionary development of nature, including also the evolution of new species. An important objective of these actions is to protect the existence of plant and animal species, their associations at natural and historical conditions conducive of natural selection. For this reason the ultimate aim of the preservation and sustainable use of natural heritage has to be connected with the maintenance and further development of dynamic evolutionary processes on Earth.

The presently observed forms and scope of human impact pose a threat to the process of historical socio-economic development of mankind. Economic globalisation results in a dramatic threat for nature, loss of biodiversity and unsustainable use of natural heritage. At the same time, these threats are irreversible, increasingly endangering the foundations of the biosphere and further socio-economic development.

REFERENCES

1. Baur B. (2010), *Biodiversität*, Haupt Verlag, Bern – Stuttgart – Wien 2010.
2. Brown L.R. (2001*), Gospodarka ekologiczna. Na miarę Ziemi* [Eco-economy: Building Economy for the Earth], Wyd. K i W, In Polish translation by E. Możejko, Warszawa 2001.
3. Costanza R., Cumberland J., Daly H. et al. (2003), *Einführung in die Ökologische Ökonomik*, UTB, Stuttgart 2003.
4. Costanza R. et al. (2014), *Changes in the global value of ecosystem service*, "Global Environmental Change" 2014, 26, pp.152-158
5. Crutzen P. J. (2002)b, *The Anthropocene: Geology of Mankind*, "Nature" 2002, 415, p. 23.
6. *Der neue Fischer Weltalmanach 2015. Zahlen – Daten – Fakten. Schwerpunkt Flüchtlinge.* Redaktion Ch. Löchel (verantwortlich) J. Bogumil, R. Gwardys. Mitarbeit L.A. Ayyash, S.Fischer Verlag, Frankfurt am Main 2015.
7. Diamond J. (2006), *Kollaps. Warum Gesellschaften überleben oder untergehen*. Aus dem Amerikanischen von S. Vogel, S.Fischer Verlag, New York 2006.

8. Gerten D. Schellnhuber (2015), *Planetare Grenzen, globale Entwicklung*, in: Leitschuh H., Michelsen G. Simonis U.E., Sommer J., Weizsäcker von E.U. (Hrsg.), *Gesucht: Weltumweltpolitik. Herausforderungen im Anthropozän*, (ed.) Simonis U.E., Jahrbuch Ökologie 2016, S. Hirzel Verlag, Stuttgart 2015, pp. 11-19.
9. Kleesattel W. (2010), *Die Evolution*, Haupt Verlag, Bern – Stuttgart – Wien 2010.
10. Pieńkowski D.(2002), *Kapitał naturalny w teoretycznych analizach czynników produkcji* [The natural capital in theoretical analyses of factors of production], „Ekonomia i Środowisko" 2002,1.
11. Wilson E.O., (2014), *Die soziale Eroberung der Erde. Eine biologische Geschichte des Menschen.* Aus dem Englischen von E. Ranke, Beck, München 2014.
12. Winpenny J.T. (1995), *Wartość środowiska* [The value of the environment], PWE, Warszawa 1995.

Anastasia Mohylova[11]

INSTITUTIONAL FOUNDATIONS FOR ECONOMIC SECURITY OF PRIVATE AND STATE-OWNED ENTERPRISES

Abstract: The list of directions for the organization of effective management of the economic security is supplemented with the ways of social and psychological impact that will promote the development of intellectual and personnel components of enterprise's economic security. Priority tools are identified to provide the state management of enterprises and promote entrepreneurship development in leading foreign countries. When forming the system of enterprise's economic security, special attention is paid to the issue of ownership, which is considered not only as a problem of assets ownership, but also as a problem of management. Financial, political and legal components of the economic security of private and state-owned enterprises are considered in detail. Financial aspects of economic security of joint-stock companies are analyzed through the prism of conflicts between the major inside stakeholders. National and foreign experience in operation of state-owned enterprises is also compared. Specific features of the national market relations are examined, and characteristic features of their manifestation in the process of ensuring the economic security for the state-owned enterprises are identified.

Key words: economic security**,** enterprise type of ownership, stakeholders**,** asset financing

INTRODUCTION

The economic security of an enterprise is largely determined by its management mechanism, which provides an optimal combination of all resources (material, labor, financial, etc.) needed to achieve the targets of the enterprise.

The quality of enterprise's economic security management is largely determined both by full using classical rules of enterprise management and the environment in which the enterprise operates. Taking into account a multistructural nature of the national economy, we consider that one should examine the institutional aspects of enterprise management in the triad "state – industry – enterprise".

Constant changes in the external economic conditions, strengthened crisis phenomena explain the fact that the managers are often unable to make decisions adequate to new conditions and in most cases they are guided by the intuitive approach in grounding their management decisions and in the formation of business strategy. So, the problem arises to make researches aimed at identifying trends and regularities in the development of economic conditions for Ukrainian enterprises depending on the specific factors of external and internal environment.

To form the mechanism for optimal management of enterprise's economic security it is necessary to consider all factors of impact, which affect the level of implementation of the enterprise's plan. Availability of organizational, structural, technical, economic, administrative factors explains the importance of distinguishing similar types of management mechanisms: organizational, economic, structural, technical, administrative, informational and others [Коваль, Русин-Гриник 2011]. However, the application of any mechanism should be based on the principle of harmonious coordination of the interests of owners, managers, personnel and the state.

NATIONAL PECULIARITIES OF STATE MANAGEMENT OF ENTERPRISES AS A DEFINING FOREIGN FACTOR OF THEIR ECONOMIC SECURITY

The main methods of enterprise management are:

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1. Economic methods:

- the state is expected to form the system of taxation for economic entities; determine the effective depreciation policy that will promote good-quality reproduction of enterprise's tangible and intangible assets; establish minimum wages and pensions;

- the enterprise is expected to use such levers as financing, lending, pricing, penalties, etc.

2. Organizational methods include a set of methods to influence the employees within the existing organizational relations and manager's administrative authorities:

- procedural methods are used for creating the organizational management structure and defining the rights and responsibilities of different groups of personnel; setting targets for the enterprise and supplying the personnel with instructions and teaching materials to achieve these targets;

- administrative methods include a set of instructions and orders of management to organize operating activities according to planned targets [Коваль, Русин-Гриник 2011].

The organization of effective management must be based on the continuous improvement of this process in accordance with main directions, such as:

1. improving the organizational management structure;

2. optimizing the organization of management and business processes by improving the system of planning, accounting and control over the main indicators of enterprise's activities;

3. improving the management of production resources and inventory;

4. improving the efficiency of management of innovation processes at the enterprise, improving the quality of manufactured products [Коваль, Русин-Гриник 2011].

This list can be supplemented with the following ways of social and psychological impact that will promote the development of intellectual and personnel components of economic security:

5. developing a modern motivation system for employees, adequate to their interests and level of production;

6. forming a corporate culture, the system of shared values, strong corporate spirit.

However, it should be noted that the development of the theory and practice of enterprise management should cover not only the issues of internal control (i.e., management at the enterprise itself), but also the impact of the state on the organization of enterprise's activities. Thus, the expansion of the state support to the financial and economic activity of enterprises in Ukraine is possible due to the use of the experience accumulated by the leading foreign countries in the aspects of the state influence on certain directions of enterprise activity.

A high level of competitiveness of the US economy in general and of its enterprises is provided by the effectiveness of the national markets, the competitiveness of enterprises which depends on the ability to technological innovation based on the first-class system of universities and research centers. In the US, the state regulation system significantly restricts the creation of large groups of companies through tax limits, significant among which is the double taxation. Special strategic programs make a great contribution to the improvement of enterprises competitiveness. They are aimed at enhancing the employees' participation in the implementation of programs on the increase of enterprise's products competitiveness and formation of workers belief in the importance of their personal contribution to this, as well as at developing an effective system to motivate the production of competitive products.

Activity of enterprises in Russia is subject to the negative impact of such internal factors such as corruption, taxation, crime, inefficient bureaucracy. Therefore, the state management of enterprises involves the encouragement of their foreign economic activity by increasing the profitability of exports, expanding geography of supplying domestic products abroad, developing the system of determining the customs value of export goods in order to prevent its unreasonable reduction.

Japan has made a significant contribution to the system for protection of enterprises from the redistribution of value by "hostile" takeover, the mechanism of which provides a system of cross-ownership – a controlling interest is divided into several parts and is exchanged with other companies. Enterprise management systems are aimed at producing good-quality products due to the prevention of defects, not their detection and elimination. Japan has launched the use of the principle of five "no":

1. the conditions which promote the occurrence of defects must not be created on the workplace;
2. defective products are not transferred to the next operation;
3. defective products are not taken from a previous operation;
4. one cannot violate or reduce the technological parameters;
5. one cannot repeat the mistakes made.

In Japan, long-term enterprise management is reserved for top management.

The defining characteristic of Sweden is the leadership in the IT industry. This is due to the intensive R&D in the industrial sector, professional workers and respect for the traditions of innovation in the field of computer and communications. To restore the economic growth in Sweden, since 90s tax rates have been reduced significantly, and the conditions are created to provide healthy competition of enterprises, to enhance socio-economic programs, providing thus stability in the country and its economic development. The main taxes are the taxes on citizens and business, property tax, VAT, excise duties and fees.

Table 1. Priority tools of state management of enterprises

Country	Priority tools of state management
USA	Restriction of large groups of companies through the system of tax regulation. Effective motivation of employees to production of competitive products.
Russia	Encouragement of enterprises' foreign economic activity by increasing the profitability of exports.
Japan	Protection from hostile takeover through the system of cross-ownership. Orientation to production of high-quality products.
Sweden	Stimulating innovation development. Effective tax policy.
China	Leading role of state property. Obligatory tax burden of enterprises to provide the state budget revenues.
South Korea	Strict control of the executive authorities over strategically important enterprises with the state share in the authorized capital over 50%.

Source: Own study

China decided to construct a mixed economic system of socialism that is based on the state, collective, private and individual property. The state property has a leading role in all sectors of the economy. During the transition from capitalism to socialism the leaders of the country developed the mechanisms for governing the country on the basis of optimal combination of centralized economic planning and market methods of management. The state allowed various forms of industrial enterprises, which are subject to strict control through the system of economic responsibility. Enterprises are not able to avoid taxes that ensure the budget revenues in China [Ильин 2013, p. 104 – 107].

In South Korea, at least three ministries are systematically involved in the execution of property rights in strategically important corporations with the state share in the authorized capital over 50% [Рудченко, Шкільняк 2011].

Priority tools to provide the state management of enterprises and promote entrepreneurship development in the leading foreign countries are systematized in Table 1.

As for domestic enterprises, V. Ivanter and V. Panfilov have established the nature of relationship between the state intervention in the economy: the growth of society's welfare and the country's participation in the international division of labor reduces it, but in times of crisis the role of the state increases since the state is the only entity that is interested in achieving system-wide goals [Ивантер, Панфилов 2011, p. 595].

FINANCIAL ASPECTS OF JOINT-STOCK COMPANIES' ECONOMIC SECURITY

It is believed that the main task of the institution of property is to overcome the contradictions between public and private interests, as well as to balance the interests of the owners of the means of production, which, according to A. Amos, is possible only through the establishment of the system of public control over the use of socially significant property and as a result of legislative restrictions and the introduction of prohibited taxes on speculative and nonproductive "eating away" capital [5, p. 18 – 19]. Under modern conditions, the problems of a large volume of private wealth per 100 thousand inhabitants, nonproductive "eating away" capital, and the importance of its investment in innovation development increase the need for functioning of the institution of private wealth transformation in productive capital as a separate structural element of the institution of property [Амосов 2009, p. 16].

The problem of property is not exclusively the problem of assets ownership. Under modern conditions, the problem of property is primarily the problem of management. Therefore, the study of the nature of transformation of relations between different actors at the enterprises with specific forms of ownership is rather important and urgent.

The relations between the owners of JSC are determined by the volume of shareholders' property rights. The shareholders who own large blocks of shares are involved in management of JSC. They include strategic shareholders, managers-owners, the state and institutional investors. As for the involvement of large shareholders in the management of JSC, there are two opposing points of view:

- the first is that there is a conflict of interests between major and minor shareholders;
- the second runs that in this case a single direction of managers' and shareholders' actions is achieved.

According to the results of classical empirical studies made by S. Ushaeva on the basis of non-financial corporations, "the increase in the share of property of the shareholders involved in the management promotes the growth of corporations' efficiency because of their strong motivation to maximize the company's value". The researcher believes that the conflict is caused by a fragmented structure of share capital, the remoteness of the property from management and availability of portfolio investors. For this reason, in many countries dominate the companies with controlling shareholders (blockholders). Thus, there is a direct connection between the growth of property of the shareholders involved in management of JSC and the effectiveness of its operation. Despite this dependence, the growth of block of shares owned by the state and affiliates reduces the effectiveness of the company [Ушаева 2010, p.102].

The likelihood of a conflict of interests between shareholders and owners increases proportionally to the number of owners. This fact can be explained by the difficulties facing a financial manager to organize the consideration and coordination of the interests of all shareholders in a large company [Ушаева 2010, p. 103].

Managers make decisions in the interests of shareholders if the manager's remuneration is determined by the financial results of JSC and the price of his shares, as the manager is primarily focused on his own benefit, not on the growth of JSC's value.

Control over JSC is within the competence of the General Meeting of Shareholders who elect the Board of Directors and the Board of JSC, the competences of which includes the employment and dismissal of managers.

The structure of the Board of Directors is determined by the property structure. In foreign practice, the divergence of interests of individual shareholders is a common phenomenon. In domestic practice, such a divergence is treated as a crisis of management. Thus, if the blockholder is directly involved in management, the "independence of the director" is under threat and there is a probability that the director will join the advisors or managers.

The rights of those shareholders who have a small number of shares (minority shareholders) are not covered sufficiently by the legal protection, resulting in frequent trouble of their rights. However, dissatisfied shareholders can change the existing management of JSC by using the mechanism of proxy. Proxy allows voting the share of another person. Thus, if a group of unsatisfied shareholders receives the right to vote from other shareholders by proxy, then in these circumstances there are real opportunities to replace the current management. In addition, the management of JSC may be replaced in the event of redistribution of property through mergers and acquisitions [Ушаева 2010, p.104].

Another kind of conflicts in JSC arises over the payment of dividends. The possibility of paying dividends is determined by the return on equity and the rate of net profit distribution for dividend payment and development of the company. If the return on equity is high it is possible to increase the company's accumulation fund and pay dividends to shareholders. If the company did not manage to achieve high profitability, the management faces the task to choose the way of funding – the current payment of dividends or financing future development of the company. V. Ilyin supports the position that the optimization of expenses for dividend payments may be the key to the enterprise development provided that not more than 25% of net profit is allocated for the dividends [Ильин 2013, p. 584]. Thus, the dividend policy of the company determines the specificity of its reproductive manufacturing process.

If JSC manages to use attracted capital to improve the return on equity due to the effect of financial leverage, in this situation, the conflict between JSC management and shareholders smoothes, but the conflict between the owners and creditors escalates.

Under the need to pay for the use of credit resources, if together with a reduction in the amount of net income JSC has to decide on the payment of dividends and on the increase in dividend payments, the result of these decisions will be the reduction in equity both in absolute terms and relative to borrowed capital which ultimately will require new loans and increase of costs for servicing debt. As a rule, the loans received by JSC earlier, are usually prolonged, which leads to impairment of loans granted to JSC previously.

The growth of debt ratio (over 1.0) increases the risk of JSC bankruptcy. In this situation, the owners agree to take risks and choose highly profitable projects, though high-risk ones, which strengthens the conflict of interests between the owners and creditors. If managers of JSC do not support the owners in risky projects, the scenario of the conflict will be the following: the conflict between the managers and owners escalates and the conflict between the managers and creditors smoothes.

To manage the conflict of interests between the owners and creditors of JSC, the use of a short-term borrowed capital is supported to finance long-term projects. This way of financing increases the confidence of creditors in the financial ability of JSC to pay in time for its obligations as JSC will have to pay for the use of short-term loans constantly [Ушаева 2010, p. 105].

Management of JSC capital structure provides solution to the problem of financing activities in the aspect of financing sources.

1. Financing mainly due to borrowed capital reduces the financial stability of JSC and increases the risk of bankruptcy.

2. Financing mainly due to equity capital increases the risk of losing financial balance, reducing dividend payments, which ultimately reduces the interest of JSC owners in maximizing profits, and they can start selling shares reducing, thus, their market value.

Financing due to equity capital aims to ensure stable rates of profit growth in JSC. This can be achieved by changing the structure of production through the expansion of those products which have higher rates of profit (e.g., products made exclusively using automated processes) [Кочкодан, Миронова 2012, p. 28].

To finance assets in the context of groups three basic approaches are possible in practice:

1. Conservative: the formation of non-current assets and a half of variable part of current assets are financed due to equity capital and long-term liabilities. The advantage of this approach is a minimum risk because of the small amount of short-term loans. The disadvantage is the high cost of the capital used.

2. Aggressive: only non-current assets are financed due to equity capital and long-term obligations, the financing of current assets being due to short-term loans. The advantage is the lowest cost of the capital used. The disadvantage is the high risk of possible losses or capital deficiency.

3. Compromise: non-current assets and a constant part of current assets are financed due to equity capital and long-term obligations; a variable part of current assets is financed due to short-term liabilities. The advantage is a compromise between the capital cost and the risk of its loss. Restrictions – the difficulty to obtain a long-term external financing because the amount of financing sources is limited only by its own funding and short-term loans [Міняйленко, Носенко 2012, p. 315].

JSC can influence the cost of attracted borrowed funds through its own credit rating, which is determined by the bank on the basis of achieved and projected indicators of company's financial and economic activities, at the achievement of which the management of JSC should be aimed.

Emission strategy, which involves the issue of new shares, contradicts to the interests of owners. Since the appearance of new shareholders threatens to lose their control over JSC. The decision of the owners to expand the authorized fund by placing a new issue of shares can be perceived by an investor as the information on a poor financial position of JSC. However, the attraction of additional loans may indicate that JSC is able to pay for debt service cost. And therefore, it says about a satisfactory financial position of JSC. So, making financial managerial decisions in JSC should be based on predictive assessment of reactions of all participants related to the activity of JSC and contribute to achieving the main strategic goal of the company – the increase of its value.

To make well-grounded decisions on the management of enterprise's capital structure, A. Semenov, O. Plaksyuk and O. Yaroshevska offered an important approach to the analysis of property structure of enterprise's capital in terms of the ratio of assets in monetary and non-monetary form, which allows making accurate assessment of monetary obligations to cover obligations concerning company's borrowed capital as well as distinguishing the following "directions of the ratio of its different-classification structural elements:

- in the financial aspect (financial leverage of capital's financial structure) – the ratio of equity capital to borrowed capital;

- in a property aspect (financial leverage of property's capital structure) – the ratio of property in monetary and non-monetary forms" [Семенов, Плаксюк,Ярошевська 2010, p. 141].

MANAGING STATE-OWNED ENTERPRISES' PROPERTY IN THE LEADING EUROPEAN COUNTRIES

The problem of enterprise's capital distribution by forms of ownership is also of great importance. For example, Russian companies have experienced increased presence of the state in the authorized capital from a blocking package to a control one. At the same time, the strengthening of state property was observed in raw regions, resource industries and in industries with a large potential of monetary circulation: communication and transport, construction, metalworking, machine building, food industry, fuel and energy industry, housing and communal services, wholesale and retail trade. It is obvious that in the Russian Federation the property impact of the state was fixed in strategic sectors of the economy. With this, the method of "golden share" was used mainly in strategically important resource sectors, in socially important sectors a controlling interest was assigned to the state. At the general national level, the Russian Federation has the status of a minority owner of 8-10% of enterprises. The country has the status of a majority owner in eight strategic sectors of the economy [Березянко 2010, p. 28 – 29].

The practical economic management proves that the state-owned enterprises are losing significantly in comparison with those that have other forms of ownership in terms of management organization. However, foreign experience in functioning of state-owned enterprises in the developed economy demonstrates their significant contribution to the social development, as well as their similar positions in terms of the return on investment capital as compared with other forms of ownership.

The presence of state-owned enterprises in the market economy of post-socialist countries explains the "so-called market failures at the stage of legal support for the legal mechanism, production of public goods, compensation of external effects (externalities), stabilization of macroeconomic fluctuations" [Щербіна].

The influence of the state on activities of state-owned enterprises through management is realized by setting up production-financial programs and plans which are based on government contracts, government orders, and so on. In addition, the state can fix the requirements as for the nomenclature and volume of production, the level of costs and prices, deliveries of products to a certain market.

Management of state-owned enterprises by executive authorities is realized through their direct participation or through:

- transfer to authorized persons for managing (lease);
- participation in the management bodies of JSC;
- bringing property in the authorized capital of business companies;
- transfer to economic ownership or operational management;
- introduction of the State Property Register.

Property relations of state-owned enterprises with government bodies are connected with the use, reproduction, expansion and return of the state property. However, the executive bodies perform the function of a nominal owner only, they act on the instructions of the real owner and according to statutory restrictions concerning their competencies.

Numerous mistakes in the management of state-owned enterprises are explained by the mistakes made in conducting economic reforms on the basis of the belief in the unlimited self-organization of the market and unambiguous exclusion of the state from the economic management. In Ukraine, the actions of executive authorities in the management of state-owned enterprises are characterized by insufficient effectiveness, which strengthens the urgency of developing an effective mechanism for managing state-owned enterprises. Therefore, the experience in the organization of management of state-owned enterprises in the developed countries is rather useful.

In Western Europe, the persons who are the members of the management of purely state-owned enterprises (private shareholders are not presented in their capital) are appointed directly by the state. At the enterprises with mixed forms of ownership the state is involved in management on a par with other shareholders according to general procedures provided by a corporate law.

In France, at the state-owned enterprise there is a government commissioner, who is the representative of the ministry and who takes part in meetings of the Board. The enterprise is under its jurisdiction. Financial and economic custody of the enterprise is carried out by the state controller or control commission of the Ministry of Economy and Finance which are empowered to sign agreements. Annual plans of revenues and expenses are approved by the ministry-curator and the above Ministry. The development of the investment fund is the task of the Fund of Economic and Social Development. Every 2 years the Clearing House prepares a report on the management and financial results of state-owned enterprises. Each enterprise has an accountant-auditor. He is appointed by a judicial body and his task is to make audit of financial statements. It is the Parliament that has the highest right to control the activities of state-owned enterprises. However, the management of state-owned enterprises is not limited to the execution of control functions. The state also creates the conditions favorable for their development, mainly through the financial support, authorized capital increase, financial assistance in the form of grants, subsidies.

The position of state-owned enterprises in Poland is fixed by the law, approved in 1981. According to it, the state-owned enterprise is an independent entity created by a government body; appointment of the first director is within the competence of the body-founder; some changes should take place after their approval by the body-founder; financial statements are subject to customary standards; the body-founder takes control over director's activities and can make decisions on the appointment of the supervisory board. Since 1997, the relevant authorities at the level of municipality cannot organize state-owned enterprises.

In the developed countries, the expediency of the state property is measured by the following indicators for state-owned enterprises:

1. the amount of taxes paid;
2. the amount of paid wages (for the reason that the increase in wages is one more method to stimulate domestic demand along with direct public procurement);
3. the size of realized investments (indicates the potential of the state-owned enterprise growth);
4. the growth in the value of state property;
5. total increase in capitalization [Щербіна].

Only one direction for using non-distributed profit is identified for state-owned enterprises – the reproduction of fixed assets, which certainly deserves a positive assessment, as it provides the solution to an important problem of non-compliance of a quantitative and qualitative composition of fixed assets with the tasks of the economic reproduction through the formation of potential of Ukraine's economic recovery.

In Ukraine, the negative sign of state-owned enterprises is largely the informal relations together with a complex hierarchical structure of the enterprise that prevents management personnel to do their work effectively, and make effective economic decisions. For this reason, it turns out that the estimation of state-owned enterprises' results is very important for making conclusion whether they will remain and operate in the future or will be liquidated because of the failure to provide the foundation for the country's future economic development.

CONCLUSIONS

Under not always civilized competitive relations, imperfection of the current legislation, arbitrary fiscal authorities, etc., the creation of the enterprise needs in providing for measures to

ensure its economic security, which will allow preventing or minimizing the impact of internal and external threats, as well as their negative consequences.

Taking into account specific national market relations it can be noted that the use of foreign experience in the management of enterprises will contribute to the improvement of management, formation of effective organizational and economic management mechanism in Ukraine. However, this experience must not be copied blindly but organized so that it would be possible to make appropriate adjustments, taking into account the specific features of the current economic and political situation in Ukraine.

REFERENCES

1. Амосов А. (2009), Стратегия великой державы в судьбе России, *Вестник Института экономики РАН*, nr 2, p. 7-21.
2. Березянко Т.В. (2010), Державна політика регулювання корпоративного середовища в трансформаційних країнах, *Інвестицій: практика та досвід*, nr 7, p. 27-31.
3. Ивантер В. (2011), Конец экономики роста или смена парадигмы развития, *Вестник Российской Академии наук*, nr 7, p. 594-600.
4. Ильин В.А. (2013), Частный капитал и национальные интересы, *Вестник Российской Академии наук*, nr 7, p. 579-586.
5. Коваль Л.М., Русин-Гриник Р.Р. (2011), Світовий досвід управління організаційно-економічними механізмами конкурентоспроможності підприємства, *Маркетинг і менеджмент інновацій*, nr 3 (part 1), p. 103-108.
6. Конащук В.Л., Карпенко В.В. Визначення напрямків удосконалення господарської діяльності підприємства, *Економічний Вісник Запорізької державної інженерної академії*, www.zgia.zp.ua/gazeta/evzdia_6_036.pdf
7. Кочкодан В.Б., Миронова І.В. (2012), Стратегія формування і управління структурою капіталу підприємства: теоретичний аспект, *Інноваційна економіка*, nr 3, p. 28-32.
8. Міняйленко І.В. (2012), Особливості оптимізації структури капіталу підприємств агропромислового комплексу / І.В. Міняйленко, О.А. Носенко // *Наукові праці Полтавської державної аграрної академії. Серія: Економічні науки*, nr. 4, part 3, p. 311-317.
9. Рудченко О., Шкільняк М. (2011), Управління державним сектором: проблеми та перспективи, *Соціально-економічні проблеми і держава*, nr. 2 (5), http://sepd.tntu.edu.ua/images/stories/pdf/2011/11royptp.pdf.
10. Семенов А.Г., Плаксюк О.О., Ярошевська О.В. (2010), Ефективне управління структурою капіталу акціонерного товариства, *Вісник економічної науки України*, nr 2, p. 137-144.
11. Ушаева С.Н. (2010), Особенности оптимизации структуры капитала фирмы: мотивационные конфликты и права контроля, *Вестник Челябинского государственного университета*, nr 28, p. 101-105.
12. Щербіна В.І. Організація управління державними підприємствами: стан і перспективи, http://www.kdu.edu.ua/statti/2006-5-1(40)/135.pdf.

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SUPPORTING THE DEVELOPMENT OF ENTREPRENEURSHIP IN RURAL AREAS FROM STRUCTURAL FUNDS OF THE EUROPEAN UNION (USING THE EXAMPLE OF MAŁOPOLSKIE PROVINCE)

Abstract: The aim of the article is to assess the scope and level of support for entrepreneurship in rural areas from structural funds of the European Union. The empirical data were acquired from the Agency for Restructuring and Modernization of Agriculture as an institution that manages distribution of EU funds from the Rural Development Program 2007-2013. The data of the Local Data Bank of the Central Statistical Office (BDL GUS) were used to assess the level of development of entrepreneurship. The analysis covered the years 2007-2013. On the basis of the analysis of empirical data, it was noticed that non-agricultural activities were among the most important elements in the pursuit of multifunctional development of Małopolskie Province. Effective use of EU funds in these areas has become a priority that positively affects the development of minor entrepreneurship. The analysis of two activities under RDP 2007-2013 indicated areas of the Province that are characterized by large activity in the scope of entrepreneurship, both additional to a holding and non-agricultural.

Key words: entrepreneurship, European Union funds, local development, rural areas

INTRODUCTION

Entrepreneurship, comprehended as an act of creating a new business entity, is an interesting phenomenon for representatives of various scientific disciplines. It is treated as a socio-economic phenomenon referring to undertaking business activities, running and developing business activities in a way to achieve the approved objective, which most often is profit.

The notion of entrepreneurship includes any measures aiming at examination, analysis and making use of opportunities for launching new products and services, management methods and techniques, selling markets or raw materials purchasing markets. An immanent feature of entrepreneurship as a process is risk acceptance, related to launching innovations consisting in creation of new resource combinations [Shane 2000]. Entrepreneurship understood in this way requires undertaking more and more recent organizational projects that require involvement of both human resources and material resources [Prus, Domagalska 2010; Prus, Sadowski 2012].

At present, from among material resources funds play a very important role, including access to sources of cheap capital. Acquiring capital on the financial market in the conditions of open market economy requires incurring costs in the form of interest rate. The development of entrepreneurship as a socio-economic phenomenon is, however, a direction of economic policy of the government desired in many countries and is supported in different forms from public funds. An example of such support may be offering financial aid to begin business activities, finance its development or support investment activities.

The purpose of the article is to assess the scope and level of support for entrepreneurship in rural areas from structural funds of the European Union.

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MATERIAL AND METHODOLOGY OF THE PAPER

The empirical data necessary to conduct analyses were acquired from the Agency for Restructuring and Modernization of Agriculture as an institution that manages distribution of EU funds from the Rural Development Program 2007-2013. In addition, the data of the Local Data Bank of the Central Statistical Office (BDL GUS) were used to assess the level of development of entrepreneurship.

The analysis covered the years 2007-2013. The research period coincides with the period of programming the cohesion policy of the European Union. The spatial scope of analyses was limited to the area of Małopolskie Province in connection with the application of regional algorithm of allocation of funds under aid programs. The analysis of spatial diversity of entrepreneurship and gaining and making use of EU funds from structural funds was conducted at the level of classification of territorial units NUTS-4 (including districts).

Indexes used to assess the level of entrepreneurship are the number of business entities entered in the REGON register and the number of newly established entities per 10 000 inhabitants. To assess the level of making use of EU funds indexes were used in term of quantity and value. The data were aggregated at the level of districts. To assess relationships taking place between the level of entrepreneurship and the absorption of structural funds, correlations of variables were analysed.

ENTREPRENEURSHIP AND LOCAL DEVELOPMENT

Entrepreneurship is a multi-dimensional notion. In the economic monitoring of entrepreneurship, mainly relationships with economic growth are considered, i.e. creation of economic and social values, creation of new jobs, decrease in unemployment and elimination of social exclusion [Bednarczyk 2010]. The analysis of the relationships between the development of entrepreneurship and the economic growth is well identified both on the ground of theoretical concepts and empirical research [Majkut 2014]. Entrepreneurial behaviours are favourable not only for success of an individual; they also determine the process of local and regional development [Bucka 2014].

In rural environments, entrepreneurship is understood as activity that aims at earning money. At the same time, it is perceived as one of the most important elements of the local labour market and includes individuals who, apart from being connected with agriculture, live in rural areas. On the other hand, in local environments at the level of commune, entrepreneurship can be understood as activity aimed at searching for additional sources of income in connection with work in a holding, or as taking other measures not associated with agriculture. However, entrepreneurship is always about additional income, which is aimed at raising the standard of living of people in rural areas [Tabor 2010].

After Poland's accession to the European Union, funds were allocated for rural areas, aimed at the adaptation to EU standards and accelerated development of those areas. In the years 2007-2013, the Rural Development Program (RDP 2007-2013) was the main instrument of support for structural, economic and social transformations in agriculture and in agricultural products processing in the subsequent programming period, financed with use of the EU funds. This Program included two measures meant for support for undertaking or developing non-agricultural business activities in rural areas. The measures implemented by ARMA and aimed at the development of entrepreneurship in rural areas were: *Differentiation towards non-agricultural activities* and *Establishment and development of microenterprises*. These measures were to contribute to growth in economic competitiveness of rural areas, development of entrepreneurship and labour market, and thereby – growth in employment in these areas [ARMA 2014].

The situation of rural areas, especially provinces with large agrarian fragmentation is favourable for the development of minor entrepreneurship, especially non-agricultural entrepreneurship, which

contributes to making use of resources, creation of new jobs and thereby improvement in economic and social situation of local population. The economic condition of microregions is affected directly by social potential of local environments, being "a non-exhaustive resource, thanks to which local community may initiate activities, independently from external factors" [Knapik, Kowalska 2014].

The use of EU funds by Polish company also has an effect on their activity in research and development (R&D) and increase competitiveness through the implementation of innovation [Popyk, Lis, Mikołajczak 2014]. In addition, some entrepreneurs acquire structural funds in order to adapt their businesses to the current requirements in such areas environmental protection [Łuczka, Smoluk-Sikorska, Kurek 2014].

RESEARCH FINDINGS AND DISCUSSION

Małopolskie Province is one of the regions with over-average level of entrepreneurship in the country [Guzik, Gwosdz, Działek 2013]. The level of entrepreneurship within Małopolskie Province is characterized by large spatial diversity (tab. 1).

The highest level of development of entrepreneurship measured by the number of entities entered in the REGON register is recorded in the western part of the Province – in Olkusz, Wadowice and Chrzanów Districts. Even higher values of this index are typical of Tatra District (1450 entities per 10 000 inhabitants in 2013), nevertheless it results from its specific nature related to the location and land form, which is reflected in particularly beneficial conditions for the development of tourism.

Another area where entrepreneurship is developed to equally good degree covers districts under direct influence of the largest municipal centre of the region – Krakow. These are the following districts: Krakow, Wieliczka and Myślenice. Definitely, entrepreneurship is developed most poorly in the eastern part of the Province in Dąbrowa Tarnowska and Tarnów Districts. The values of indexes obtained in these units in 2013 were: 512 and 574 business entities per each 10 000 population, respectively.

Communes in the western part of Małopolskie Province as well as neighbouring on Krakow are characterized by high entrepreneurship indexes, despite relatively high local property taxes. As shown in the research carried out by Płonka et al. [2014], there is no significant correlation between the amount of property tax charging entrepreneurs and the number of business entities registered in particular communes. Therefore, the deciding role in the processes of establishing new business entities should be attributed to human capital and economic potential of a particular area.

The analysis of dynamics of the development of entrepreneurship leads to a conclusion about quite a stable growth (2-3% every year) with certain temporary collapse of this tendency in 2011. It should be connected with clear economic slowdown recorded at the time on the scale of the entire national economy. Entrepreneurship indexes were increasing at a relatively highest pace in the districts characterized by their initial low level (e.g. Tarnów , Nowy Sącz, Gorlice, Dąbrowa Tarnowska). The lowest dynamics was typical of areas of the western Małopolska, which could result from statistical effect (high level of development already at the beginning of the analysis period). Nevertheless, it is worth noting that districts similarly highly developed with regard to entrepreneurship, neighbouring on Krakow, did not record such a strong slowdown of the dynamics. It should be interpreted as a positive impact of the administrative and economic centre of the region on the neighbouring areas, in the zone of its direct impact. This phenomenon is designated in literature as agglomeration effect [Brodzicki, Szultka 2002]. The impact of a large and strong municipal centre seems to have a greater importance for the development of entrepreneurship of adjacent areas than location in a traditionally more industrialized and bordering on Silesia western part of the region. In addition, the areas of the western Małopolska experienced to a definitely greater extent the effects of economic slowdown in 2011 (decrease in entrepreneurship indexes)

than the remaining part of the Province (tab. 1). This can be attributed to a relatively greater connection of local entities with large industrial companies that, reacting to smaller demand for their products, were reducing orders from cooperating entities.

Table 1. Spatial diversity in the level of entrepreneurship development in Małopolskie Province in the years 2007-2013 (number of business entities entered in the REGON register per 10 000 inhabitants)

District	Year						
	2007	2008	2009	2010	2011	2012	2013
Bochnia	664	685	715	758	765	785	802
Brzesko	551	573	595	624	627	651	672
Chrzanów	843	852	868	906	890	906	920
Dąbrowa Tarnowska	414	436	467	492	493	506	512
Gorlice	571	596	627	652	672	688	707
Krakow	828	854	899	950	962	998	1021
Limanowa	563	599	642	681	677	686	696
Miechów	755	800	810	832	820	842	860
Myślenice	819	842	859	911	909	926	942
Nowy Sącz	543	580	619	644	653	675	694
Nowy Targ	689	702	726	754	747	769	781
Olkusz	1022	1023	1024	1051	1012	1032	1036
Oświęcim	835	843	859	899	880	903	912
Proszowice	628	650	655	687	687	720	753
Sucha Beskidzka	860	877	881	906	892	909	913
Tarnów	437	459	487	524	529	554	574
Tatra	1333	1388	1440	1440	1400	1436	1450
Wadowice	966	978	987	1000	987	1002	1006
Wieliczka	890	926	956	1005	1018	1061	1087
Małopolskie Province	**896**	**917**	**952**	**993**	**991**	**1024**	**1 045**

Source: prepared on the basis of BDL GUS.

Another aspect worth noting with regard to the absorption of EU funds is the establishment of new business entities. They create jobs, affect competitiveness and attractiveness of local economies, boosting the value of GDP generated there, whereas funds obtained from their taxation are income of local government units.

The district where the most business entities were established throughout the whole 8-analysis period, was Tatra District. Its position as the leader was safe in all years, while an important fact on which attention should be focused is that it was the only case when the number of newly established companies was lower in 2013 as compared to the beginning of the analytic period (2007). Under no circumstances, should this fact be interpreted as crisis of entrepreneurship at the Tatra Mountains; it was rather a certain kind of slowdown in the establishment of new entities in connection with great competition present already on the local market and achieving the level of saturation.

Table 2. Newly established enterprises in the districts of Małopolskie Province (registered entities in the REGON register per 10 000 inhabitants)

District	Year						
	2007	2008	2009	2010	2011	2012	2013
Bochnia	62	66	73	89	82	75	74
Brzesko	59	63	61	75	63	69	67
Chrzanów	59	62	78	93	71	71	74
Dąbrowa Tarnowska	38	43	55	64	53	51	51
Gorlice	68	76	78	90	84	75	73
Krakow	67	80	95	107	96	91	89
Limanowa	64	82	94	104	71	78	74
Miechów	46	65	60	68	65	60	70
Myślenice	68	71	84	109	77	84	87
Nowy Sącz	66	78	85	86	82	82	83
Nowy Targ	67	75	84	95	77	84	85
Olkusz	61	66	85	100	74	75	69
Oświęcim	58	60	66	97	75	74	69
Proszowice	41	45	57	72	57	63	75
Sucha Beskidzka	57	64	78	80	71	73	67
Tarnów	47	53	58	71	59	63	63
Tatra	118	121	133	150	116	119	106
Wadowice	63	69	83	90	74	73	77
Wieliczka	73	90	99	110	102	105	101
Małopolskie Province	**74**	**82**	**95**	**109**	**91**	**96**	**93**

Source: prepared on the basis of BDL GUS.

Areas where the number of newly established enterprises was the lowest in the first year of the analysis are districts with dominant agricultural function (Dąbrowa Tarnowska, Proszowice, Miechów, Tarnów). In 2007, the number of established there new business entities only slightly exceeded the half of average value for the index calculated for the whole Province.

Another important aspect worth emphasizing is the fact that dynamics of establishing new enterprises was increasing in the first part of the analytic period, reaching the maximum values in 2010. Starting from 2011, when the pace of establishing new businesses reached the lowest level, dynamics of development of new enterprises largely decreased. One of the reasons for restricted establishment of new business entities, apart from the previously mentioned economic slowdown, is depletion of EU funds available within the framework of the financial perspective for the years 2007-2013.

Entrepreneurs from the area of Małopolskie Province were demonstrating diverse activity in the acquisition of financial support from EU funds for the development. Within the RDP measure "Differentiation towards non-agricultural activities" together 1403 applications were submitted, from among which financial support was granted to 820 entities, which means successful applications at the level of 58.4% (tab. 3). Relativizing the number of the submitted applications with the previously discussed entrepreneurship indexes, the most active entities are from the following districts: Nowy Sącz, Tarnów, Miechów and Proszowice. Taking into account the special

character of the concerned measure focused on support for the development of rural areas, it should be concluded that the largest interest was shown by entities from areas rural neighboring on large cities (Nowy Sącz, Tarnów) and from areas with well developed, active and commodity agriculture. Large interest in acquiring funds in suburban areas results from a relatively higher level of their development and proximity of centres constituting the centres of diffusion of innovation and information on new possibilities to acquire co-financing for the development of entrepreneurship. High interest on the part of entities located in the area of intensive and well flourishing agriculture was a derivative of high activity of business entities operating there (among others, staff knowledge and qualifications) and good examination of potential sources of financing their activities.

Table 3. The activity of entrepreneurs of Małopolskie Province in acquiring EU funds from the measure "Differentiation towards non-agricultural activities" of the Rural Development Program in the period 2007-2013

District	Number of applications		Successful applications (%)	Value of the requested financial aid (PLN 000)	
	submitted	co-financed		total	paid
Bochnia	69	38	55.1	5 612.30	3 326.68
Brzesko	92	41	44.6	6 033.35	2 647.62
Chrzanów	3	2	66.7	252.30	152.30
Dąbrowa Tarnowska	73	58	79.5	6 262.56	4 876.51
Gorlice	41	18	43.9	3 092.94	1 260.06
Krakow	169	99	58.6	14 976.37	8 128.31
Limanowa	62	38	61.3	4 777.08	2 998.48
Miechów	178	98	55.1	15 844.42	8 156.32
Myślenice	37	16	43.2	2 610.77	1 160.69
Nowy Sącz	175	110	62.9	12 629.56	7 891.52
Nowy Targ	65	39	60.0	4 994.91	2 815.58
Olkusz	40	27	67.5	3 095.87	2 198.26
Oświęcim	18	5	27.8	1 763.31	473.31
Proszowice	130	95	73.1	11 059.52	8 121.31
Sucha Beskidzka	10	4	40.0	538.30	123.20
Tarnów	135	82	60.7	10 408.44	6 103.48
Tatra	40	20	50.0	2 986.49	1 526.94
Wadowice	23	10	43.5	2 081.12	921.09
Wieliczka	43	20	46.5	3 828.84	1 852.93
Total	**1403**	**820**	**58.4**	**112 848.44**	**64 734.56**

Source: prepared by the author on the basis of ARMA data.

The lowest interest in acquiring EU funds for the development of activities was shown by entities located in the western part of the region – Chrzanów, Sucha Beskidzka, Oświęcim and Wadowice Districts. It can result from quite a high level of development of entrepreneurship in these areas already at the beginning of the analysis period. On the other hand, in Chrzanów and Sucha Beskidzka Districts the meaning of agriculture in the local economy is very small, which was

also determinant for low activity, especially taking into account some criteria of aid granting [see Zawadzka, Strzelecka, Szafraniec-Siluta 2011].

Spatial diversity of activity and effectiveness of acquiring structural funds in values was close to the quantitative perspective presented before. The calculated variability indexes show, however, that disproportions between districts which are the most and least effective in the acquisition of co-financing (in terms of value) were slightly greater than in the case of analysis of their activity. This observation confirms the previously discussed reasons, and its further duration may result in growing polarization.

Another measure, under which it was possible to acquire financial aid, was "establishment and development of microenterprises". Support within this measure was aimed at creation of new jobs in rural areas through establishing new and developing so far operating business entities.

Table 4. The activity of entrepreneurs of Małopolskie Province in acquiring EU funds under the measure "Establishment and development of microenterprises" of the RDP in the years 2007-2013

District	Number of applications		Successful applications (%)	Value of the requested financial aid (PLN 000)	
	submitted	co-financed		total	paid
Bochnia	232	136	58.6	44 550.96	26 961.25
Brzesko	158	85	53.8	26 625.89	14 921.29
Chrzanów	51	21	41.2	9 983.91	3 969.48
Dąbrowa Tarnowska	62	34	54.8	10 710.83	6 224.51
Gorlice	129	71	55.0	26 215.31	14 163.78
Krakow	614	262	42.7	108 838.98	46 508.50
Limanowa	276	164	59.4	52 295.12	29 392.19
Miechów	152	53	34.9	30 378.04	8 988.87
Myślenice	212	108	50.9	37 417.73	19 941.38
Nowy Sącz	455	263	57.8	79 189.20	45 778.52
Nowy Targ	363	227	62.5	63 919.62	39 009.69
Olkusz	131	71	54.2	22 406.36	11 825.55
Oświęcim	114	55	48.2	20 707.33	10 266.69
Proszowice	131	65	49.6	25 800.15	11 768.66
Sucha Beskidzka	143	67	46.9	23 446.19	11 087.93
Tarnów	286	144	50.3	49 085.05	24 657.98
Tatra	149	51	34.2	27 299.90	8 653.46
Wadowice	180	75	41.7	30 718.81	11 706.73
Wieliczka	243	114	46.9	49 791.93	24 861.48
Total	**4081**	**2066**	**50.6**	**739 381.30**	**370 687.94**

Source: prepared by the author on the basis of ARMA data.

Interest in the measure "establishment and development of microenterprises" was definitely higher as compared to the previously discussed. 4081 applications were submitted, from among which 2066 were positively evaluated (tab. 4). Despite a higher activity across the whole region, clear territorial changes in the distribution and least and most active districts were not noticed. A relatively high interest in acquisition of co-financing was shown by entrepreneurs from Nowy Sącz,

Krakow and Tarnów Districts, while owners of companies from Chrzanów, Dąbrowa Tarnowska and Olkusz Districts applied for funds relatively least frequently. The thesis about the positive effect of proximity of large municipal centres on the development of entrepreneurship in the areas neighbouring on them was confirmed.

In order to identify potential relationships between the level of entrepreneurship and the use of EU funds, correlations between variables were analysed. The analysis covered on the one hand potential relationships between the present level of entrepreneurship and measures relating to acquiring co-financing, and, on the other hand – impact of acquired funds on the pace of creating new business entities.

The highest value of correlation index was describing the relationship between the value of paid financial aid as part of the measure "differentiation towards non-agricultural activities" and the dynamics of establishing new enterprises over the period 2007-2013 (r_{xy} = 0.636). A relatively high value (r_{xy} = 0.603) was describing the relationship between dynamics of the index of entrepreneurship (number of business entities per 10 000 inhabitants) and the number of submitted applications for co-financing in this RDP measure. Slightly lower indexes were calculated for support for establishing microenterprises. It is worth considering correlation between the value of financial aid used under this measure and pace of growth in the index of entrepreneurship for districts (r_{xy} = 0,518). Such findings should be interpreted as a positive impact of programs co-financed with the EU structural funds on the development of entrepreneurship in rural areas of Małopolskie Province.

CONCLUSIONS

The characteristics of rural areas of Małopolskie Province make non-agricultural activities one of the most important elements in pursuit of multifunctional development of those areas. Efficient use of EU funds in these areas became a priority which, as it results from conducted research, positively affects the development of minor entrepreneurship. The analysis of two measures under RDP 2007-2013 indicated areas of the Province that are characterized by activity within entrepreneurship additional to a farm and non-agricultural entrepreneurship. On the basis of the research findings, it is required to emphasize larger interest of beneficiaries in the acquisition of funds for business activities rather than additional non-agricultural activities, implemented in a holding. It may mean that Małopolskie Province does not focus, first of all, on agriculture, and the inhabitants of rural areas head towards non-agricultural entrepreneurship.

REFERENCES

1. ARiMR 2014: PROW 2007-2013. http://www.arimr.gov.pl/pomoc-unijna/prow-2007-2013.html. Dostęp z dnia 17.08.2015.
2. Bednarczyk M. (2010), Przedsiębiorczość w turystyce. Zasady i praktyka. Wydawnictwo Fachowe CeDeWu.pl, s. 19-31.
3. Brodzicki, T., Szultka, S. (2002), Koncepcja klastrów a konkurencyjność przedsiębiorstw. *Organizacja i Kierowanie*, *4* (110), pp. 1-14.
4. Bucka, M. (2014), Małe i średnie przedsiębiorstwa jako forma przedsiębiorczości na obszarach wiejskich. *Journal of Agribusiness and Rural Development*, 2(32), pp. 35-44.
5. Guzik, R., Gwosdz, K., Działek, J. (ed.), (2013), Investment climate in Małopolskie Province, Office of the Marshal of Małopolskie Province, Krakow.
6. Łuczka, W., Smoluk-Sikorska, J., Kurek, M. (2014), Benefits and costs of environmental management in enterprises of Wielkopolska, *Intercathedra*, 4 (30), s. 57-62.
7. Knapik W., Kowalska M., (2014). Zróżnicowanie obszarów wiejskich w Polsce na tle procesów społeczno-ekonomicznych i demograficznych. (in:) *Problemy drobnych gospodarstw*

rolnych. European Research Center of Small Agricultural Holding, Krakow University of Agriculture. No. 1. 2014. Krakow. pp. 37-54.
8. Majkut, R. (2014), Przedsiębiorczość w świetle uwarunkowań interdyscyplinarnych, Wyd. Cedewu, Warsaw.
9. Płonka, A., Satoła Ł., Wojewodzic, T. (2014), Zmiany przychylności podatkowej gmin w okresie dekoniunktury gospodarczej. *Zesz. Nauk. SGGW w Warszawie. Polityki Europejskie, Finanse i Marketing*, 11 (60), pp. 185-194.
10. Popyk, W., Lis, W., Mikołajczak, E. (2014), Innovativeness of wood industry enterprises in the years 2010-2013, *Intercathedra*, 3 (30), pp. 110-115.
11. Shane, S. A. (2000), *A general theory of entrepreneurship: The individual-opportunity nexus*. Edward Elgar Publishing, Northampton.
12. Prus P., Domagalska E. (2010), Rozwój przedsiębiorczości w sektorze małych i średnich przedsiębiorstw na przykładzie gminy Żnin. *Rocz. Nauk. SERiA*, t. XII, z. 5, pp. 174-178.
13. Prus P, Sadowski A. (2012), Rozwój przedsiębiorczości na terenie gminy Tczew w województwie pomorskim, jako efekt wstąpienia Polski do Unii Europejskiej, *Rocz. Nauk. SERiA*, t. XIV, z. 2, pp. 126-130.
14. Tabor K. Przestrzeń doradztwa i przedsiębiorczości na obszarach wiejskich [in:] Przedsiębiorczość na obszarach wiejskich. Stan i perspektywy rozwoju. Ed. K. Krzyżanowska. Wydawnictwo SGGW w Warszawie. Warsaw. 2010. pp.125-141.
15. Zawadzka, D., Strzelecka, A., Szafraniec-Siluta, E. (2011), Tworzenie i rozwój mikroprzedsiębiorstw na obszarach wiejskich w Polsce, *Roczniki Naukowe SERiA*, T. 13, z. 1, pp. 479-483.

Paweł Skowron[14]

ENERGY MANAGEMENT SYSTEM AS A MODEL SOLUTION OF IMPROVEMENT OF ENERGY EFFICIENCY

Abstract: The article presents in a synthetic manner the requirements of ISO 50001. The author has analyzed the commonly used standards of energy management in different countries of the world and the European Union. The article also points out the measures to improve energy efficiency.

The author of this study pointed to the fundamental national and European legal requirements related to energy efficiency and presented proposals for applied solutions for improving energy efficiency.

The purpose of this article is to present an energy management system according to ISO 50001 as a model solution in improving the energy efficiency of the organization.

Key words: energy efficiency, ISO 50001 energy management system.

INTRODUCTION

Energy is crucial for the industry, as the services sector. Often this is one of the major cost components. It requires special supervision.

In many organizations, unfortunately, the actions are brought in for accounting the energy purchase documents. Often lack of a monitoring system, which would point to the actual energy consumption and energy consumption of individual processes. Therefore, a useful solution might be to implement an energy management system that can help to optimize energy consumption in the organization.

ENERGY MANAGEMENT SYSTEM

The international ISO standard for energy management was published on 15 June 2011 as ISO 50001: 2011 Energy management systems – Requirements with guidance for use.

It replaced a similar British standard BS EN 16001: 2009 issued on 1 July 2009. ISO 50001 was adopted in Poland in July 2012.

The standard establishes a base level of energy use, the aim of which is to ensure the correct result of energy and achieving energy efficiency by defining relevant indicators of consumption and energy use [Stoma, Dudziak, Piekarski].

The primary objective of ISO 50001 is to provide organizations with assistance in developing systems and processes necessary to improve result of energy, including energy efficiency and the use and consumption of energy [PN-EN ISO 50001:2012].

The implementation of the energy management system should lead to the reduction of greenhouse gas emissions, energy costs and other impacts on the environment. [PN-EN ISO 50001:2012].

Energy management system according to ISO 50001 is based on the continuous improvement cycle, as shown in fig. 1.

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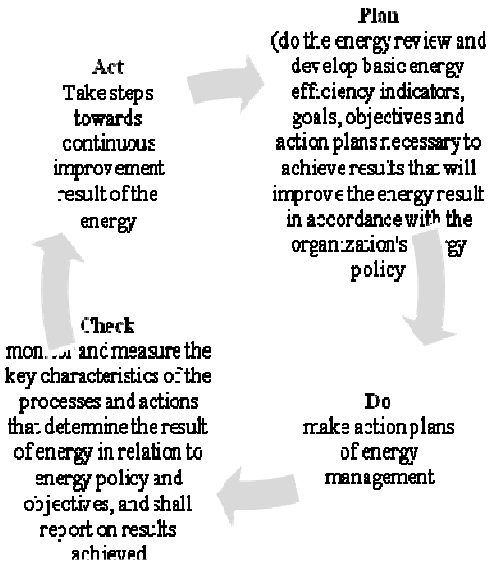


Fig. 1. The cycle of continuous improvement according to PN-EN ISO 50001:2012

Source: own elaboration based on: [PN-EN ISO 50001:2012].

Family documents describing standard of energy management consists 8 standards. Two of them, ie. ISO / CD 50007 and ISO / AWI 50008 are still at the design stage. A detailed list of the documents of the ISO 50000 series are shown in Table 2.

Table 2. Documents of the ISO 50000 series

	Document title
Documents of the ISO 50000 series	ISO 50001:2011 Energy management systems - Requirements with guidance for use
	ISO 50002:2011 Energy audits - Requirements with guidance for use
	ISO 50003:2014 Energy management systems - Requirements for bodies providing audit and certification of energy management systems
	ISO 50004:2014 Energy management systems - Guidance for the implementation, maintenance and improvement of an energy management system
	ISO 50006:2014 Energy management systems - Measuring energy performance using energy baselines (EnB) and energy performance indicators (EnPI) - General principles and guidance
	ISO/CD 50007 Activities relating to energy services - Guidelines for the assessment and improvement of the service to users
	ISO/AWI 50008 Commercial building energy data management for energy performance - Guidance for a systemic data exchange approach
	ISO 50015:2014 Energy management systems - Measurement and verification of energy performance of organizations - General principles and guidance

Source: own elaboration basing: http://www.iso.org [downloaded 01.09.2015 r].

THE POPULARITY OF ENERGY MANAGEMENT SYSTEM IN THE WORLD

Energy management system has become increasingly popular. This is indicated in annual survey of the ISO (International Organization for Standardization) concerning the number of certificates issued.

Based on survey for 2013 it can indicate that energy management system was characterized by a significant dynamics. The number of certificates increased from 459 in 2011 to 4,736 in 2013. This is more than 10-fold increase in certified management systems within two years. The largest increase in certified energy management system exists in Europe. Detailed statement presenting the number of certificates of compliance with ISO 50001 are shown in Table 3.

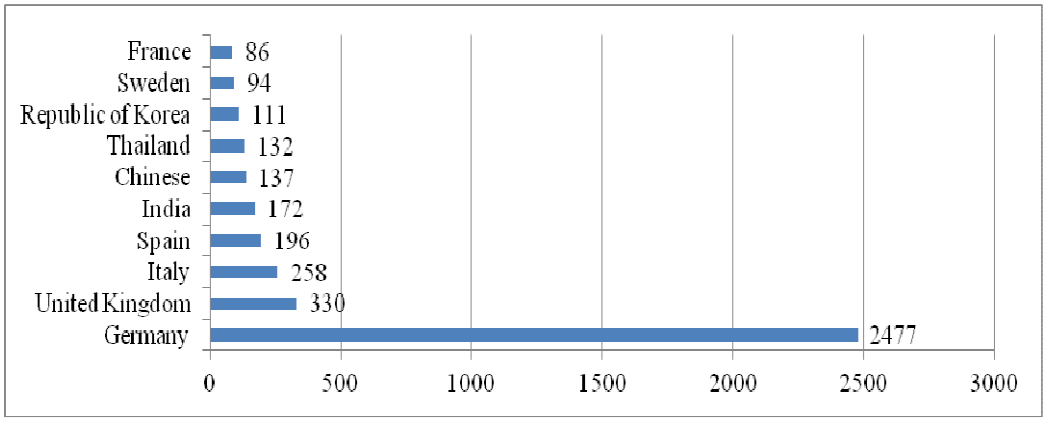
Table 3. Dynamics of growth of certified energy management system in various parts of the world

Year / Area	2011	2012	2013
Africa	0	13	36
Central / South America	11	10	34
North America	1	9	34
Europe	364	1 919	3 903
East Asia and Pacific	49	191	478
Central and South Asia	26	76	189
Middle East	8	18	62
Total	**459**	**2236**	**4736**

Source: own elaboration based on: [The ISO Survey, 2013].

The largest increase in certified energy management system in 2013 was recorded in Germany. Organizations from that country show the greatest awareness of energy efficiency management. In 2013 the 2477 implemented and certified energy management systems. The number of certificates in different countries is presented in Fig. 2.

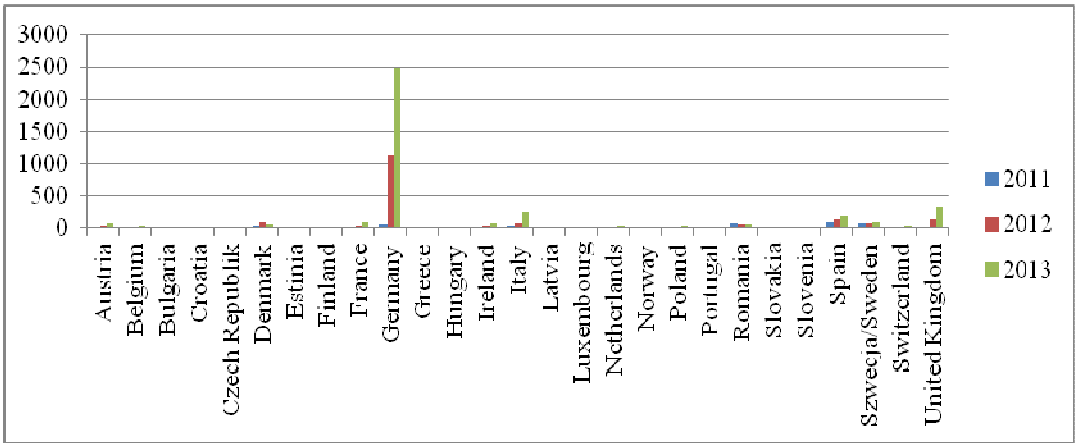
Fig. 2. The number of certificates energy management system in each country in 2013.



Source: own elaboration basing: The ISO Survey, 2013].

Comparing the countries of the European Union can indicate, that organizations operating in Germany are leading in the implementation of energy management system. In 2011-2013 in Germany there was the greatest increase in issued certificates of compliance with ISO 50001. Detailed list of the number of certificates issued in the European Union is given in Fig. 3.

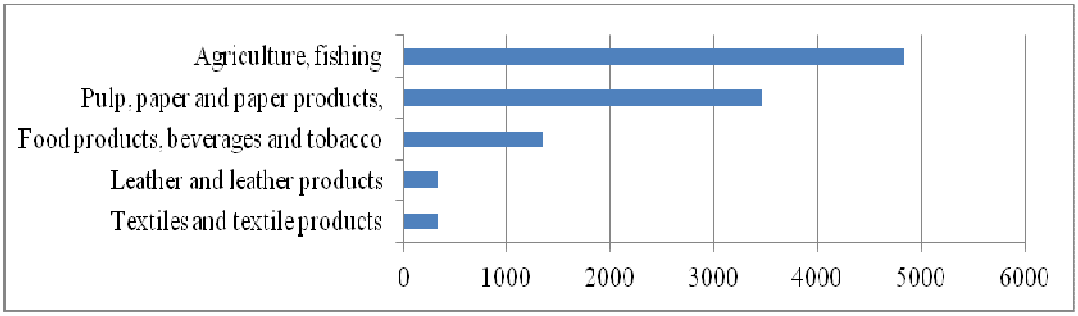
Fig. 3. The number of issued certificates an energy management system in the European Union in 2011-2013.



Source: own elaboration based on: [The ISO Survey, 2013].

The author of this study analyzed the certificates issued energy management system in various industries in 2013. Most of certificated energy management systems is in agriculture and fisheries - 4844, while in the paper industry - 3471st Fig. 4 shows only selected industries.

Fig. 4. The number of certificates issued worldwide energy management system in various industries in 2013



Source: own elaboration based on: [The ISO Survey, 2013].

Mmany industries and services have not issued any certificates of compliance with ISO 50001. This trend points to the gap between different industries, given the fact that the standard can be implemented in any type of organization, regardless of the scope and type of business.

ENERGY EFFICIENCY POLICIES

The basic concept of energy efficiency can be found in the Act of 15 April 2011 on energy efficiency. The legislator defines this concept as: the ratio of useful effect size obtained for an object, a technical device or installation, under normal conditions of use or exploitation to the amount of energy consumption by an object, a technical device or installation necessary to obtain this effect [Ustawa o efektywności energetycznej].

Table 4. Catalogue of the proposed solutions in different sectors to improve energy efficiency

Sector	Proposed solutions
Residential and tertiary sectors	a) heating and cooling (e.g. heat pumps, new efficient boilers, installation/efficient update of district heating/cooling systems); b) insulation and ventilation (e.g. wall cavity and roof insulation, double/triple glazing of windows, passive heating and cooling); c) hot water (e.g. installation of new devices, direct and efficient use in space heating, washing machines); d) lighting (e.g. new efficient bulbs and ballasts, digital control systems, use of motion detectors for lighting systems in commercial buildings); e) cooking and refrigeration (e.g. new efficient devices, heat recovery systems); f) other equipment and appliances (e.g. combined heat and power appliances, new efficient devices, time control for optimised energy use, stand-by loss reduction, installation of capacitors to reduce reactive power, transformers with low losses); g) domestic generation of renewable energy sources, whereby the amount of purchased energy is reduced (e.g. solar thermal applications, domestic hot water, solar-assisted space heating and cooling);
Industry sector	a) product manufacturing processes (e.g. more efficient use of compressed air, condensate and switches and valves, b) use of automatic and integrated systems, efficient stand-by modes); c) motors and drives (e.g. increase in the use of electronic controls, variable speed drives, integrated application programming, frequency conversion, electrical motor with high efficiency); d) fans, variable speed drives and ventilation (e.g. new devices/systems, use of natural ventilation); e) demand response management (e.g. load management, peak shaving control systems); f) high-efficiency cogeneration (e.g. combined heat and power appliances);
Transport sector	a) mode of travel used (e.g. promotion of energy-efficient vehicles, energy-efficient use of vehicles including tyre pressure adjustment schemes, energy efficiency devices and add-on devices for vehicles, fuel additives which improve energy efficiency, high-lubricity oils and low-resistance tyres); b) modal shifts of travel (e.g. car free home/office transportation arrangements, car sharing, modal shifts from more energy-consuming modes of transport to less energy-consuming ones, per passenger-km or tonne-km); c) car-free days;
Cross-sectoral measures	a) standards and norms that aim primarily at improving the energy efficiency of products and services, including buildings; b) energy labelling schemes; c) metering, intelligent metering systems such as individual metering instruments managed by remote, and informative billing; d) training and education that lead to application of energy-efficient technology and/or techniques
Horizontal measures	a) regulations, taxes etc. that have the effect of reducing energy end-use consumption; b) focused information campaigns that promote energy efficiency improvement and energy efficiency improvement measures.

Source: own elaboration based on: [Directive 2006/32/EC].

The concept of energy efficiency is also found in ISO 50001. It is the ratio or other relationship quantitative result of activities the organization, it's products, services, or energy to the energy used at the input [PN-EN ISO 50001:2012].

In the Community it is necessary to improved energy end-use efficiency, managed demand for energy and promotion of the production of renewable energy, as there is relatively limited scope for any other influence on energy supply and distribution conditions in the short to medium term, either through the building of new capacity or through the improvement of transmission and distribution. [Directive 2006/32/EC].

The European Union has consistently pursued the package climate - energy, published in January 2008, according to which Member States are required to:

- reduce CO2 emissions by 20% in 2020 compared to 1990,
- increase consumption of renewable energy in the EU by 20% in 2020, the Polish fixed 15%,
- increase energy efficiency in 2020 by 20% compared to 2005. [Efektywność, 2015, s. 37].

Directive 2006/32 / EC provides guidance on some options for improving energy efficiency in various sectors. Their catalog are given in Table 4.

Presented in Tables 4 types of actions to improve energy efficiency should be subjected to detailed monitoring, which would point whether these solutions are genuinely seek to target.

CONCLUSION

Bearing in mind the provisions of Directive 2009/28 / EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77 / EC and 2003/30 / EC the issue of implementation of energy management system in organizations is very timely.

Practice suggests that the implementation and maintenance of the system based on the requirements of ISO 50001 may make a lot of problems in many organizations, arising for example from: a) lack of belief in the importance and potential for energy savings, b) ignorance of the share of energy costs in the production costs, c) dominance of criteria to minimize investment costs over total energy costs in the lifecycle of the device. d) not seeing opportunities to save energy through simple organizational and low-input technology, e) lack of awareness of executives about the benefits of energy savings, f) lack of energy governance structure g) lack of information flow and insufficient cooperation between economic and technical staff, h) handle of energy as a commodity that doesn't require rational management, h) lack of knowledge of technical staff about the technical possibilities of saving energy, i) lack of systemic approach to energy conservation j) conservative attitude of energy services, k) lack of metering systems and monitoring of energy flow, l) low awareness of staff and lack of motivation systems to save energy, m) lack of programs, mechanisms and instruments, energy saving n) lack of competitive market for energy services (audits) lack of dissemination of information on good practices on energy saving, o) lack of standards for energy consumption based on the principle of benchmarking, p) lack of knowledge of the sources of financing for energy efficiency investments [Stoczkowski, 2009, s. 49-50].

It should be noted, however, that the implementation of energy management system can contribute to: a) improve the efficiency of processes (especially manufacturing), b) improve the safety of processes, c) reduce the consumption of electricity, fuel, gas, d) introduce a rational system of energy, e) lower costs associated with the purchase of energy, f) restrictions penalties for oversize power consumption contractual g) improve operational efficiency of processes, h) the integration of energy management system with existing systems, i) to comply with legal and regulatory requirements, j) limit greenhouse gas reduction k) to improve the image of the organization, l) improve energy security (particularly to the strategic entities).

REFERENCES

1. Directive 2006/32/EC of the European Parliament and of the Council of 5 April 2006 on energy end-use efficiency and energy services and repealing Council Directive 93/76/EEC**.**
2. Dyrektywa Parlamentu Europejskiego i Rady 2009/28/WE z dnia 23 kwietnia 2009 r. w sprawie promowania stosowania energii ze źródeł odnawialnych zmieniająca i w następstwie uchylająca dyrektywy 2001/77/WE oraz 2003/30/WE.
3. Efektywność wykorzystania energii w latach 2003-2013, GUS, Warszawa 2015.
4. http://www.iso.org [strona dostępna w dniu 01.09.2015 r].
5. PN-EN ISO 50001:2012 Systemy zarządzania energią – Wymagania i zalecenia użytkowania, PKN Warszawa 2012.
6. Skoczkowski T., Wprowadzenie do efektywności energetycznej. Inteligenta energia. Efektywne zarządzanie energią w małej i średniej firmie. Warszawa 2009, s. 49-50, http://www.change.kig.pl/pliki/Wprowadzenie_do_efektywnosci_energetycznej.pdf.
7. Stoma M., Dudziak A., Piekarski W., System zarządzania energią narzędziem zarządzania organizacją i jej zasobami energetycznymi, http://www.ptzp.org.pl/files/konferencje/ kzz/ artyk_pdf_2014/T1/t1_357.pdf.
8. The ISO Survey of Management System Standard Certifications – 2013 http://www.iso.org/iso/iso-survey [strona dostępna w dniu 31.08.2015 r.]
9. Ustawa z dnia 15 kwietnia 2011 r. o efektywności energetycznej Dz.U. 2011 nr 94 poz. 551 z późn. zm.

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APPLICATION OF VIS-NIR SPECTROPHOTOMETRY TO ASSESS ORGANIC LOADING RATE OF A BIOGAS PLANT DIGESTER

Abstract: Anaerobic fermentation is a complex, multistage biological process. This process may be controlled by analyzing parameters defining dry matter, organic dry matter and concentrations of volatile fatty acids. Traditional titration or gas chromatography methods may be applied to assay VFAs. These methods are time-consuming and costly; for this reason it was attempted to apply chemometric methods based on VIS-NIR spectrophotometry. Experimental material consisted of a mixture of maize silage and pig slurry, subjected to continuous fermentation in a digester of an agricultural biogas plant. For collected samples absorbance spectra were obtained by the transmission method at a wavelength of 400÷2170 nm. These data were used to construct PLS spectrophotometer calibration models to predict VFA contents in the substrate. The model with the best fit to the spectral data was obtained for samples of purified digestate, characterized by the coefficient of determination R^2 of 0.81 and Root Mean Square Error of Cross-Validation RMSECV =211 $mg \cdot dm^{-3}$.

Key words: spectrophotometry, PLS calibration models, volatile fatty acids VFAs, biogas

INTRODUCTION

In March 2008 EU countries signed a document, in which they declared by 2020 to reduce energy consumption by 20%, increase the share of biofuels in transport by 10% and to derive 20% consumed energy from renewable sources [Ustawa 2006]. It is also expected that energy generation from renewable energy sources in Poland will be connected with the use of various types of biomass [Budzianowski et al. 2012]. For this reason demand for biomass for energy generation has increased considerably [Chojnacki i Krzyśko 2014]. Organic biomass, which may be used as a renewable energy source is collected either as an agricultural or forestry product, or as a waste by-product in plant or animal production. It may also be a fraction of municipal waste [Rasi et al. 2007, Chojnacki and Krzyśko 2014]. This biomass may be used for energy purposes, including biogas production, which may be generated in agricultural biogas plants, sewage sludge digesters, municipal sewage treatment plants and municipal landfill degasification facilities [Adamski et al. 2015].

The process of biological biomass degradation is sufficiently efficient only under specific physico-chemical conditions. The most important of these include no access to oxygen and sunlight, the type of feedstock and its reaction, organic dry matter content and its fermentation rate, while those of minor importance are fermentation temperature and the method of feedstock mechanical processing.

Biogas generation is controlled through acceleration or slowing of bacterial degradation of organic matter [Jacobi et al. 2009]. These phenomena may be related with inhibitors of this process. The inhibitory character results from the properties of the feedstock or its inadequate feed rates. Moreover, excessive variation in feed rates caused by deterioration of feedstock digestibility may

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also have an inhibitory effect [Madsen et al. 2012]. One of the products of organic matter digestion generated by bacterial beds is acetic acid, a monocarboxylic volatile fatty acid (VFA). Acetic acid is an important indicator facilitating rapid assessment of the intensity of nutrient uptake by bacteria [Jacobi et al. 2009]. Levels of VFAs suggesting process equilibrium are specific to a given stage of the fermentation process and for used feedstocks [Reed et al. 2011, Jacobi et al. 2011]. Due to the high variability of fermentation conditions VFA concentrations need to be frequently measured. This procedure may be costly and time-consuming if conventional detection methods are used, such as e.g. chromatography.

The rapid development of applications in analyses of organic matter is associated with spectral analysis in the range of visible and infrared light. Spectral analysis is based on the variable absorption of radiation by organic matter. The intensity of this absorption is frequently dependent on the length of the electromagnetic wave deflected from a surface or penetrating through the tested object [Krützfeldt et al. 2005, Podkówka 2014].

Spectral methods have numerous advantages over conventional methods, e.g. non-invasive collection of information on tested materials and rapid measurement, while maintaining repeatability and precision of assays. Moreover, in comparison to standard methods of analyses another advantage of near infrared spectroscopy (NIRS) is connected with the potential simultaneous measurement of numerous parameters using many calibration models [Dias et al. 2008, Hansson et al. 2003]. Near infrared spectroscopy is commonly applied to measure concentrations of gases contained in biogas [Hansson et al. 2003, Holm-Nielsen et al. 2008, Jacobim et al. 2009]. Real-time monitoring of biogasification dynamics may facilitate its optimization; however, implementation of new designs of spectrometric probes has to be preceded by the development of reliable calibration models. In turn, the quality of these models depends on the applied spectral range. The method of sample preparation and standardization of recorded spectra is also a significant factor influencing calibration quality [Stanimirova et al. 2008, Wojciechowski et al. 2014].

The aim of the study was to assess applicability of VIS-NIR spectrometry in determination of VFA contents in biogasification feedstocks using chemometric methods.

MATERIAL AND METHODS

Material for analyses consisted of a mixture of maize silage and pig slurry (F1), subjected to continuous fermentation in an agricultural biogas plant digester of 1.5 MW by Big Dutchman. Analyses were also conducted on the digestate (P3). Samples for analyses were collected from the biogas plant from April to June 2015.

Spectrophotometric and laboratory analyses of acetic acid contents were conducted on two types of samples: untreated and purified, the latter obtained by separating solid impurities using a centrifuge. Each of the prepared samples was 50 ml in volume.

Next absorbance spectra were acquired at the testing stand by the reflection method. Each sample was tested using a tec5 AgroSpec spectrometer equipped with a NIRON optic tube.

The AgroSpec spectrometer (Fig. 1) is a device equipped with two optic sensors, MMS 1 and PGS 2.2, which make it possible to take measurements within the range from 370 to 1050 nm and 900÷2200 nm.

Spectra were acquired in the range from 400 to 2170 nm at the interpolated resolution of 2 nm.

A NIRON gauging probe is a contact active probe with an internal light source - a halogen lamp of 10 W. The tested sample is illuminated by a light beam with an angle of incidence of 90^{o}. Light scattered by a sample is acquired by an optic system positioned at an angle of 45^{o} in relation to the observed sample surface. The optic system of the NIRON probe head is adapted to the acquisition of an optic signal for heterogeneous and liquid samples.

Samples collected from the bioreactor were placed on Petri dishes and next spectra were acquired by contact of the probe window with sample surface.

After spectra were collected for all samples contents of VFAs were determined using the automated Nordman method in accordance with the PN-75/C-04616/04 and PN-74/C-04540/00 standards. When designing calibration models, partial least squares regression (PLS) implemented in the Unscrambler X 10.1 software was used. Quality of developed models was evaluated using cross-validation, in which such parameters as the coefficient of determination R^2 and Root Mean Square Error of Corss-Validation (RMSECV) are used as indicators of accuracy of the obtained models. The following scale was used in the evaluation of models depending on R^2 values:

- <0.81 for low quality models
- 0.82÷0.9 for models with sufficient prediction
- >0.9 for models of good fit (Saeys et al. 2005, Chodak 2008, Stanimirova et al. 2008, Wojciechowski et al. 2014).

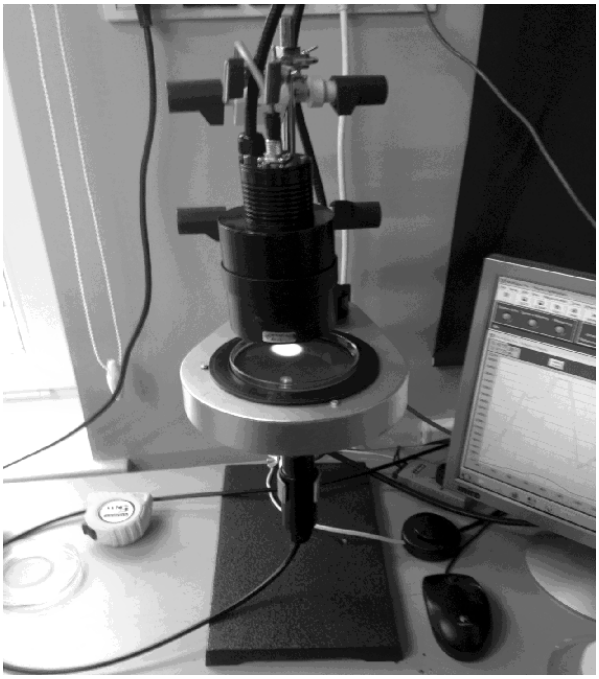

Fig. 1. A tec5 AgroSpec spectrometer applied in tests

RESULTS

A total of 80 spectra were recorded and they were subsequently used to develop new calibration models. Results of the learning set for the untreated and purified mixtures are presented in Figs. 2 and 3.

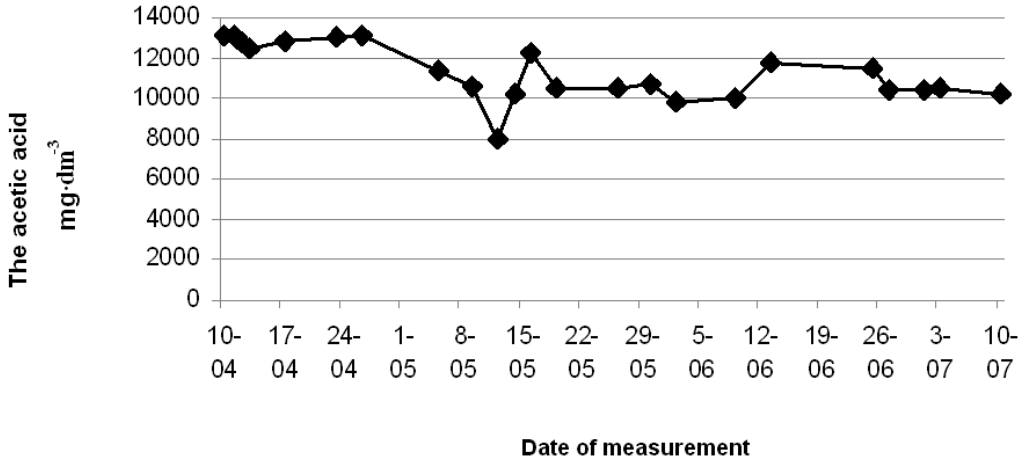

Fig. 2. Changes in levels of acetic acid and alkalinity in sample F1 with time

Source: the authors' study

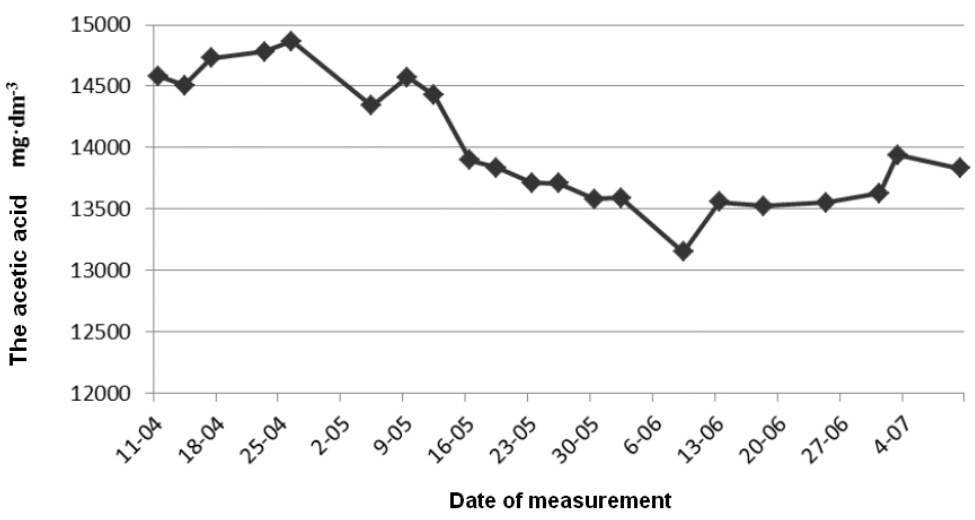

Fig. 3. Changes in levels of acetic acid and alkalinity in sample P3 with time

Source: the authors' study

Data were collected based on laboratory analyses using the Nordman method. A total of 40 absorbance spectra each were recorded for a mixture of maize silage and pig slurry (F1) and for digestate (P3) from the fermentation process. Absorbance spectra obtained by the reflection method (Figs. 4 and 5) were recorded under laboratory conditions within an entire range of spectra, i.e. 400÷2170 nm.

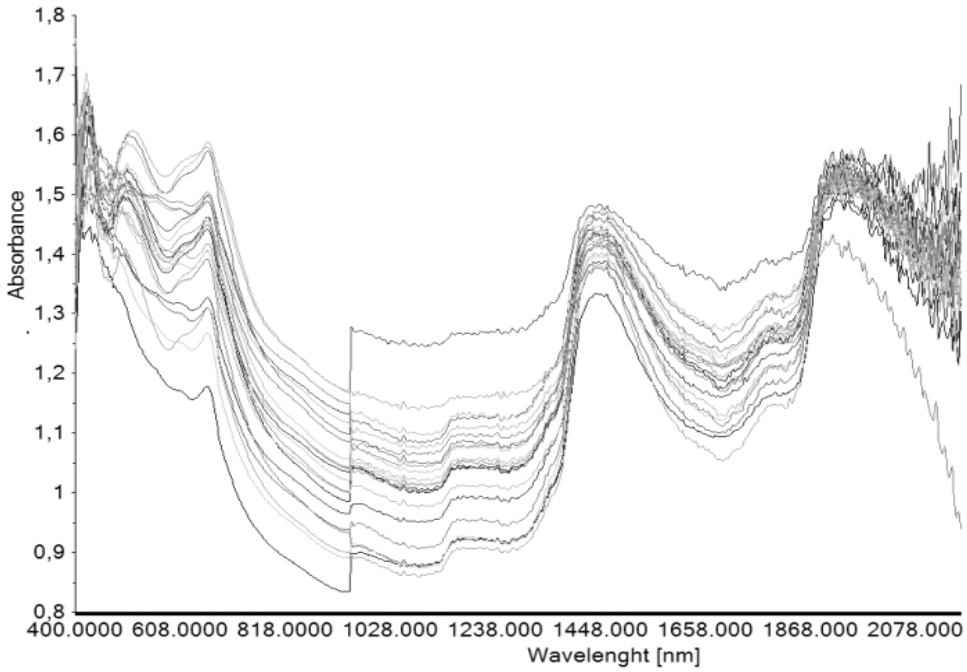

Fig. 4. Absorbance spectra for F1 samples recorded using a NIRON probe

Source: the authors' study

Spectra were recorded for the untreated mixture from fermentation solids varied in terms of absorbance. Spectra recorded using the NIRON probe are characterized by a large variance of absorbance up to a wavelength of approx. 1900 nm, after which a rapid decrease in the value of this parameter was recorded. Considerable background noise could be observed within upper limits of the spectrophotometer, i.e. above 1900 nm.

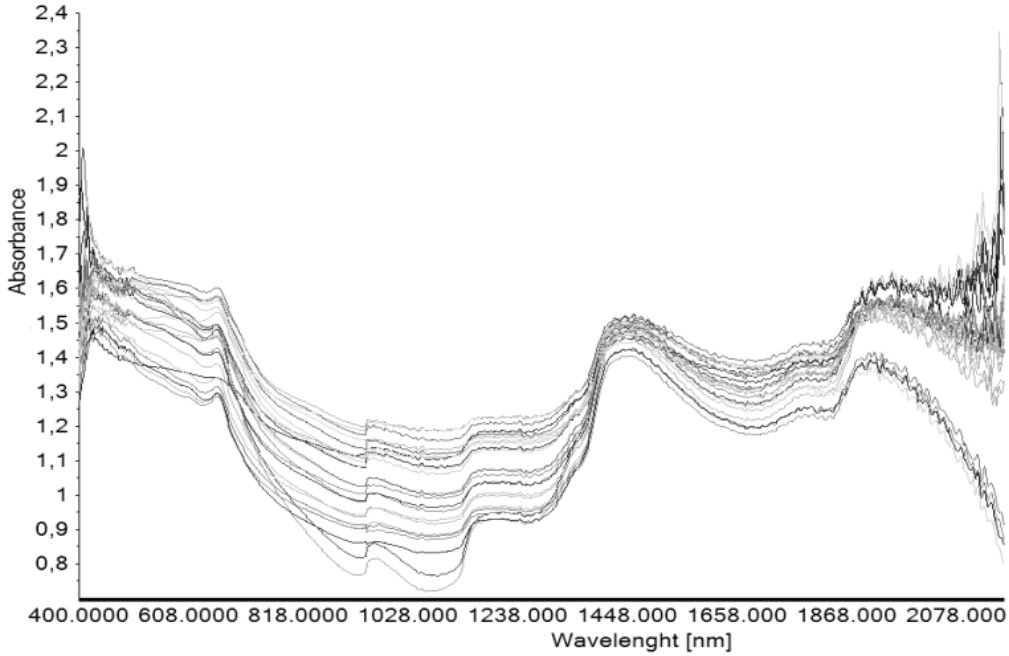

Fig. 5. Absorbance spectra for P3 samples recorded using a NIRON probe

Source: the authors' study

Models obtained in the calibration process, depending on the used samples, varied on their degree of fit and quality of the determination. The best model was generated in purified digestate (P3) for the NIRON probe with the error of model fit R^2 of 0.81 and the error of determination at 211 mg·dm^{-3}. In the case of F1 purified samples (a mixture from the bioreactor) the analysis of the constructed calibration model indicates that the error of model fit R^2 = 0.30, while RMSECV = 6 mg·dm^{-3}.

METHOD OF ECONOMIC ANALYSIS

A decision to generate energy from renewable sources is justified not only by ecological considerations, but also economic profitability of renewable energy sources, including biogas plants. A detailed economic analysis verifying profitability of such an enterprise is difficult to perform and involves numerous factors affecting the final unit costs of generated energy. For this reason cost accounting needs to be conducted in accordance with the generally accepted methodological assumptions.

The primary elements in this analysis include operating costs, comprising maintenance and operation costs. Operating costs consist of costs of repairs, labor, consumables, electricity and process water. In turn, maintenance costs should include costs of depreciation, insurance and construction costs, and under specific conditions costs of profit capitalization will also be included. Individual components of operating costs frequently refer to the service life of the facility (the number of work hours).

The volume of repair costs is assumed depending on the model and type of the machine or device and it results from the performed running repairs and overhauls performed in a specific time

period [Muzalewski A. 2006]. Depreciation costs make it possible to offset the value of a given machine. During its service life over a specific number of years these costs are eventually equal to the value of the purchased machine. Insurance costs are adopted in accordance with the actual data supplied by farmers and owners of the operated facilities. Electricity costs are a quotient of electric energy consumed by the tested equipment in the facility and the price of 1 kWh. Costs of water used to wash the installation are determined based on the amount of consumed municipal water and its unit price. Costs of consumables and auxiliary materials result from additional outlays incurred to pay for chemicals used to wash the installation, repairs, etc.

Since the study comprised laboratory analyses, at this stage of the research no economic analysis was performed for the application of spectrophotometry in a typical biogas plant.

CONCLUSIONS

Conducted laboratory analyses make it possible to formulate the following conclusions:

1. Application of a NIRON reflection probe in laboratory analyses facilitates an effective analysis of acetic acid contents in the tested digestate and it may be used in an actual technological process.
2. The impact of solid impurities in samples may be minimized by increasing the feedstock flow rate in the detection window of the NIRON probe head. It would require optimization of mixing parameters and modification of methodological assumptions.
3. Application of chemometric methods based on VIS-NIR spectrophotometry facilitates continuous control of values of the investigated parameters determining quality of produced biogas. This method makes it possible to reduce costs of chemical analyses and shorten sample preparation time.
4. High costs of spectrometers with the required software may be an obstacle for their use by present or future biogas plant operators. However, prospective popularization of VIS-NIR spectrophotometry may result in this technical and technological solution becoming an attractive and profitable option.

REFERENCES

1. Adamski M., Kot W., Wojcieszak D., Mioduszewska N. (2015), A*naliza wybranych efektów technologicznych zastosowania mieszadła spiralnego w procesie wytwarzania biogasu* [Analysis of selected technological effects of spiral stirrer applied in biogas production], Monograph: Aktualne Problemy Inżynierii Biosystemów, UP Poznań, pp. 270-277.
2. Budzianowski W M. (2012), *Sustainable biogas energy in Poland, prospects and challenges.* Renew Sustain Energy Rev, 6(1), pp. 342e9.
3. Chodak M. (2008), *Application of near infrared spectroscopy for analysis of soils.* Litter and Plant Materials 17, 5, pp. 631-642.
4. Chojnacki J., Krzyśko A. (2014), *Energetyczne aspekty termicznego zagazowania biomasy. Potencjał substratów do produkcji biogazu na Ukrainie i Polsce* [Energy generation aspects of thermal biomass gasification. Potential of substrates for biogas production in Ukraine and Poland]. Problemy produkcji energii odnawialnej, w tym biogazu, Monograph. ITP, pp. 11-18.
5. Dias A.M.A., Moita I., Páscoa R., Alves M.M., Lopes J.A., Ferreira E.C. (2008), *Activated sludge process monitoring through in-situ NIR spectral analysis*, Water Science & Technology, 57, pp. 1643-1650.
6. The official Journal of Laws „Dzienik Ustaw" no. 169, item 1199 of 25 August 2006 with later amendments „Biokomponenty i biopaliwa ciekłe" [Biocomponents and liquid biofuels].
7. Hansson M., Nordberg A., Mathisen B.(2003), *On-line NIR monitoring during anaerobic treatment of municipal solid waste*, Water Science and Technology, 48, pp. 9-13.

8. Holm-Nielsen JB., Lomberg CJ., Oleskowicz-Popiel P., Esbensen KH., (2008), *On-line near infrared monitoring of glycerol-boosted anaerobic digestion processes: Evaluation of process analytical technologies*, Biotechnology and Bioengineering, 99, pp. 302-313.
9. Jacobi H.F., Moschner C.R., Hartung E. (2009), *Use of near infrared spectroscopy in monitoring of volatile fatty acids in anaerobic digestion*, Water SciTechnol , 60, 2, pp. 339-46.
10. Jacobi H.F., Moschner C.R., Hartung E. (2011), *Use of near infrared spectroscopy in online-monitoring of feeding substrate quality in anaerobic digestion*, Bioresource Technology, 102, 7, pp. 4688-1421.
11. Krützfeldt B., Oechsner H., Mukengele M., Eder B., Eder J., (2005), *Bestimmung der Gasausbeute von Energiemais*, Mais, 4, pp.124-126.
12. Madsen M., Ihunegbo F.N., Holm Nielsen J., Halstensen M., Esbensen K. (2012), *On-line near infrared monitoring of ammonium and dry matter in bioslurry for robust production - a full-scale feasibility study*, Journal of Near Infrared Spectroscopy, 20 (6), pp. 635e645.
13. Muzalewski A. (2006), *Koszty eksploatacji maszyn. Wskaźniki eksploatacyjno-ekonomiczne maszyn i ciągników rolniczych. Jednostkowe koszty eksploatacji* [Machine operating costs. Operating and economic indexes for agricultural machines and tractors. Unit operating costs]. Wykorzystanie graniczne maszyn. Arkusze kalkulacyjne. IBMiER, Warszawa, No. 21.
14. Podkówka Z., Podkówka W. (2014), *Porównanie metod szacowania wydajności metanu z kiszonek z całych roślin kukurydzy* [A comparison of methods estimating methane yield from silage from whole maize plants], Nauka Przyroda Technika, 4, pp. 1-8.
15. Polskie Normy. PN-75/C-04616/04; PN-74/C-04540/00. Wydawnictwo Normalizacyjne. Warszawa. Oznaczenie lotnych kwasów tłuszczowych [Assays of volatile fatty acids].
16. Rasi S., Veijanen A., Rintala J. (2007), *Trace compounds of biogas from different biogas production plants*, Energy, 32(8), pp. 1375e80.
17. Reed J.P., Devlin D., Esteves S.R.R., Dinsdale R., Guwy A.J. (2011), *Performance parameter prediction for sewage sludge digesters using reflectance FT-NIR spectroscopy*, Water Research, 45, pp. 2463-2472.
18. Stanimirova I., Daszykowski B., Walczak M. (2008), *Metody uczenia z nadzorem – kalibracji, dyskryminacja i klasyfikacja. Chemometria w analityce* [Supervised learning methods – calibration, discrimination and classification. Chemometrics in analytics]. IES. Kraków.
19. Wojciechowski T., Czechlowski M., Szaban S. (2014), *Wykorzystanie metod spektrometrii VIS-NIR do oceny wilgotności kompostów rolniczych* [Application of VIS-NIR spectrometry methods to assess moisture content in agricultural composts]. Monograph: Aktualne problemy Inżynierii Biosystemów, UP Poznań, pp. 86-93. ISBN 978 83 7160 731 8.

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THE CONCEPT FOR THE PROCEDURE PRECEDING FINANCIAL PLANNING IN AN ENTERPRISE

Abstract: The paper presents relationships found between financial planning and actions preceding this planning. These operations constitute a procedural series and outline the concept of activities, which eventually provide cohesion to material and financial plans with the economic outcomes forecasted by the enterprise management. A starting point in this procedure is provided by the company resources. Four basic types of resources are characterised and the application of SWOT analyses is discussed to determine the internal condition of the company and external factors affecting their functioning. Four types of strategies are presented, which may be constructed based on the results of SWOT analyses. Selection of the development of strategy of an enterprise, typical of its situation, influences the status of material plans. Types of material planning are characterised and their relationships with respective types of financial planning are indicated. It was proposed to construct material and financial plans based on the approach consisting in their cyclical corrections, feedback-based functioning, up to the achievement of the expected level of profit.

Key words: the company resources, SWOT analyses, strategies of the company, material planning, financial planning

INTRODUCTION

Economic activities undertaken by an enterprise are always characterised by a certain degree of uncertainty concerning financial outcomes produced as a result of these activities. The main source of risk is connected with errors connected with planning of material actions and forecasting future changes in the environment of the enterprise. A tool potentially decreasing the economic risk and limiting the scale of its negative effect on the outcome is provided by financial planning. However, this has to be preceded by a set of actions, which supplies reliable information.

The aim of this paper is to present a proposal for a series of actions preceding financial planning. Key elements of this procedure include SWOT analysis and the selection of development strategies of a company. Results of these actions are the basis for the construction of material plans in the variant-based approach. In the proposed approach financial planning is a factor adjusting material planning and its results are in turn corrected by financial planning. In this way it is possible to gradually improve material plans and to select its most advantageous variant, using the feedback mechanism functioning between both types of plans. As a result comprehensive material and financial plans are obtained along with satisfactory economic outcomes for economic activities planned by the company.

CHARACTERISTICS OF RESOURCES OF AN ENTERPRISE

Economic activity is based on resources (manufacturing factors), which enterprise has at its disposal, irrespective of the form, in which they are found. Stefanowicz [2004, p. 78] defined a resource as a certain amount of an item, which was collected, accumulated to be used in the future. We distinguish four basic types of resources in an enterprise. These are material, financial, human resources and information resources [Kunasz 2006].

Material resources (real capital) include all material assets, which an enterprise owns or has at its disposal. These include machines and equipment (owned by the company, leased or rented), tools, raw materials and manufacturing materials, semi-finished products, final products, tooling of

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machines and equipment, manufacturing infrastructure (electric, gas, heating, water supply and sewerage infrastructure, dust extraction systems, etc.), communication routes, warehouses, shop floors, administration buildings, maneuvering areas, utility buildings, construction structures (fire fighting reservoirs, boiler houses, fuel depots, drying rooms, etc.), land, on which the enterprise is operating as well as other non-manufacturing objects owned or rented by the company.

Financial resources (financial capital) include all financial resources, with a specific market value and differing in the degree of liquidity, which the enterprise has at its disposal, irrespective of the form in which they are found. Thus they include cash in the cash register, money deposited in bank accounts on current and deposit accounts, overdraft facility and long-term credits, loans, receivables from goods and service consumers, shares in other economic entities, stocks and shares, bonds, etc. Material and financial resources are defined as material components of resources. They are composed of capitals of the company, which are valued and in this form they are reflected in the balance of the company.

Human resources (staff, human capital, labour) are composed of all individuals, which were employed by the enterprise, irrespective of the legal form, on the basis of which they provide labour. Workers are employed due to their professional qualifications (acquired through education or training, confirmed by a diploma or certificate, etc.), skills (knowledge and ability to use it constitute employee competences), professional experience, predispositions and features of character (e.g. accuracy, resistance to stress, rapid acquisition of new knowledge, etc.), which are or may be useful for the functioning and development of the company. Soft skills are valued increasingly often, which include interpersonal and creative (innovative) skills. Entrepreneurship is a particular type of skills, connected with the features of character. It should be a characteristic of the management staff in the company.

The fourth type of resources in the enterprise – information resources – has been distinguished in the literature on the subject as late as the 1970's [Materska 2005]. Information resources include the company brand, trademarks, patents, legally protected utility models, design drawings of products, manufacturing technology of products (including know-how[19]), workstation manuals, the organizational structure of the enterprise, the quality management system, the personnel management system, the contractor service system together with their characteristics, data archivisation system, computer software – licensed or developed by the company as well as other information resources accumulated on magnetic recording media (e.g. in the form of data bases) or produced in the paper form, etc. Sometimes information resources include knowledge of the employees together with their ability to apply it in the enterprise. Information resources and the knowledge of employees constitute non-material resources of the enterprise. This type of resources is difficult to measure and valuate (e.g. skills and knowledge of employees). For this reason it is only partly considered in the balance of the company. In accounting systems it is included as intangible assets. At present information resources are treated as a key factor, which makes it possible for the enterprise to gain competitive edge on the market, which means that the company or its products are distinguished positively in the opinion of customers in comparison to the image of the competitors and their products.

[19] Know-how – a package of described, unpatented or confidential practical information, resulting from experience and studies, which are significant for the manufactured products. The above definition of know-how was adopted in the European law, in the Commission Regulation (EC) no. 772/2004 of 7 April 2004 on the application of art. 81 item 3 on the application of Article 81(3) of the Treaty to categories of technology transfer agreements (the Journal of Laws Dziennik Ustaw L 123 of 27.4.2004, pp. 11-17). Based on: Rafał Golat: Know-how, Status prawny i podatkowy. Wyd. Ośrodek Doradztwa i Doskonalenia Kadr, Warszawa 2007.

SELECTION OF DEVELOPMENT STRATEGY OF THE ENTERPRISE BASED ON SWOT ANALYSIS

There are many methods (manufacturing technologies) for the utilisation of resources to produce specific goods and services. For this reason companies are forced to continuously make economic choices, determining what is to be produced, using what resources and how selected resources are to be used to provide possibly the most advantageous financial results. Based on economic choices various variants of product manufacturing or service provision are developed. Problems connected with economic choices constitute the basis for enterprise management. Figure 1 presents dependencies found in enterprise management processes, which lead to the selection of the most advantageous variant of product management or service provision.

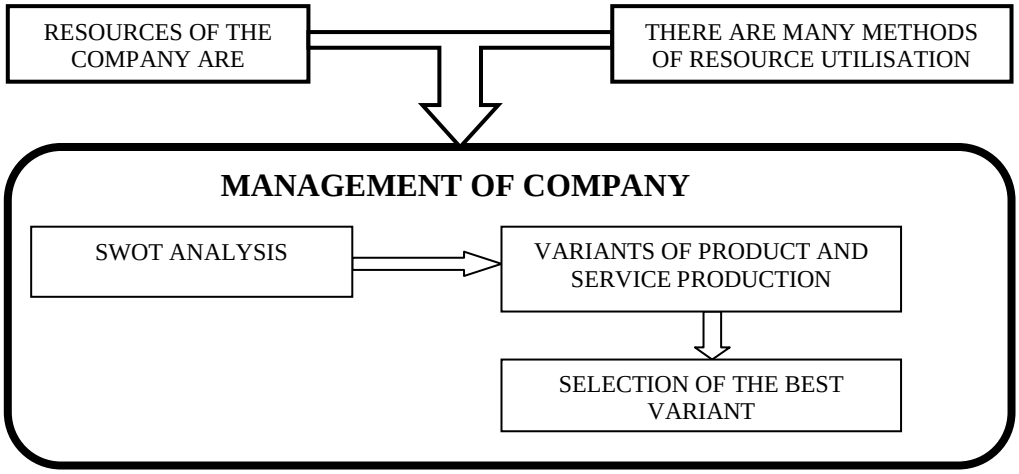

Fig. 1 Selection of an operational variant of the company based on SWOT analysis

Source: own study.

Generally economic choices are preceded by an analysis of external and internal conditions, in which the enterprise is operating. Most typically such an analysis is conducted by the SWOT method (Strengths, Weaknesses, Opportunities, Threats), which is a heuristic technique to order information. Interpretation of SWOT results provides data facilitating rational economic choices. On this basis the variant of operational strategy which is the most advantageous for the company is selected from among the developed operational variants [Tyrańska, Walas-Trębacz 2010].

SWOT analysis consists in the identification of factors, which influence or may influence the operation of the enterprise in the future. These factors are divided into four groups:

- Strengths (S) – constitute a set of internal factors of the company. They represent advantageous characteristics (advantages) of the company and are treated as its assets in confrontation with the competition.
- Weaknesses (W) – constitute a group of internal factors of the company. They are disadvantageous characteristics (defects) of the analysed company. In this respect the competition has better solutions.

– Opportunities (O) – constitute a set of external factors found in the company environment. They provide an opportunity of an advantageous operation for the enterprise.
– Threats (T) – constitute a group of external factors, found in the company environment. These factors are obstacles in the operations of the enterprise and may hinder its future development.

All factors are identified so that their scopes of meaning are mutually exclusive. Factors, which are a consequence of those previously included in the analysis are not taken into consideration. Internal factors are classified to a specific group based on a comparison with the same factors found in the strongest competitor. Identified factors, separately for each group, are assigned weights defining their relative impact (importance) [Gierszewska, Romanowska 2009].

The enterprise has a relatively large effect on the status of internal factors. It may develop its strengths and improve or eliminate weaknesses. In turn, the company has a limited potential to influence external factors. In relation to opportunities the company only adapts its activity to utilise opportunities to the greatest possible extent. In the case of threats the enterprise modifies actions to minimise their negative impacts or attempts to avoid the effect of these factors. Interpretation of SWOT analysis results provides guidelines for the construction of a strategy for future operations of the company. For this purpose opportunities and threats found in the company environment are analysed in a dynamic approach, i.e. the current status of factors in the company environment and in the future specified by the time interval, for which the strategy is being created. Such an approach is presented in Fig. 2.

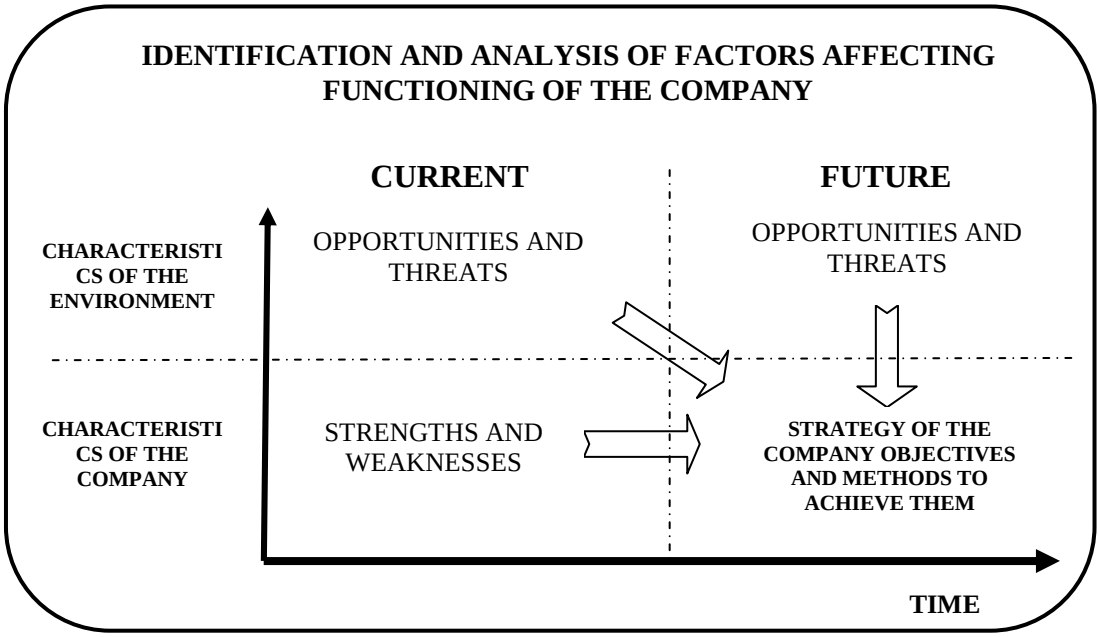

Fig. 2. Formulation of the strategy based on an analysis of factors influencing the functioning of the company

Source: own study.

Next it is investigated, which factors may be inter-related. For example it is determined to what extent factors comprising strengths make it possible to utilise opportunities found in the environment or to what degree weaknesses limit utilisation of these opportunities. In this way interactions are identified for all combinations of factor groups. As a result we obtain the number of interactions and based on calculated weight quotients the power of its impact is determined. Thus obtained information is given in the collective table.

Based on an analysis of results contained in the collective table we may indicate the type of strategy, which is most advantageous for the company. Most frequently we distinguish four types of strategy: aggressive, conservative, competitive and defensive [Tyrańska, Walas-Trębacz 2010]. Table 1 presents a characteristic of possible strategy types depending on the advantage of a specific combination of two groups of factors.

Table 1. Selection of strategy type based on the system of factors affecting the company

GROUPS OF FACTORS	OPPORTUNITIES	THREATS
STRENGTHS	**AGGRESSIVE STRATEGY** **DEFENCE** STRENGTHS PREDOMINATE IN THE ENTERPRISE. OPPORTUNITIES STRONGLY CONNECTED WITH THEM WILL BE FOUND IN ITS ENVIRONMENT.	**CONSERVATIVE STRATEGY** **STABILISATION** THE ENTERPRISE WILL OPERATE IN AN ADVERSE ENVIRONMENT. HOWEVER, IT HAS A SET OF STRENGTHS STRONGLY CONNECTED WITH THREATS.
WEAKNESSES	**STRATEGIA KONKURENCYJNA** **COMPETITIVE STRATEGY** THE ENTERPRISE HAS MORE WEAKNESSES THAN STRENGTHS. HOWEVER, THEY WILL OPERATE IN A FRENDLY ENVIRONMENT. THIS WILL FACILITATE MAINTENANCE OF THE CURRENT POSITION IN THE FUTURE.	**DEFENSIVE STRATEGY** **REDUCTION OR LIQUIDATION** THE ENTERPRISE HAS MORE WEAKNESSES, WHICH WILL BE STRONGLY CONNECTED WITH THREATS. THERE IS A CONSIDERABLE RISK OF ENTERPRISE FAILURE.

Source: Own study.

An aggressive strategy is selected by an enterprise if there are more strengths connected with opportunities, which are found or which will appear in the environment in the forecasted period. Such a strategy means that activities focused on an intensive development of the company are undertaken. Depending on the type of factors it may be to enhance production capacity as a result of investment in new machines and equipment, implementation of new manufacturing technologies or new products, etc.

If factors representing strengths predominate over threats, which are presently manifested in the environment or will probably appear in the future period in the time interval covered by planning, the company should choose a conservative strategy. It consists in the elimination of threats thanks to factors, which constitute its strengths. The enterprise does not develop, but only maintains its strengths, waiting for a change in external conditions to more advantageous ones.

In the case when weaknesses connected with advantageous environmental conditions predominate, the enterprise decides to realise a competitive strategy. It consists in the elimination or reduction of the impact of weaknesses. Realisation of this strategy is facilitated by the environment, which provides advantageous conditions for the functioning of the company. Thus this will make it possible for the enterprise to concentrate resources on the elimination of these barriers, which deteriorate its competitive position on the market.

A defensive strategy is adopted by the enterprise, if weaknesses predominate in relation to threats found in the environment. There is a risk of company bankruptcy. In such a situation the enterprise may attempt to establish advantageous conditions for takeover by another company or may sell some assets to obtain resources to survive the time of changes in the external conditions to more advantageous ones.

The selected variant of strategy is the starting point for planning of tangible activities (material planning). In the general sense planning consists in the identification of:

– objectives, which are to be realised in the assumed period of time,
– stages (tasks) and modes of action facilitating achievement of objectives,
– resources required for the realisation of specified actions, including the identification of employees responsible for the performance of individual stages,
– a schedule for the performance of actions.

Material planning, also called technical planning, consists in the determination of inputs and outcomes expressed in natural (physical) units for each stage, e.g. consumption of materials in tons or manufacture of products in pieces. All material operations contained in the operational plan are reflected in the financial plan, where they are expressed in monetary units as costs of operations of the company. Financial planning also indicates sources of financing for material operations as well as the final outcome in the form of profit or loss.

Between material and financial planning we may apply feedback mechanisms (Fig. 3). This is equivalent to the procedure correcting objectives and tasks contained in the material plan based on final financial results expressed in absolute values or in the form of indexes. The corrective operation lasts until the final outcome found satisfactory by the enterprise management board is achieved.

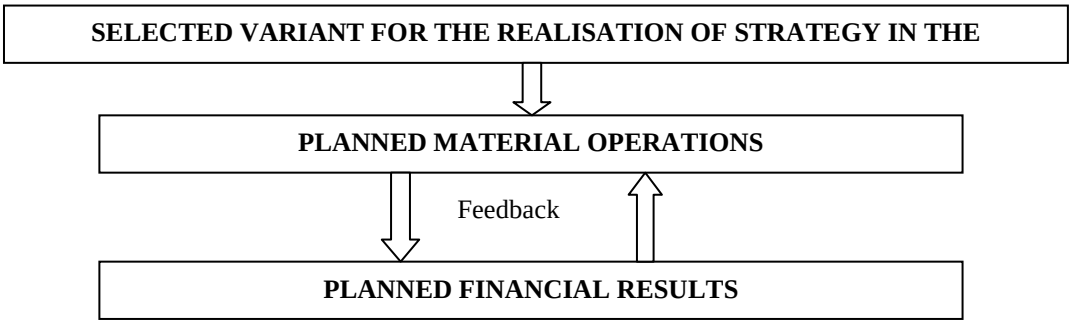

Fig. 3. Relationships between material and financial planning

Source: own study.

We distinguish three basic types of material planning: strategic, tactical and operational (executive, current). The basis for the identification of these types of planning is provided by the

material scope, the degree of specificity of used data and the time period they concern. Strategic planning refers to the functioning and development of the entire enterprise – e.g. undertaking production of a new product or development of the company to include a new division. Data of a high aggregation degree – e.g. mean annual increase in the sale of a specific group of products is to be 5% and it covers the time perspective of several years. Tactical planning refers to a selected part of the enterprise, e.g. a plant or division. Data applied in this planning have a lower degree of aggregation than it is in strategic planning, e.g. average demand for softwood timber is to be 30 m^3 per quarter, while the time perspective is a year or a quarter. Operational planning concerns small organisational units of the company, e.g. manufacturing sections or work stations. Data of the lowest degree of aggregation are applied – e.g. during a shift 100 pieces of subassemblies are to be produced and the period which it concerns includes monthly, weekly, daily or shift sections. Types of material planning and their relationships with financial planning are given in Fig. 4.

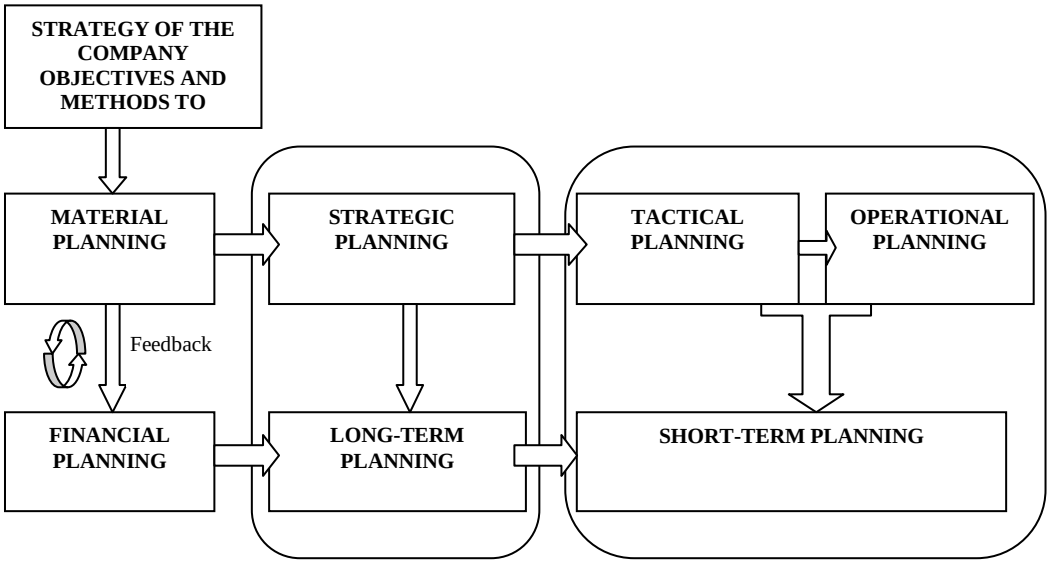

Fig. 4. The structure of connections between types of material and financial planning

Source: own study.

Financial planning is divided into long-term and short-term planning [Naruć 2013].The former type of planning concerns periods of more than a year and it is closely related with strategic planning (see Fig. 4). In turn, short-term planning covers time intervals of less than a year. This type of planning in terms of values reflects actions contained jointly in tactical and operational plans. Financial planning referring solely to operational planning is relatively rarely used in enterprises.

All types of material and financial planning are adequately interrelated through cyclical corrections of material operations based on financial outcomes calculated in each cycle. In turn, values included in financial plans influence the choice of material operations. They are also changed cyclically until intended results are obtained. In this way a feedback-based correction mechanism is developed. As a result of its application material operations with insufficient economic efficiency or bringing losses are eliminated. Moreover, all material actions are covered by financing sources. In

this way cohesion of material actions and financial outcomes is provided along with their consistency with the expectations of the company management.

Primary recipients of financial plans are internal, i.e. the management staff and internal agencies of the enterprise, which are responsible for the modification of cost levels. Financial plans may be useful also for external economic partners – potential investors or partners in joint enterprises. The third group of external recipients of financial plans includes financial institutions, primarily commercial banks. Based on financial plans they evaluate the condition of the company in the applications for credits for the financing of planned economic enterprises. The fourth group of recipients of financial plans comprises institutions organising competitions and allocating EU funds for the realisation of projects of economic enterprises. In such a case financial plans are used as a source of data, which are listed and processed in accordance with the requirements imposed on applications for co-financing of projects from EU funds.

The financial plan of a company is composed of pro-forma statements. They are constructed based on future values of revenue and costs, the outcomes and expenditure as well as status of assets components and sources of its financing. The structure of financial statements is specified in Appendixes to the Act on accounting of 29 September 1994 (the Journal of Laws Dziennik Ustaw of 2013, item 0330). A financial plan comprises the following balances:

– the revenue plan (quantitative and valuation sales targets for goods and services),
– the balance of investment targets along with the plan for the depreciation of fixed assets,
– a balance of financing sources for outlays,
– a debt repayment schedule (repayment of credits),
– a balance of forecasted costs divided into fixed and variable,
– a forecast for the profit and loss account,
– a plan for net operating capital demand,
– a forecast for the cash flow demand,
– a forecast balance,
– assessment of efficiency of planned economic actions,
– analysis of sensitivity.

Based on balances contained in the financial plan we obtain key information characterising a planned economic enterprise. This information includes first of all the volume of forecasted profits. The source of such information is the forecast of the profit and loss account. In turn, based on the forecast for the cash flow account we obtain information on the degree of financial liquidity of the company in the period covered by the financial plan. The status of financial liquidity is a key issue for the stable settlement of liabilities in relation to the external economic entities cooperating with the enterprise. For owners, partners or shareholders important information is provided by the volume of the rate of return from invested capital. This makes it possible to evaluate attractiveness of investment of financial resources in the operations of the company. The degree of threat for the realisation of planned enterprises may be identified based on the results of sensitivity analysis. In the course of analysis planned outcomes of the enterprise are investigated for a situation when main parameters found in the plan are changed: prices, volume of sales, unit costs, etc. The power of impact for these factors on the level of income in the enterprise is established.

CONCLUSIONS

An outline of the presented concept for the procedure preceding financial planning aims at the development of a possibly precise procedure for the collection of data for financial planning. This concept needs to be greatly supplemented, first of all specific in character. The foundation for the described scenario was provided by SWOT analysis and the closely related choice of the

development strategy for the enterprise. The selected strategy provides the framework for the development of material plans for enterprises undertaken by the management staff of enterprises.

Specific procedures for the transition from the indicated strategy to material planning were not discussed in this paper. This problem needs to be elaborated separately due to its complexity. The procedure in this respect to a significant degree depends on the situation of a given enterprise and conditions found in the environment, in which it is operating. This results in a large number of specific cases, for which separate procedures need to be indicated. Many partial procedures for such an activity have already been developed, published and applied in practice. They have not been ordered and compiled to form a comprehensive method. In some situations it will be necessary to fill the gaps, which obviously will be found when preparing such a comprehensive study of the problem.

REFERENCES

1. Gierszewska G., Romanowska M.: Planowanie strategiczne w przedsiębiorstwie. Wyd. Polskie Wydawnictwo Ekonomiczne, Warszawa 2009.
2. Golat R.: Know - how, Status prawny i podatkowy. Wyd. Ośrodek Doradztwa i Doskonalenia Kadr, Warszawa 2007.
3. Kunasz M.: Zasoby przedsiębiorstwa w teorii ekonomii. Gospodarka Narodowa nr 10 2006, pp. 33-48.
4. Materska K.: Rozwój koncepcji informacji i wiedzy jako zasobu organizacji. W: Od informacji naukowej do technologii społeczeństwa wiedzy. Wyd. Stowarzyszenie Bibliotekarzy Polskich, 2005, pp. 199-216.
5. Naruć W.: Planowanie finansowe efektywnym narzędzie zarządzania. Teoria i praktyka. Wyd. Marina, Wrocław 2013.
6. Stefanowicz B.: Informacja. Wyd. Szkoła Główna Handlowa – Oficyna Wydawnicza, Warszawa, 2004.
7. Tyrańska M., Walas-Trębacz J.: Wykorzystanie metod analizy strategicznej w przedsiębiorstwie. Wyd. Uniwersytet Ekonomiczny w Krakowie, Kraków 2010.

Aneta Wysokińska-Senkus[20]

EFFICIENCY AND DEVELOPMENT PROSPECTS OF STANDARDIZED ENVIRONMENTAL MANAGEMENT SYSTEMS

Abstract: The objective of this study was an attempt to answer the research question, whether implementation of an environmental management system determined an increase in organizational effectiveness. The article describes the role of environmental management systems in improving management processes in organizations. The reference to effectiveness was made here in economic and organizational terms. Moreover, development prospects of standardized environmental management systems were presented. The results of analyzes of primary and secondary data showed that the management systems, which were effectively planned and implemented, contributed to achievement of many benefits, among which there were: cost rationalization, increase in employees' environmental awareness, improvement of the management system as well as improvement of the organization's image among particular groups of stakeholders.

Key words: effectiveness, environmental management, management systems, organization development.

INTRODUCTION

The problem of the organizational effectiveness is a very interesting issue and is still in a focus of research. Its importance is especially essential for the economic practice due to the fact that the increase in effectiveness is a key objective of every organization. It is in the modern world that organizations face many challenges arising from constant changes. The prerequisite to survive in the rapidly changing environment is the high flexibility of the organization in order to adapt to new conditions and the ability to understand emerging trends.

Organizations in order to ensure their survival and development should focus on the implementation of new organizational solutions relating to specific aspects of their operations, including the environmental management. It should be emphasized that the involvement in environmental issues has become an important variable to be taken as part of modern competition strategies implemented by organizations.

THE ESSENSE OF THE ENVIRONMENTAL MANAGEMENT SYSTEM

Nowadays, the environmental management system is implemented and certified on the basis of requirements of the PN-EN ISO 14001:2005 standard: Environmental management systems. Requirements with guidance for use (ISO 14001:2004 Environmental management systems – Requirements with guidance for use). The standard is updated every few years in order to ensure that ISO 14001 certification works correctly in organizations and meets current needs of the market. On September 15, 2015, a new ISO 14001:2015 standard "Environmental management systems" entered into force. Requirements with guidance for use.

The new standard puts more emphasis on increasing importance of the environmental management in the process of strategic planning of an organization. The new requirements help to understand the concept of the organizational context in order to identify it as well as obtain financial benefits for the organization and improve environmental care. The new ISO 14001 standard puts particular emphasis on the issues and changes related to the needs and expectations of stakeholders (ISO 14001:2015, https://www.iso.org/obp/ui/#iso:std:60857:en).

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Moreover, in order to boost the success of the system in the ISO 14001:2015 standard, a new clause was introduced that assigns specific responsibilities to the top management related to the promotion of the environmental management in the organization.

THE STATE AND PROSPECTS FOR THE DEVELOPMENT OF ENVIRONMENTAL MANAGEMENT SYSTEMS IN THE WORLD

Environmental management systems become increasingly popular. Most often, organizations implement systems based on the requirements of the ISO 14001 standard, however, it should be noted that there are about 30 alternative environmental management systems in the world nowadays [Wysokińska – Senkus, Senkus, 2013].

At the end of 2014, 1 609 294 management system certificates were issued according to the requirements of the ISO standards, of which 324 148 certificates attesting the compliance of the system with the ISO 14001 standard. According to the data contained in the ISO Survey report, it was in 2014 that the increase in the number of certificates confirming compliance with the requirements of the ISO 14001 standard by 7% compared to the previous year could be noted [ISO 2014 Survey].

The largest increase in the number of certificates confirming compliance with the ISO 14001 standard in 2014 as compared to the previous year was reported in East Asia (10%) and North America (14%), however, the largest increase in the number of the certificates (13,023) issued was reported in China.

Figure 1 presents the number of the environmental management system certificates in the world issued according to the ISO 14001 standard in 2001-2014. The figure shows that the number of environmental management system certificates was increased almost 9 times between the years 2001 and 2014. Since 2001 to 2014, it can be observed a continuous increase in the number of certificates. The estimated regression model for the certification of environmental management systems in the world shows that the number of ISO 14001 certificates increases by about 23,823 every year. It is due to the fact that the involvement in environmental issues has become an important variable to be taken as part of modern competition strategies implemented by organizations.

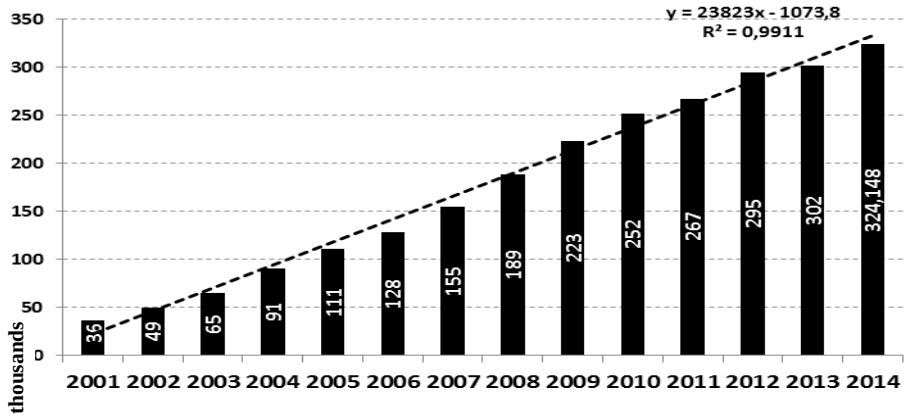

Figure 1. The number of certificates according to the ISO 14001 standard in the world in the years 2001-2011

Source: own study, 2015 based on The International Organization for Standardization – ISO Survey Of Certifications 2014, 2015.

The experience of organizations shows that ignoring environmental issues in business activity brings many negative consequences and their taking into account while making business decisions increases their competitiveness. An example can be General Electric, which was considered to be one of the biggest polluters in the US in the 30s of the last century, which necessitated the payment of many compensations for damages. Today, this organization sees the huge importance of the activities aimed at improving the quality of the environment and holds investments targeted at this purpose.

EFFECTIVENESS OF ENVIRONMENTAL MANAGEMENT SYSTEMS IN THE LIGHT OF THE STUDIES

The effectiveness of environmental management systems is a very interesting issue and, as in the case of quality management systems, there are two extremely different opinions on this issue. According to the first opinion, there is extensive evidence that suggests that organizations can achieve many benefits from implementation of an environmental management system, and the second one tends to claim that such systems generate only costs. The literature on the scope of the effectiveness of environmental management systems shows that there are many authors conducting research in this area.

According to Potoski and Prakash (2005), the compliance with requirements of the ISO 14001 standard leads to reduction of the negative environmental impact of the organization.

The implementation of an environmental management system according to the requirements of the ISO 14001 standard helps organizations to adopt to legal requirements by establishing a systematic management system (2001). A certificate confirming compliance with the requirements of the ISO 14001 standard can provide a guarantee that customer requirements towards environmental protection are met.

A very strong incentive to implement an environmental management system is the pressure of individual groups of stakeholders, which have a large impact on the organization management strategies and are a strong motivator to implement the requirements of the ISO 14001 standard [Anton, Deltas, Khanna, 2004].

Bansal and Bogner (2001) found that implementation of an environmental management system according to the requirements of the ISO 14001 standard was a prerequisite for reliability growth and contributed to increasing confidence among customers in retail business.

According to Hillary (2004), implementation of an environmental management system according to the requirements of the ISO 14001 standard may be related to organizational, financial and social benefits. Organizational benefits, according to Dahlstrom, Howes, Leinster, Skea (2003), are usually associated with ensuring compliance of company's operations with the law, which in turn leads to a reduction in the frequency of inspections carried out by external supervision units. The implementation of a system complying with requirements of the ISO 14001 standard is a guarantee for creation of a management structure for environmental issues. Financial benefits result from the reduction of consumption of resources, waste and improvement of the operational efficiency. As part of social benefits, one may mention awareness increase and positive changes in the behavior of workers [Raines, Summers 2002].

The environmental management system plays a very important role as a useful tool for the environmental protection management in the supply chain. Firstly, the implementation of an environmental management system complying with the ISO 14001 standard ensures the constant improvement of the relationship between the organization and the customer or supplier in the field of environmental protection: the increase of the confidence in the organization and facilitating communication in the field of environmental protection requirements. Furthermore, implementation of an environmental management system allows for more detailed observation of suppliers by

carrying out environmental audits. However, the lack of resources limits the use of audits in the supply chain management in most cases. Examples of good practices in this respect are supply chain management systems in such companies as: Herman Miller, Sony Ericsson or IKEA. Companies require compliance with environmental protection requirements from their suppliers; the suppliers should implement a system being consistent with the requirements of the ISO 14001 standard. As a result, more and more organizations implement the ISO 14001 standard [Darnall 2006].

Moreover, normative requirements may motivate companies to implement environmental management systems compliant with the ISO 14001 standard. An example is the World Business Council for Sustainable Development (WBSD) organization, which encourages its members to take into account environmental aspects in supply chains [Sharfman, Shaft, Anex 2009]. Another example is a situation, when consumers and NGOs require companies to meet requirements of the ISO 14001 standard and take into account environmental problems in the process of delivery. End customer requirements in this respect become a priority. Consumers may demand "green products" or implementation of environmentally friendly solutions [Seuring, Muller 2007].

Cohen and others carried out a test on a sample of 500 US companies being on the Standard & Poor list (S&P500 index includes 500 companies with the largest market capitalization, listed on the New York Stock Exchange and NASDAQ), which publish environmental reports. The main conclusions of the research carried out indicate that the group of companies characterized by a smaller impact on the environment achieved better economic results (however the difference was not significant).

Hart and Ahuja (1996) analyzed 127 US companies being on the Standard & Poor's list. The study showed that the companies which took actions aimed at prevention of pollution achieved better results in respect of emissions within 1-2 years based on the TRI with IRRC (Investor Responsibility Research Center), while the increase in ROE was noticeable but in the longer period. Russo and Fouts (1997) conducted a survey of 243 US companies from various industries. They made environmental assessment (FRDC), the analysis of compliance, costs, waste and ROA. The group of companies, which took environmental actions reached a higher value of ROA. Christmann carried out a study on a group of 88 US companies from the chemical industry. The study confirmed a positive and significant impact of pollution abatement technologies on reduction of production costs.

Valdez and Chini (2002) analyzed business activities of a company from the construction sector in the US. The analysis showed the following benefits resulting from the implementation of an environmental management system according to the requirements of the ISO 14001 standard: fulfillment of obligations resulting from the responsibility for the environment, increase of the awareness of employees and creation of new marketing opportunities.

Melnyk and others (2003) conducted studies on 1,222 managers of manufacturing companies. The main conclusions of the studies are as follows: a significant and positive relationship between the level of implementation of the environmental management system and the efficiency improvement measures referred above.

Wahba (2008) conducted a study on a group of 156 Egyptian organizations from different industries (84 of them had certified environmental management system according to the requirements of the ISO 14001 standard). The main conclusions of the study are as follows: an environmental management system compliant with the requirements of the ISO 14001 standard has a positive and significant impact on the market value of the organization as measured using the q-Tobin ratio.

González–Benito J. i González–Benito A. (2005) based their studies on a group of 186 Spanish companies belonging to the following sectors: chemical - 63, electronic - 96, furniture - 27. From

the studies, it was concluded as follows: the practices of environmental management applied by the companies are a tool for improvement of competitiveness.

Menguc and Ozanne (2005) analyzed economic and environmental variables of 140 Australian manufacturing companies. The following environment variables were analyzed: a high degree of natural environment orientation of companies (NEO) - understood in three dimensions: entrepreneurship, corporate social responsibility, commitment to the development of the natural environment. The economic efficiency variables tested were as follows: market share, sales growth, profit value. The following conclusions were made: NEO (natural environment orientation) has a positive impact on the value of after-tax profit and market share, however it does not translate into increased sales.

It was in order to identify the key determinants for the management that the author conducted studies, in which 180 organizations from Poland participated, which had implemented at least three management systems: QMS (based on the requirements of the ISO 9001 standard); EMS (based on the requirements of the ISO 14001 standard) and OHSAS (based on the requirements of the PN-N 18001 or OHSAS 18001 standard). The organizations could also have implemented the HACCP system (based on the Codex Alimentarius or the ISO 22000 standard) or the Information Security Management System - ISMS (based on the requirements of the ISO 27001 standard).

According to the own studies of the author, the environmental management system had a significant impact on the various aspects of the organization functioning. It was in the organizations subjected to the studies that it was concluded that the system management has greatest impact on improving relationships with customers: 91.1% of respondents. This factor was estimated at 3.7 in the proposed scale of from 1 to 5. Similarly, 91.1% indications were obtained by the factor, which is the product quality improvement (estimated at 3.8). Then there were the increase in resource management efficiency - 89.4% of respondents (the factor was rated at 3.7), process improvement - 87.8% of respondents (respectively: 4.0), promotional effect and organization image improvement - 83.7% of respondents (4.0), increase in the employee satisfaction - 82.1% of respondents (3.2), increase in the customer satisfaction - 81.3% of respondents (3, 6).

ACHIEVING THE SYSTEM EFFECTIVENESS

The literature studies shows numerous examples that environmental management systems could be economically effective. Wysokinska-Senkus and Senkus did research on 180 companies that had quality management system, environmental management system and some other system implemented. The responders had declared that in order to achieve efficiency that had implemented numerous practices including, replacement

of the hazardous raw materials with more ecological ones; reduction of the raw material consumption and better waste management in the production stage; waste reduction in the consumption stage; designing the products for the reuse and recycling. The other practices to implement were preferences for buying eco-raw materials and implementation environmental criteria in the purchasing process. The ranking of the practices is presented on the figure 2.

Also the specific practices need to be implemented regarded to production process like: proper waste disposal process; better air and water filtration; significant reduction of the energy and natural resources; production planning devoted to optimization of the energy and resources use and purchasing of the clean technologies (figure 3).

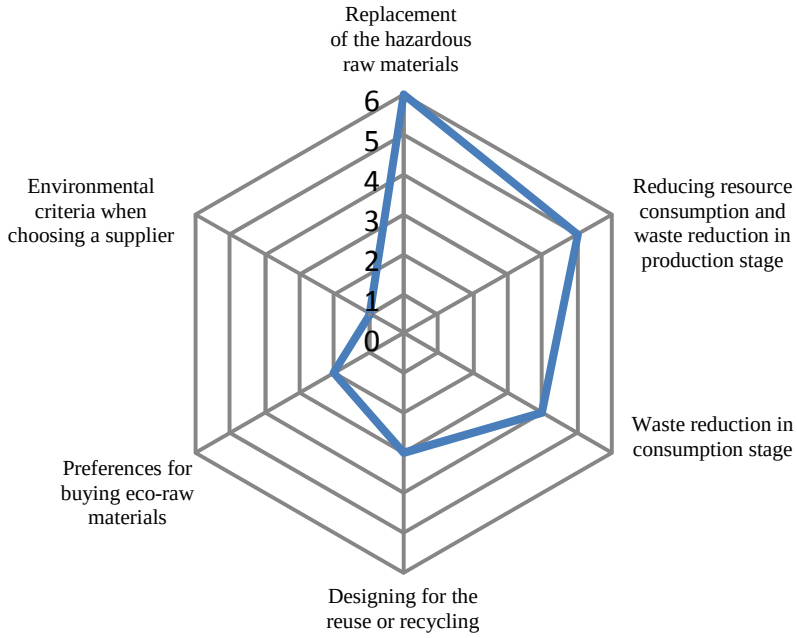

Figure 2. Key actions in the field of environmental management in the design process of products

Source: own study, 2015 based on Wysokińska – Senkus A., Senkus P. (2013). (6-most significant; 1 –least significant)

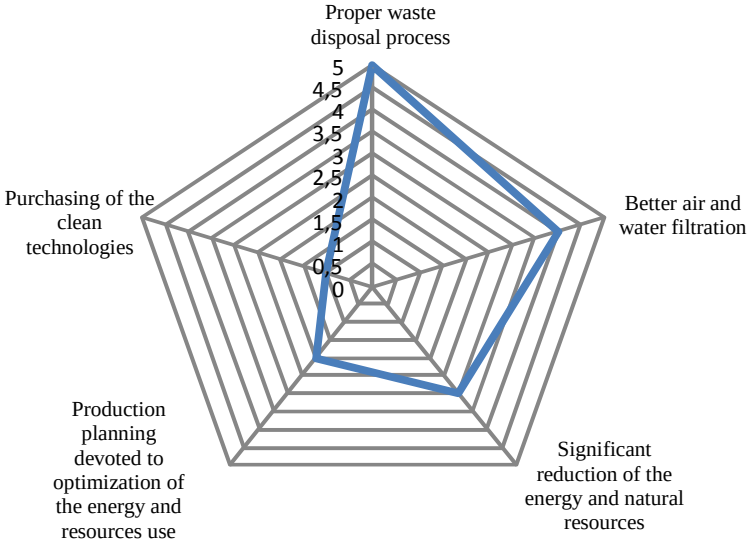

Figure 3. Key actions in the field of environmental management in the implementation of internal processes

Source: own study, 2015 based on Wysokińska – Senkus A., Senkus P. (2013). (6-most significant; 1 –least significant).

Wysokińska-Senkus A. and Senkus P. (2013) have identified the following benefits of the environmental management systems implementation among the researched sample:

- Implementation of the cleaner and more efficient processes;
- Increase of the productivity and lowering operating costs mainly by waste reduction;
- Generate savings;
- Improvement of the profitability and competitiveness of a products or services;
- Help in the market expansion;
- Improvement the organization image of the company and its management system;
- Improved of the relations with stakeholders.

CONCLUSION

Experience of organizations shows that the involvement in environmental issues has become an important variable to be taken as part of modern competition strategies. It is ignoring environmental issues in business activities that brings many negative consequences whereas their taking into account, while making business decisions, increases competitiveness. An example can be General Electric, which was considered to be one of the biggest polluters in the US in the 30s of the last century, which necessitated the payment of many compensations for damages. Today, this organization sees the huge importance of the activities aimed at improving the quality of the environment and holds investments targeted at this purpose. The implementation of an environmental management system according to the requirements of the ISO 14001 standard enables an organization to increase the involvement of managers, more accurate matching to the strategic development directions as well as facilitates defining objectives, their measurement and the management of change in the organization.

REFERENCES

1. Ammenberg J., Hjelm O., Quotes P. (2002), The connection between environmental management systems and continual environmental performance improvements, “Corporate Environmental Strategy” 9 (2), s. 183 – 192.
2. Anton WRQ, Deltas G, Khanna M. (2004), Incentives for environmental self-regulation and implications for environmental performance, “Journal of Environmental Economics and Management” 48 (1), s. 632 – 54.
3. Bansal P., Bogner WC. (2002), Deciding on ISO 14001: economics, institutions, and context, “Long Range Planning” (3), 35, s. 269 – 290.
4. Dahlstrom K., Howes C., Leinster P., Skea J. (2003), Environmental management systems and company performance: assessing the case for extending risk-based regulation, “European Environment” 13 (4), s. 187 – 203.
5. Darnall N. (2006), Why Firms Mandate ISO 14001 Certification, “ Business and Society” 45 (3), s. 354 – 381.
6. Gimenez Leal G., Casadesus Fa M., Valls Pasola J. (2003), Using environmental management systems to increase firms competitiveness, “Corporate Social Responsibility and Environmental Management” 10 (2), s. 101 – 110.
7. González-Benito J., González-Benito O. (2005), Environmental proactivity and business performance: an empirical analysis, “Omega” 33, s. 1 – 15.
8. Hall J. (2001), Environmental supply-chain innovation, “Greener Management International” 35, s. 105 – 119.
9. Hillary R. (2004), Environmental management systems and the smaller enterprise, “ Journal of Cleaner Production” 12 (6), s. 561 – 569.

10. Melnyk S., Sroufe R., Calantone R. (2003), Assessing the impact of environmental management systems on corporate and environmental performance, "Journal of Operations Management" 21, s. 329 – 351.
11. Menguc B., Ozanne L. (2005), Challenges of the "green imperative": a natural resource-based approach to the environmental orientation business performance relationship, "Journal of Business Research" 58, s. 430 – 438.
12. Potoski M., Prakash A. (2005), *Covenants with weak swords: ISO 14001 and facilities environmental performance*, "Journal of Policy Analysis and Management" 24 (4), s. 745 – 769.
13. Raines Summers S. (2002), Implementing ISO 14001 – an international survey assessing the benefits of certification, "Corporate Environmental Strategy" 9 (4), s. 418 – 426.
14. Seuring S., Muller M. (2007), Integrated chain management in Germany – identifying schools of thought based on a literature review, "Journal of Cleaner Production" 15 (7), s. 699 – 710.
15. Sharfman M.P., Shaft T.M., Anex R.P. (2009), The road to cooperative supply-chain environmental management: trust and uncertainty among pro-active firms, "Business Strategy and the Environment" 18 (1), s.1 – 13.
16. Sroufe R. (2003), Effects of environmental management systems on environmental management practices and operations, "Production and Operations Management" 12 (3), s. 416 – 431.
17. The International Organization for Standardization – ISO Survey Of Certifications 2014, 2015.
18. Vermeulen W.J.V., Ras P.J. (2006), The challenge of greening global product chains: meeting both ends, "Sustainable Development" 14 (4), s. 245 – 256.
19. Wahba, H. (2008), Does the market value corporate environmental responsibility? An empirical examination, "Corporate Social Responsibility and Environmental Management" 15 (2), s. 89 – 99.
20. Wysokińska – Senkus A., Senkus P. (2013), Systemy Zarządzania w Świetle Nowych Wyzwań. Ewolucja systemów, jakość, środowisko, Wydawnictwo ROI, Warszawa, s. 112-145.

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ORGANIZATIONAL SAFETY – NORMALIZATION ASPECTS

Abstract: the aim of this article is to show the mechanism of managing risks taken in a standardized way, by using guidelines to organize multiple managing systems. The schedule of this article is set to achieve this goal. In the first part of the article there are represented issues and definitions in the area of risk. Risk management and continuity of action and constant success of organization. In the following part of the article presents issues of standardization in the area of widely considered risk management, standardizing actions aimed at prevention undesirable actions in multiple areas of economic activity. The third part is dedicated to a system of quality management, as a most commonly standardized area, to which the newest requirements include the issues of risk management. After theoretical consideration the author will show practical issues from the area of system risk management, based on his own grant research.

Keywords: risk management (RM), risk management system (RMS), business continuity management (BCM), quality management system (QMS).

INTRODUCTION

Organization safety is a wide issue for every kind of activity economical and non-profit. Multiaspectivity of safety is related to multifacetedness of profiles of organizations and their actions on the market, which implies insurtenty of planned actions and risks influencing the realisation of goals. The initial issue in the area of organization safety is the question of risks, which are characteristical to a given organization, it's internal actions and interaction with the surroundings. Risks are evaluated according to internal criteria, for unexceptional risks, there are preventive actions. Risk management is defined as coordinated actions concerning managing the organization and supervision in reference to risk [ISO 31000,2009]. Storage actions in the framework of risk management are realized in every form of economical activity from the very beginning. Such actions are taken very often in an intuitive way, under subjective influence of decidents. The aim of this article is to show the mechanism of risk management, in a standardized way, aspiring to objectivism in making decisions. The Author raised a question whether, despite the diversity of standardising solutions, which organizations could use in the area of systematic risk management, it is possible to make decisions in this area. In the further part of the article the author shows issues regarding standardization in a widely comprehended risk management, normalizing actions aimed at forbidding unwanted events in multiple areas of economical activity. The subject of standarizing has been shown by presenting norms concerning minimalisation of unwanted events, the norms have been published over the years. In the final part of this description the actual standardizing solutions in the area of risk management. The third part of this article is dedicated to the most commonly standardized area- quality management. The latest standard ISO 9001 [ISO 9001, 2015] contains the area of systematic quality management and risk management. Considering quality as the prime element in creating goods and services, in order to generate income from sales we can show, that managing risks in that area is a equally important matter, as is the definition of quality. The author of this article thinks, that the shape of the present standard concerning a system of quality management is a result of publications of various norms in the area of risk management, which, concerning the lack of put into wide practical usage influenced implementing risk management into

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the area of quality control. Risk management expressed in economic actions, has always been important, however has not found reflection in wide used normative approach in this area. On the other hand quality management, as primary to running any economical activity regards, in its present standardization system subjects of minimising negative events influencing quality – directly organizational, and result of products and final services. After theoretical considerations the author will show practical subjects in the area of risk management system based on his own grant research.

RISK MANAGEMENT, ACTION CONTINUITY, LASTING SUCCESS OF ORGANIZATION

Every rational manager would like his organization to function on the market for a long time and for it to raise its market value. Actions taken are aimed at realising the planned business goals, with simultanious using chances and minimalization of unwanted events. Every organization functions in a different enviroment, characteristic to it because of interpersonal interactions being built over the years inside aswell as outside of the organization. In addition to that there are conditions of macrosurroundings, which to a different degree influence the economical actions. Threats concerning realisation of goals are diverse, and may come from different sources. Taking actions aimed at maximizing chances and minimizing negative events is a practical use of risk management, where risk is described as influence of uncertainty on goals [ISO 31000, pkt. 2.1, p. 1]. Actions concentrating around risk management have a preventing character. Sometimes however risk materializes itself, and then the organization has to take immidiate action minimalizing the negative effect of this unwanted event and, in the shortest time lead to normal function of the company, as it was before the critical situation. These actions can not be taken in a chaotic way, showing that the company is supprised by the given situation. In Risk management we have for example preparation for critical situations. In order to prepare for critical situations it is essential to create procedures concerning action in case of critical situations. Creating and practising these procedures during normal function of the oarganization will influence on methodical actions during a critical situation. Branch norms such as IFS, BRC, ISO 22000 also determine the nessessity of creating and practising ,in simulated conditions, actions during a critical situation [Górna, 2012, pp. 85-95]. Actions taken inn the area of reaction are named action continuity described as a strategic and tactical ability to predict and react on events and malfunctions in the activity, aimed at continuing on a acceptable defined level [BS 25999-2, 2007, pkt. 2.3., p. 4.]. Continuity of action management is a process of managing potential threats and the effects, that the threats may have on the busines activity in case of their occurance, that ensures shaping the companies resistance and enables an effective reaction aimed at protecting the key interests, stakeholders, the companies reputation, brand and activities creating value [BS 25999-2, 2007, pkt. 2.4, p. 5]. Managing the continuity of business actions mainly concernes reacting to critical situations and taking actions in order to minimize its effects and recreating normal function of the company. At the same time those subjects are connected with a outside aspect- the companies image to the clients, which is put into the noticeability on the market and is connected to social responsibility [Kaźmierczak, s. 159]. In the area of consideration concerning risk management in administration processes it is worth it to show the „lasting success of the organization", described as a result of the ability to achieve and keep their goals in a long time [ISO 9004, 2009, p. 11]. In order to ensure a lasting success of the organization it is essential to call attention to multiple aspects of the activity. The key and main element of the companies function on the market is to create a quality offer fullfilling the needs and expectations of the clients. Quality management is often realised as a system implementing the nessesities of the ISO 9001 norm. This commonly used standard has been taken into acount in the ISO 9004 standard as a basis for building a permanent success of the organization. Permanent success is achieved by the companies ability ot fullfill the needs and expectations of its clients and

other sides interested in a long time and in a stable way [ISO 9004, p. 11]. However , to achieve a permanent success it is essential to take many actions, which are preceded by identifying threats, effect analysis and the probability of existance of a unwanted event. Risk management is a set of multiple actions, mainly based in the area of prevention. Forseeing multiple events that may have a negative effect on economic activity ,creating and testing them is an element of prevention and reaction to critical events. Materialization of a risk and arising of an unwanted situation starts the prepared procedures of action, that takes place in the phase of reaction to a critical situation. The aim of these actions is to minimize the effects of the situation and the fastest comeback to a normal function of the company, that in a long perspective will build a permanent of the organization. This is how the basic dependances between the two shown terms are shaped. In order to achieve the result, which is permanent company success, it is essential to take a set of actions, that have influence to a different degree on the result and the shown sucess of the activity.

Here is where we have the basic dillema, how to achieve success and which instruments to use for it not to be a work of coincedence, but a permanent effect of actions being taken. Overall we can say, that the answers could be looked for in a set of all the actions taken on the market, but it is these kinds of dillemas that make the managers reach for standarizing solutions that indicate preciesly the area of taking action and put order into their system realization.

STANDARIZATION IN RISK MANAGEMENT

Standardization is an activity aimed at achieving in given circumstances, a described degree of order and it is a domain of activity for standardizing units. By the end of the XX century there appeared an approach to an integrated risk management in companies in reference to the safety of management [Strzelczak, 2003, p. 37]. At the beginning of the XXI century followed the widening of actions to issues concerning the continuity of actions. [Monkiewicz, 2010, p. 64]. As it was shown continuity of action is described as a strategic and tactical ability to foresee and react to events and disturbances in the business activity. We can determine that the basics of defining action continuity is a narrow engineered approach in the context of reliability of the production process [Zawiła-Niedźwiedzki, 2007, p. 16]. Ongoing informatization of life and technological-economical processes makes the continuity of action of particular organizations associate with access to informatical goods. In this context the issues of continuity of action are identified with ensuring constant action on the level of IT [Kaczmarek, Ćwiek, p. 27].

Until not so long ago the issues of continuity of actions were identified with the area of information safety, and often were put into literature in this context [Bajgoric, 2014].

The system approach to this area is realized according to the norm ISO/IEC 27001 in which we can find the requirements concerning continuity of action in the area of IT. Therefore this term was often treated to this area. Currently more and more popular standardization in the area of continuity of action management and the growing amount of publications and lectures makes this term more widely understood.

In the year 1997 the CAN-SA Q850-97 standard was published, it contained guidelines for the process of risk management, showing its main components. This was a local standard, the interest in a normative approach in this area of function was small. In 2004 a Australian-New Zeeland standard of risk management AS/NZS 4360 , which was used as a base in 2009's norm ISO 31000, that contains guidelines for the process of risk management. And as every norm containing guidelines it cannot be considered a base for outside certification. The british BS 25999-2 standard containing conditions for corporate continuity management that is possible to use for the needs of certification, but the popularity of this solution was not meaningful, compared to other standardized systems of management put into rankings in the ISO survey. The newest standard in the area of continuity of actions management is the norm ISO 22301, that is considered as the successor of the british

standard shown above. This „ISO" norm published by the International Standardizing Organization is meant to be more widely used than the british standard, which is related to the common usage of the ladder, as local, while in the history of standardization it was the british standards that were used as a base for international standards.

As it is with all management standards it is uncertain that this standard will be widely spread. By the end of 2014 1757 organizations in the world had a certificate [The ISO survey 2014 p. 1] confirming the meeting of system requirements, which is a value one year after the norm was published. The issue in its usage is related to the generality, that was shown earlier, when the guidelines to ISO 31000 were published [Leitch 2010, p. 892]. At the same time the amount of certified continuity of action management systems ISO 22301 is only 0,15% of the amount of certified systems of quality management ISO 9001 by the end of 2014 [1.138.155, ISO Survey]. ISO 9001 requirements have obviously a longer lineage than ISO 22301, however in comparison with the newest norm ISO 9001 from September 2015 shows the changes in the structure of the standards. The diversity of standards in the area of risk, and business continuity management systems (BCMS) over the years shows the importance of this area and the need to regulate these issues. On the other hand, the diversity of economic activities makes it difficult to standardize, thereby opened new solutions that are being applied in the market or not had widespread use. Observation of reality standardization work has focused on the incorporation of elements of risk management in general quality management process. Such practical moves were just reflected in the structure of ISO 9001. In order to present a practical background for this approach in the next section of this paper presents the results of research.

RISK MANAGEMENT AND BUSINESS CONTINUITY – RESULTS OF RESEARCH

Because of the above issues the author of this chapter conducted a research in 2012, in Poland organizations which have a certified information security management system ISO/IEC 27001 in the area of risk issues and business continuity. The aim of the project (co-financed with NCN, contract no. 4106/B/H03/2011/40) was to identify potential motives, barriers and benefits of the operation of the business continuity management system among the organizations that have certified information security management system. This research sample was chosen because of three issues. Firstly, because of the management system and compliance with the regulatory requirements, what is the common denominator of every standard system, in this case the ISO/IEC 27001 and BS 25999-2. Second, knowledge of business continuity, due to the adequate requirements of the ISO/IEC 27001, although in a narrow information-information scene. And thirdly, to have practical experience related to the functioning of the management and the necessity of meeting the regulatory requirements.158 organizations gained Access to the questionnaire. Replies were received from 32 respondents from different organizations. Thus, the percentage of the completed questionnaires stood at 20%. The biggest potential motive for the implementation of business continuity management system to BS 25999-2 is improving the resistance of the organization to threats. This approach to consideration of the implementation of the system indicated the functioning of the management positions in the area of prevention. Second, as to the validity, condition of a possible decision to implement a "system of BS 25999-2 'concerns minimizing losses in case of adverse events. In turn, this theme refers to the realm of the reaction functioning of the business continuity management system. Such responses indicate understanding of the issues of business continuity as just one way to prevent undesirable situations, on the other hand, response and mitigation at the time of a crisis, which is fully in line with the concept of business continuity management.

The second analyzed in the survey question were barriers to implementation and operation of business continuity management system. You can certainly assume that, as with any management system based on the requirements of normative, the question of the compliance requirements and

generate time required for project implementation is problematic. However, as part of business continuity management system you need to look at the general purpose of this system, which is to minimize the business risks in the sphere of preventing and preparing the company for instance if necessary. The probable barrier to the implementation of this system will be in the first respect, the issue related to the themes of this system, which is seeing the benefits in comparison with the costs and the work relating to the implementation and maintenance of the system in accordance with BS 25999-2. Based on the available literature test results could indicate that companies who have had in the past problems associated with "normal" conduct of business (as a result of cooperation with suppliers, customers or unreliable events taking source in the environment) are not watching barriers implementation of this system, in addition to general, related to the adjustment measures to the respective requirements. In the context of the barriers associated with the implementation and operation of business, a continuity management system seems to be more useful as an analysis of the area analyzed the scope of the management system. Standard BS 25999-2 requires the identification of key products and services in determining the boundaries of the system. The barrier to implementation may therefore be possible to limit the system to the "slice" of the organization. You can, however, look at it from two points of view. Firstly, an excess of external motives and the desire to hold a certificate, not a system, the lines of the system may favor ,,deployments under certificate". Secondly, in the reverse situation is likely to deter employees of the organization to implement this system due to the restriction in a situation where the processes in the organization are multidirectional and are interrelated and then this will cause the artificial separation of parts of the system, with a very positive approach to the system. Representatives of the organizations that have a certified information security management system ISO/IEC 27001 pointed out the possible barriers on the decision to implement a business continuity management system to BS 25999-2. The need to meet the following regulatory requirements is, according to the average value (when using scale of 1-5), identified as the greatest barrier to implementation of business continuity management system to BS 25999-2 implementation. Although all the means for the individual barriers are below 3 it can be assumed that there are no significant barriers to the implementation of the following scheme. Twelve of the surveyed organizations supported only by information security management system according to ISO/IEC 27001. In eight in addition to ISO/IEC 27001 standard organization meets the requirements of ISO 9001. Four organizations have additional health and safety management systems. Eight organizations have an integrated management system that meets the requirements of four standards: ISO 9001, ISO 14001, ISO 18001, ISO/IEC 27001. It is indicated that the greatest barrier to implementation of standardized business continuity management system is most noticeable in organizations designated as the last - with four certified subsystems management. Detailed analysis of the data shows that organizations that have more than one certified standardized management system are more interested in implementing the business continuity management system than other organizations. The most interested in implementing a "system of BS 25999" are those of the surveyed organizations that in their activities meet the standard requirements of four standards. These are some contradictory results. On one hand, organizations which have several certified management systems at the same time most estimates barriers, on the other hand, are more than the others interested in implementing and certification system for compliance with the requirements of BS 25999-2.

This should be seen through the prism of experience acquired with the operation of a variety of standardized management systems in two areas - the idea of the functioning of standardized management systems and administrative spheres of these systems. The idea is systemic implementation of activities focusing on achieving planned objectives. In this sense, respondents indicate a desire to implement BCMS seeing it right concept for the prevention of the occurrence of hazards and preparation of reactionary measures to be taken in a crisis situation. Simultaneously, the

standardized management systems requires the formal, carry out actions relating to, among others, audits of various parties, conducting management review and to keep proper documentation. The second plane, especially in light of their existing experience with the functioning of various standardized management systems affected the assessment of the barriers associated with the implementation of BCMS. Results-largest barrier to the implementation of a business continuity management system is the need to meet regulatory requirements, and the next barrier is strongly noticeable with time functioning of other certified management systems in your organization. Issues concerning awareness of the risks and related organizations that enhance resilience to the potential hazards have been identified as the strongest anticipated effects of the operation of a business continuity management system to BS 25999-2. It is worth noting that issues concerning the cooperation with existing customers and acquiring new ones, they are not convinced of the respondents the possible benefits of owning BCMS. Probably due to the nature of the organizations that have been certified "the ISO/IEC 27001," so organizations recognized as mature and responsible that through the prism of their experience and collaboration with customers not connect the fact of having another system of acquiring new customers. Perhaps organizations that do not have any standardized management system should assess the benefits far higher. Also interesting is the relationship between the relatively high assessment of the increased likelihood of achieving business goals, and low perception of the benefits related to minimize the likelihood of emergencies. These results show respondents a proactive approach to business continuity management concept as opposed to a passive approach. In the second approach, the "system of BS 25999-2" is treated as a tool which, by their certificate guarantees the security of the organization in the field of resilience to emergencies. Nothing could be further from the truth, because the system, and certified as formal confirmation of compliance, in itself, guarantee nothing. The essence of it is because the current implementation of activities within the framework of business continuity management system and thus their focus on the implementation of the planned targets. Such results the potential effects of the business continuity management system are encouraging, particularly because of the analyzed group of organizations. Respondents with experience of the functioning of various standardized management systems, indicated that treat "system to BS 25999-2" as a tool to prevent undesirable situations, thereby increasing the efficiency and effectiveness of the organization. At the same time reaction sphere is left in the background. The activities are focused on current activities and preparation procedures within the system in case of emergency. However, the analyzed system is not regarded as a defensive shield against the materialization of risks. Of course, a safeguard for emergencies, but are not prime role of this system, which are preventative and long-term organization building resilience to events that could adversely affect the achievement of business objectives. This approach confirms the indication for the most important potential effect of the operation BCMS – improve resistance organization, in conjunction with realizing the risks that affect ongoing operations. It is noteworthy that these results are independent of the type of ownership of the organization and its size measured by the number of employees, customers and suppliers.

The potential implications of business continuity management system have been indicated by organizations having at least the information security management system. These research results through the prism of experience of respondents are optimistic in the context of possible outcomes operation of the business continuity management system of the organization, without far different standardized certified management systems. In the analyzed group of organizations with certified information security management system has been the highest rated two benefits from the operation BCMS: "Awareness of the risks to business continuity" (internal benefit) and "possession of a certificate" (external benefit). At the same time it indicated the external benefit is more strongly identified from the inside , although it should be noted that this does not concern only the issue of a

certificate , but the possibility of passing on the market just building the system and resistance to risk -conscious organizations, which shows the interdependence between the two groups benefit.

As already indicated the British standard BS 25999-2 goes into oblivion in favor of ISO 22301. However, analysis of the history of standardization in the area of risk management and business continuity not necessarily optimistic can look to the future and believe in the growing number of certificates. Optimism may, however, in the opinion of the author exist with respect to the spread of the latest version of the ISO 9001 standard, which the amendment is aimed at incorporating risk management issues just in a standardized quality management system certification which is over the years the most common.

QUALITY RISK MANAGEMENT - CONCLUSION

The activities of each company are focused on the end result, in the form of the product: a product or service, or various combinations thereof. Products that are recognizing and fulfilling customer expectations are a source of sales revenue, which affects the functioning of the organization in the market. Product quality is therefore a key factor for business success, while the resulting quality of organizational activities undertaken within the organization. The supervision of the quality, taking into account the technical aspects can be carried out within the framework of a standardized quality management system standard ISO 9001 latest and previous versions, impose requirements governing the issues of quality, but also introduce the risk issues that need to be taken into account when implementing them. Standard in its content, therefore, take into account the important issue of risk, and at the same time it does so in a general way, resulting in the history of standards in this area that have not found wide use.

Risk management is not a fashion statement but recognized in the activities of business processes every day. Since taking into account the risks in the conduct of economic activities depend on the success of the organization and thus testify to the results of the efficiency and effectiveness of the risk management process [Arena and Arnaboldi, 2014]. The history of organizational approaches to security in terms of standardization shows their diversity. Responding to a question posed itself at the beginning of this paper the author concludes that it is possible the system to take action in the area of risk management in a standardized manner, combining the importance of these issues to rational and a disturbing approach - by implementing a quality management system according to ISO 9001: 2015.

REFERNCES

1. Arena M., Arnaboldi M., (2014), *Risk and performance management: are they easy partners?*, Management Research Review, vol. 37, no. 2, pp. 152-166.
2. Bajgoric N., (2014), *Business continuity management: a systemic framework for implementation*, Kybernetes, 2014, vol. 43, no. 2, pp. 156-177.
3. Górna J., (2012), Determinanty skuteczności identyfikowalności w nadzorze nad wyrobem niezgodnym na przykładzie przedsiębiorstw przetwórstwa mięsnego, Wydawnictwo Uniwersytetu Ekonomicznego w Poznaniu, Poznań.
4. Kaczmarek T.T., Ćwiek G., (2009), *Ryzyko kryzysu a ciągłość działania*. Business Continuity Management, Difin, Warszawa, p. 24.
5. Kaźmierczak M., (2011), *Społeczna odpowiedzialność biznesu – wzmocnienie działań na rzecz zarządzania ciągłością biznesu*, [in:] Zapłata S., Kaźmierczak M., *Ryzyko, ciągłość działania, odpowiedzialność społeczna. Nowoczesne koncepcje zarządzania*, Oficyna a Wolters Kluwer business, Warszawa, s. 159.
6. Leitch M., (2010), *ISO 31000:2009 – The New International Standard on Risk Management*, Risk Analysis, 2004, vol. 30, no. 6.

7. Monkiewicz J., (2010), *Przedsiębiorstwo jako podmiot ryzyka – rozwój koncepcji zarządzania ryzykiem*, w: Monkiewicz J., Gąsiorkiewicz L., *Zarządzanie ryzykiem działalności organizacji*, Wydawnictwo C.H. Beck, Warszawa, p. 64.
8. Strzelczak S., (2003), *Business planning and risk management*, [in:] Strzelczak S. (ed.), *Economic and managerial developments in Asia and Europe. Comparative studies*, Wydawnictwo Politechniki Warszawskiej, Warszawa, p. 37.
9. Zawiła-Niedźwiedzki J., (2007), *Metoda TSM-BCP projektowania rozwiązań zapewniania ciągłości działania organizacji*, w: *Zarządzanie przedsiębiorstwem. Teoria i praktyka*, Akademia Górniczo-Hutnicza w Krakowie, Kraków, p. 16.
10. AS/NZS 4360:2004, *Risk management*, Standards Australia/Standards New Zealand, Sydney/Wellington.
11. BS 25999-2:2007, *Business Continuity Management – Specification*, British Standards Institution, London.
12. CAN-CSA Q850-97:1997, *Risk Management: Guideline for Decision Makers*, Canadian Standards Association, Ontario 1997.
13. ISO 22301:2012, *Societal security – Business continuity management systems – Requirements*, International Organization for Standardization, Geneva.
14. ISO 31000:2009, Risk management – Principles and guidelines, International Organization for Standardization, Geneva.
15. ISO 9001:2015, Quality *management systems – Requirements*, International Organization for Standardization, Geneva.
16. ISO 9004:2009, Managing for the sustained success of an organization – A quality management approach, International Organization for Standardization, Geneva.

Jacek Łuczak [22]

MONITORING THE EFFECTIVENESS OF MANAGEMENT – SAFETY AND CRISIS MANAGEMENT ASPECTS

Abstract: Measurement, understood as the process of acquiring information and analysis through the prism of assumptions related to a product or a service, is an integral element of management. Consequently, it affects decision-making – depending on the approach, whether it is a noncompliance or corrective action, or the process is approved of in a given form.

There are many measures, groups of measures and their characteristics. In all instances they are related to process effectiveness. Sometimes they amount to the essence of the management conception as in MBO, Lean Manufacturing; Human Performance Improvement as well is behavioral models. The measures may be divided, for example, in relation to the scope of appliance – productivity measurement, effectiveness measurement, technical exploitation, quality process, setup time, logistics.

Measures related to emergencies are becoming increasingly appreciated. They contribute to the management system and aim at presenting the readiness for potential emergencies. The measures consist in risk assessment on the basis of which actions related to unacceptable risk treatment are planned. The measurement of information security, and more widely: crisis management, is crucial for the clients' overall safety – it is a simple signal that in the case of possible threats the continuity of functioning at a given level is assured.

Relevant research has been conducted - in-depth interviews in the group of 7 enterprises, among experts. All enterprises were selected according to mature standardization. The aim of the research was the identification of methods and techniques used by the enterprises in order to define measures related to risk and crisis management, as well as to define their motivation, criteria and effectiveness assessment criteria.

The research resulted in identifying the management areas in which risk assessment is applied, indicating and classifying methods, evaluating the organizations' motives as well as their employees' attitudes to the relevant issues.

Key words: risk management, continuous management**,** crisis management**,** process management**,** process performance

INTRODUCTION

The questions of increasing the effectiveness in production and service organizations have become one of the determinants of research in management in 20th and 21st centuries. In professional literature effectiveness, efficiency and productivity are frequently subject to discussions in which they are defined in a contrastive and incoherent manner. It also affects the objectives set for realized processes, projects or in the other organization of management. Hence, it is important to define key terms within the aforementioned scope, i.e. expectations of the process effectiveness measurement system. The measurement of process effectiveness and efficiency in relation to risk assessment, safety and crisis management is often overlooked in this context.

Measurement, understood as the process of acquiring information and analysis through the prism of assumptions related to a product or a service, is an integral element of management. Consequently, it affects decision-making – depending on the approach, whether it is a noncompliance or corrective action, or the process is approved of in a given form.

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In the IT industry KPI (Key Performance Indicators) are established, whereas in the automotive industry special characteristics are distinguished; the indicators are not always measurable – it is important to be in search of them, define acceptance levels, realization criteria and assessment formulas.

Numerous groups of indicators of significant interest for clients in B2B relation may be distinguished. These indicators are frequently key elements of effectiveness management and measurement as well as process effectiveness.

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Management based on risk is mostly concerned with mature corporate enterprises. It is a more advanced stage of the management system development due to the fact that it requires investment in mostly intangible issues. The evaluation of these issues is more difficult and is often misunderstood in relation to other more real needs of an organization. Clients amount to the significant motivating force in this regard as their requirements encourage suppliers to develop the area of risk assessment and crisis management.

DEFINITIONS AND SYSTEMS RELATED TO EFFECTIVENESS AND EFFICIENCY MEASUREMENT

According to Kotarbiński an action can be described as effective if it leads to the intended result constituting its aim [Kotarbiński 2003, p. 74]; consequently, an aim is defined as an intention which is formally established and predicted to be achieved in the future while being rooted in social and economic needs of its environment [Stabryła, Trzecianiecka 1982, p. 316]. Effectiveness is most frequently described as the extent to which the aim is realized, whereas efficiency takes into account input. Authors often perceive the last two terms as synonymous.

A wide spectrum of terms have been included in the relevant scope, e.g. productivity, solvency, proficiency, usefulness. Moreover, it is extremely difficult to determine the relations between the aforementioned categories [Bielski 2004, p. 60]. On the other hand, efficiency is quite unambiguously defined as the relation between the output and input [Penc 1997, 99] [Pisieczny, Więckowski 1987, p. 14].

The discussion concerning the terms amounts to the basis for touching upon a more important subject related to success criteria of an organization. In this regard the spectrum of terms is even wider as it is enriched with the following notions: solvency, fluctuations, absence, productivity and many others [Katz, Kahn 1979]. Professional literature includes numerous descriptive models connected to an organization's effectiveness, e.g. the model discussed by P.C. Light [Light 2005]. The author indicates the pillars of an effective organization:

- readiness and openness to future challenges,
- positive strengthening of an organization's participants and effective communication,
- flexibility by dint of learning and applying numerous indicators,
- unequivocal realization of the strategy, concentrating on key objectives.

A similar approach is presented by Peters and Waterman. According to them an organization's effectiveness may be defined as its capability to adjust the strategy, systems, leadership style, structure, abilities, leadership and work style [Peters, Waterman 1982].

We may indicate management systems which focus on the effectiveness of management. Such systems embrace popular and fashionable in the last decade lean methods and much more traditional conception of complex quality management as well as management by objectives developed by Drucker and Locke, including the HPI (Humen Performance Improvement) model – a tool used in order to evaluate the effectiveness of employees. Behavioral conceptions, rooted in the analysis of behavior and undertaking actions aiming at changing it, should also be noted [Needham 2005].

P. Drucker in 1954 observed that in management we should mainly focus on the way objectives are defined and measured. Only measurable elements are significant, the remaining ones will not be taken into account [Drucker 2005, p. 111]. Professional literature includes a number of universal measures allowing monitoring and evaluation. The measurement system and exploitation measures (MTBF, MTTR), SMED, overall equipment effectiveness (OEE), process capability measures (Cp, Cpk) and TPM should primarily be noted.

MANAGEMENT BY OBJECTIVES

The conception of management based on objectives and effectiveness measurement system was initiated by P. Drucker [Drucker 2005]. The system has been developed by numerous theoreticians, and consists in defining and consulting an organization's objectives by managers as well as in measurement in order to provide information to support management decisions. Employees are entrusted with the realization of the task. Moreover, the measures for effectiveness evaluation are defined. The defined objectives are cascaded during which objective operationalization is the key element. The operationalization consists in materialization and measurement of functionality [Reinfusso 2009, p. 53]. The parameterization of objectives is excellently characterized by Armstrong who states that the essence is the result and not the effort related to its achievement, and that the executor should have influence on its achievement. Moreover, accessibility and proper structure along with objectivity during measurement are necessary. Consequently, the previous measurement methods should possibly be adjusted. [Armstrong 2000, p. 397].

The conception, however, has many opponents, including W.E. Deming who emphasized in his management principles the necessity to eliminate quantitative objectives in favor of quality objectives. Furthermore, Deming postulated the need to plan the rules of achieving them as an essential condition allowing achieving them. Deming also took notice of negative consequences of reducing the scheme to the objective-realization relation [Deming 2000]. It this regard not only does the conception concern understanding and implementation but also the essence and legitimacy of effect measurement.

Negative opinions in relation to management by objectives are quite popular. J. Stoner and Ch. Walker noted the need to change the behavior of top management to an extent depending on the leadership style (the more authoritarian the style is, the bigger change is required). The success of the implementation calls for real, genuine involvement and support of management at all levels. Effective communication between different levels of the organization is necessary, but it is conditioned by skills, abilities and training [Stoner, Wankel 1992, p. 86]. Furthermore, it should be stressed that even properly determined objectives relate to merely a fragment of the required professional activity of an employee. In some instances it is impossible and illegitimate to find some tasks more important than others; frequently actions conducted on the regular basis are significant for the organization. Finally, by determining objectives we focus exclusively on defined actions and do not take into account other activity. Not only is it difficult to set objectives but also it is troublesome to select proper measures which will allow presenting the actual degree of the realization of an objective in an adequate manner.

Management by objectives has been the subject of numerous researches realized in various forms since the beginning of the conception's development. Consequently, the advantages of applying this method have been defined which confirms its strong position in management:

- the unambiguity of expectations towards employees – it causes the sense of comfort for employees and managers;
- the possibility of more effective and unequivocal action planning and employee evaluation;
- a tool for successful communication between management levels;
- communicating expectations on the scale of the whole organization;
- limiting actions not related to the required activity of employees;
- the possibility of positioning themselves by employees at a given level of an organization [Caroll, Tosi 1970, p. 295-305].

PERFORMANCE EFFECTIVENESS MEASUREMENT

In professional literature and practice a number of economic measures are applied. They reflect facts in relevant units within separate economic categories. Contemporary observation of processes entails applying appropriate measures producing the results on the basis of which management decisions are made [Twaróg 2005, p. 13].

J. Twaróg claims that the effect measurement of an organization should be conducted at three levels:

- the set of measures used in the measurement system;
- individual measures;
- relation between the measurement system and the environment in which it has been established.

Numerous authors have presented their definitions of performance effectiveness measurement. For example, B. Moseng and H. Bredrup noted that the measurement system integrates three measures: efficiency, effectiveness and the capability of an organization to adopt to changes [Moseng, Bredrup 1993, p. 198-206].

During the selection of effectiveness measures it is necessary to take notice of some methodological issues. According to B. Maskell they are as follows:

- measures must stem from an organization's strategy;
- financial measures should not be the only type of measures applied;
- the variety and adequacy of measures in relation to the specifics of the area;
- the verification and modification of measures, depending on changing conditions;
- the simplicity of application;
- the pace of achieving results;

- emphasis on growth [Maskell 1989, p. 33].

In addition to the abovementioned elements S. Globerson mentions the significance of data objectivity, benchmarks as well as the need to discuss and acceptance granted for the level of defined objectives [Globerson 1985, p. 640-645].

The research of R.S. Kaplan and D. Norton amounts to an important voice in the discussion. They indicate that financial measures must not be the only effectiveness measures. Hence, they promote perspectives and exemplary indicators:

- financial perspective (cash flow, ROI);
- customer perspective (customer satisfaction index, customer rating, market share);
- internal processes perspective (complaint level, JIT, new product index);
- learning and growth perspective (employee evaluation, trainings) [Kaplan, Norton 2001].

Other authors mention different proposals of measures, e.g. P. White defines more than 100 of them [White 1996, p. 45-55]. K.F. Cross, R.L Lynch proposed the performance pyramid which indicates the correlation between effectiveness measures at different levels of an organization. A number of various measures have been presented by, among others, N. Slack, M. Lewis, S.C, Wheelright [Slack, Lewis 2008; Wheelright 1984, p. 77-80].

PROCESS PARAMETERIZATION AS A BASIC OF THE EFFICIENCY RESEARCH

Along with the popularity of the ISO 9000 series standards, as well as independently of the "ISO phenomenon", process approach has become a highly significant element of management. While realizing a project of process management in an organization it is necessary to conduct process mapping, modeling and measurement.

Effectiveness measurement is a significant feature of both process approach and quality management systems in conformity with ISO 9001. Therefore, there is a need to parameterize processes (Grajewski, 2007, p. 79-87). In practice it is linked to the need to define:

- main quality features;
- result and leading measures;
- target values of measures.

Parameterization should be conducted for individual processes within the process map. Hence, objectives, measures and target values are defined in the quality management practice, at least for so-called megaprocesses. At the next stage objectives, measures and target values for the basic processes are defined (sectors of lower level). Finally, these parameters are established for the lowest sectors – the operational level. As the result of these actions every worker is aware of objectives and tasks defined in the frames of a given process.

PROCESS MANAGEMENT IN SELECTED ORGANIZATIONS

The case study included deliberately selected 5 enterprises which have certified quality management systems (ISO 9001 or ISO/TS 16949). All the enterprises declare involvement in the realization of the process management conception. In this case certificates guarantee meeting at least the basic requirements concerning process management, independent of the veracity of the declaration. The organizations belong to the group of medium-sized enterprises; three of them amount to a part of bigger concerns; all of them are production enterprises.

The analysis of the enterprises has been focused on existence and functionality of key process management elements. In-depth interviews were conducted in head offices of the above-described enterprises in 2011 with plenipotentiaries for quality management, in one case with lean manager.

All the enterprises presented process maps, yet only in three cases they had been created according to the accepted methodology; in the remaining cases the maps had an intuitive character – they were frequently inconsistent or even did not meet basic definitions of processes.

Only in two cases the architecture used professional notations (BPMN), VACD and EPC diagrams, and included at least three levels. Hence, only in these two cases architecture was detailed enough in light of process optimization. In one organization supportive process management software was employed (Corporate modeler).

Three of the organizations analyzed in the research had at their disposal merely very general process maps which had been created at the stage of implementing the quality management system. Processes were divided into two groups – basic and support processes.

Despite the fact that all of the abovementioned organizations met requirements included in ISO 9001 standard, it is difficult to agree with the thesis that they employ process management (except for one case). Processes were defined, the relations between them were described, system documentation embraced methods and criteria of their realization. Process architecture; however, was limited to only one, occasionally two, levels consisting of processes presented uniquely in the form of VACD diagram. Thus, it is impossible to undertake actions which optimize processes on the basis of analyzing measures which make up a given process. Processes were described only in general and with no reference to particular actions. Furthermore, processes did not constitute a basis for planning, system documentation, and they did not define duties and entitlements of workers. The description level of processes did not allow measurement and factual analysis based on data.

In one case of an enterprise which acts on an extremely demanding market of auto industry and medical equipment the process map was the genuine basis for management. Process architecture had been modeled on four levels, the lowest of which was presented in the form of EPC algorithms. Quality management documentation was generated automatically on the basis of EPC algorithms. Planning and simulating activity in the frames of VSM, Lean and also TPM originated in processes.

RISK MANAGEMENT AS THE BASIS FOR DEFINING CRUCIAL ELEMENTS OF CRISIS MANAGEMENT

Risk management is a requirement increasingly often posed by standards or clients. However, a key practical question is whether the chosen method of assessment and risk management are useful for ensuring quality and safety of products and processes in practice. Ensure effective in this respect is difficult, especially in cases of the transfer of technology or technical changes to processes and products. Each of these and many other situations that should result in the revision of estimated risk, and actions based on the result.

By applying the aforementioned approach to risk assessment we may define a methodical approach to determining the necessary procedures in the context of crisis management related to maintaining business continuity.

CHARACTERISTICS OF SAFETY RISK ASSESSMENT METHODS

In theory and in practice several dozens of methods for risk assessment and evaluation are utilized. These methods can be divided into 3 following groups:

- quantitative methods;
- qualitative methods;
- hybrid methods [Sułkowski 2004].

Qualitative risk assessment is most often a subjective evaluation which is based on best practices and experience. The outcome of such an assessment is a list of threats ranked by their risk level (low, medium, high). Qualitative methods are very flexible and open to various kinds of modifications. Owing to their flexibility and modifiability they provide the organization with fast and cost-effective results when identifying threats and deploying security measures is concerned. However, the flexibility the scope and cost of risk assessment in different organizations can vary to a significant extent. That is why, depending on the available financial resources allotted for this purpose in the budget the scope of risk assessment may change in the course of time.

In qualitative risk analysis all risks and potential effects of their occurrence are presented in a descriptive way. It entails using risk scenarios and determining the effects of potential realization of risk. The scenarios should include numerous details which are helpful in taking specific actions and choosing proper security measures. In widespread use, there are various scales to describe specific situations and incidents.

In quantitative risk assessment it is essential to determine two basic parameters - the value of effect and the probability of occurrence of a specific risk.

The potential effects may be determined by evaluating the effects of risk occurence or extrapolated on the basis of data from the past. The consequences of risk events may be expressed by means of different categories (e.g. financial, technical, operational, human resources).

The overall quality of the analysis depends on the accuracy of indicated values and statistical validation of the deployed model.

Both quantitative and qualitative methods have some disadvantages. First of all, they are too general. Second, they do not identify all the needs with regard to safety in a precise way. Apart from that, they do not provide the organization with sufficient information concerning the cost analysis when deploying new security measure. Hence, the majority of companies make use of the combination of the two approaches. On the one hand, qualitative analysis founded on scenario-based methods is used to identify all risk areas and potential effects of specific risks. By contrast, quantitative analysis is used to determine the costs associated with the effects of risk occurrence. This also leads to significant increase in knowledge related to processes realized in an organization, and raises awareness on the potential risks.

The Failure Mode and Effect Analysis (FMEA) is mainly a method to support quality management, however, the concept and rules of risk assessment (organzsational and technological) may also be applied in the case of safety product risk assessment.

The Operationally Critical Threat, Asset, and Vulnerability Evaluation (OCTAVE) is a set of guidelines developed at Carnegie-Mellon University in 2001. This method is used, for instance, by the US army, and is getting more and more popular in other, mainly large, organizations.

The Control Objectives for Risk Analysis (COBRA) is a complete risk analysis method designed for the board and management of an organization to thoroughly evaluate the profile of risks related to the conducted activity. Particular attention is paid to the security of the image, conformity with applicable legal regulations and laws and to internal control mechanisms.

The CCTA Risk Analysis and Management Method (CRAMM) is a risk analysis method developed by the British Central Communication and Telecommunication Agency (CCTA) whose name was changed to Office of Government Commerce (OGC). The integral part of this method is a special IT tool for risk assessment (CRAMM). Using the method without the CRAMM software tool can be difficult.

The method MARION (Methodology of Analysis of Computer Risks Directed by Levels) was developed by the CLUSIF (Club de la Sécurité de l'Information Français), and the last update was performed in 1998. Nowadays, CLUSIF does not longer finance nor promote the method as the financial resources were reallocated to another, newly developed, method, i.e. MEHARI. However, this method is still used by many organizations.

It is possible for the organization to use its own methods which are developed on the basis of industry knowledge and experience. This approach, however, is only appropriate for large organizations which have proper organizational structures to develop and validate such a method. The biggest advantage of it is being fully aware of the method as well as the whole risk assessment process by all people involved in the processes related to it. Obviously, there is a danger that the developed method may turn out to be ineffective and that the organization shall not be granted a recommendation during the certification audit. In consequence, it may also not be awarded a

certificate. For this reason, small businesses do not decide to develop their own methods and prefer to choose one of the methods which are already available. Such ways of proceeding are usually approved of auditors during certification audits. Finally, small businesses do not usually have sufficient human resources to develop their own methods.

THE EVALUATION OF THE EFFECTIVENESS OF CRISIS MANAGEMENT AND BUSINESS CONTINUITY PROCEDURES

Seven organizations, which function in Poland and declared significant maturity within the scope of management systems, were subjected to the research. Not all of them had certified systems (4 of them - ISO 16949, 4 of them ISO/IEC 27001, 3 of them ISO 14001, 2 of them ISO 20000-1). It was a preparatory research and aimed at determining the scope of future research in functioning of the business continuity management processes, the structure of documentation and, last but not least, the way monitoring is conducted.

The research was carried out in the form of in-depth direct interviews of representatives of top management (information security administrators, IT security administrators, representatives of top management for the management system issues, IT directors). The research was conducted in the course of 6 months (03-09.2015).

In 5 organizations some processes, or at least procedures, directly concerned with business continuity assurance were identified. They were coherent and documented. However, only in 3 instances the processes/procedures were correlated with the process of risk management. In the remaining cases there was no such a correlation and risk assessment was conducted only as fulfilling requirements – the standard amounting to the basis – or within corporate guidelines.

Each of the organizations performed risk assessment, only 4 of them in relation to information security. In the cases of 3 organizations the MEHARI method was applied, 3 other organizations had their original methods of risk assessment.

None of the organizations had business continuity management procedures at the same priority level as other procedures which could also be seen in the lack of any mechanism allowing the evaluation of performance effectiveness. The research showed that the organizations carried out backup in an operational manner. However, scenarios going beyond monitored processes and business continuity maintenance are not tested. The interviews confirmed that some more advanced processes, e.g. launching services in different locations, relocating production lines etc., function only formally.

CONCLUSIONS

Professional literature provides us with numerous conceptions relating to the measurement of effectiveness of economic processes. For many other conceptions it is a key assumption, e.g. LM, management by objectives, process management. The need to conduct measurements is indisputable, however, there is no agreement at the level of defining some key questions, e.g. connected to effectiveness, efficiency, productivity etc. There are many views on the understanding and legitimacy of setting objectives as well as the way and legitimacy of measurement. In this regard authors agree only in the area of financial results and the view that measuring only financial results is by far not sufficient.

The conducted research was a preparation for a more comprehensive evaluation of monitoring the effectiveness of business continuity plans and crisis management. In-depth interviews provided knowledge of weak coherence and lack of correlation of such processes in the context of the key process of risk assessment.

REFERENCES

1. Armstrong M. (2000), *Zarządzanie zasobami ludzkimi*, Kraków, Oficyna Ekonomiczna, s. 397.

2. Bielski M. (2004), *Podstawy teorii organizacji i zarządzania*, Warszawa, Wydawnictwo C.H. Beck, s. 60.
3. Cross K.F., Lynch R.L. (1992) *Food good measure*, CMA Magazine, kwiecień, s. 20-23.
4. Deming W.E. (2000), *The New economics for industry, government, education, Second Edition*, Boston, MIT Press.
5. Drucker P. (2005), *Praktyka zarządzania*, Warszawa, MT Biznes.
6. Globerson S. (1985), Issues of developing a performance criteria system for organization, *International Journal of production Research*, vol. 23, no 4, p. 639-646.
7. Kaplan R.S., Norton D. (2001), *Strategiczna karta wyników*, Warszawa, PWE.
8. Katz D., Kahn R.L. (1979), *Społeczna psychologia organizacji*, Warszawa, PWN.
9. Light P.C. (2005), *The four pillars of high performance, How robust organizations achieve extraordinary results*, New York, McGraw-Hill.
10. Maskell B. (1989), Performance measures of world class manufacturing, *Management Accounting*, May, p. 32-33.
11. Moseng B. Bredrup H. (1993), *A methodology for industrial studies of productivity performance*, Production Planing and Control, vol. 4, no 3, p.198-206.
12. Needham A. (2005), Discretionary effort – every employer wants it. B-innovative, *Auckland Chamber of Commerce Professional Journal*, June.
13. Pasieczny I.J., Więckowski J. (1987), *Ekonomika i analiza działalności przedsiębiorstwa*, Warszawa, PWE, s.14.
14. Penc J. (1997), *Leksykon biznesu*, Warszawa, Placet, s. 99-100.
15. Peters T.J., Waterman M.H. (1982), *In search of excellence: Lessons from America best companies*, New York, Harper and Row.
16. Reinfuss R. (2009), *Prosta i skuteczna technika zarządzania Twoją firmą*, Gliwice, Helion, s.53.
17. Slack. N., Lewis M. (2008), *Operations strategy*, Pretnice Hall, Pearson Education
18. Stoner J., Wankel Ch. (1992), *Kierowanie*, Warszawa, PWE.
19. Twaróg J. (2005), *Ekonomiczne podstawy mierników działalności przedsiębiorstwa*, w: Twaróg J., Mierniki i wskaźniki logistyczne, Poznań, Instytut Logistyki i Magazynowania, s. 13.
20. White P. (1996), A survey and taxonomy of strategy related performance measures for manufacturing, *International Journal of Production and Management*, vol 16, nr 3, p. 42-61.

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FINANCIAL SECURITY IN ELECTRONIC BANKING

Abstract: The purpose of this work is to analyse the activities, whose aim it is to ensure financial security of the provision of electronically supplied services. The research covers electronic banking in Poland. The analyses were conducted on the basis of data and works concerning electronic banking security. An analysis of the collected body of subject-matter literature and the synthesis of the knowledge contained therein, as well as an analysis of the statistical data, whose results are illustrated below with the use of graphic images, were helpful in the execution of this method. The research outcome indicates that the development of electronic banking services is impossible without the constant monitoring of their security.

Key words: security, electronic banking, payment cards, cash machines, phone banking, internet banking.

INTRODUCTION

The development of electronic banking, including the dynamically developing internet banking, based on electronic data processing, results in an increase of the various forms of criminal activity targeted against data security, which threaten the financial security on the banking services market and in particular the security of the financial means deposited on a bank account, which may be accessed remotely by means of devices for electronic processing and storage of data, such as: a computer, a telephone, etc. [Górnisiewicz, Obczyński, Pstruś 2014].

The electronic transactions security issues are, therefore, the basic condition for the development of the electronic banking services. It is a tremendous challenge for a bank to overcome this development impediment, described as a security barrier. It involves the need to invest in the relevant technologies to secure the banking system from unauthorised access by third parties. To earn the trust of depositors, a bank needs to convince them of the effectiveness of its activities, which turns out to be a particularly difficult task because the news of the spectacular crimes committed in this area which are broadcast by the media, bear a much more negative meaning than the actual effects of the crimes; which is why "there arises a problem of convincing the hypothetical users, including the customers in particular..." [Węsierska 2004].

METHODS TO INCREASE THE SECURITY OF TRANSACTIONS PERFORMED WITH THE USE OF CASH MACHINES AND CARDS

Along with the development of the payment cards market, there begun to appear new phenomena connected with various forms of abuse and crime. Not only did their focus on this payment instrument limit the banks' profits, but it also undermined the customers' trust in this payment instrument.

Fraudulent operations may be connected with the obtaining of payment cards under false pretences, the use of stolen or lost cards by unauthorised persons, the forging of payment cards, the copying of payment cards on debit accounts, the illicit use of the card number, the use of a card reported a as lost, theft, remote purchasing with the use of someone else's card or skimming [Masiota 200].

As Narodowy Bank Polski informs on the basis of the information submitted by banks (Figure 1), the number of fraudulent operations conducted with the use of payment cards was 40.5 thousand in 2014 and their total value reached PLN 15 million.

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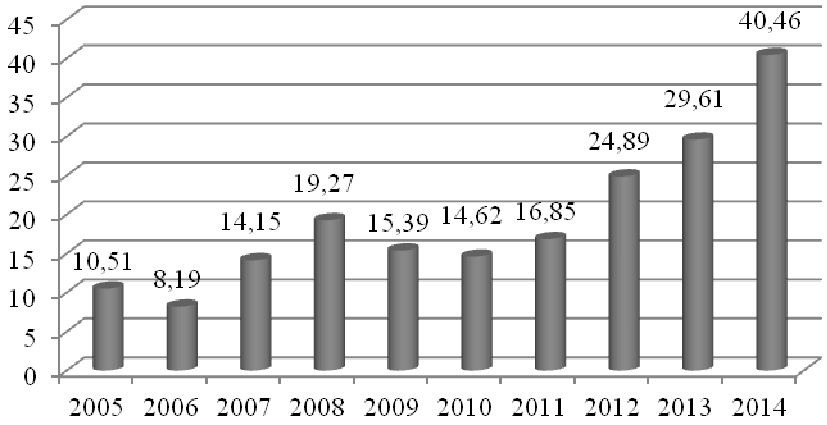
One of the dangerous and most common crimes on the payment card market is skimming. The criminals fix devices to the cash machines thanks to which they skim the cards. For effective skimming, there are skimming devices fixed on the slot into which you push the card. In this manner all information from the magnetic stripe is scanned and then encoded on any piece of plastic with a magnetic stripe. However, the contents of the magnetic stripe are not enough. What is needed is the PIN code. Two methods are used to obtain it. A miniature bar with a camera is fixed over the keypad or a bogus keypad which is fixed on the real one. This enables the PIN code entry and cash withdrawal. [Górnisiewicz, Obczyński, Pstruś 2014].

Magnetic stripe cards are potentially vulnerable to abuse on a large scale. These instances of abuse forced the card issuers to adopt a number of security solutions, not only in respect to the information on the magnetic stripes [Bury 2001]. Therefore, a payment card bears: a card number, a card expiry date, the card holder's personal data, a hologram, the payment organisation's logo, the card holder's signature, the card holder's picture (which is not commonly used, however), security components visible in ultraviolet rays, microprinting as the characteristics playing the role of security means [Bury 2001, Jurkowski 2001, Masiota 2003, Piesik 2007].

Figure 1. The number of fraudulent operations conducted with the use of payment cards in the years 2005-2014 (in thousands).



Source: Own work on the basis of NBP data: Ocena funkcjonowania polskiego systemu płatniczego w II półroczu 2014 roku (Assessment of the operations of the Polish payment system in the 2nd half of 2014) Warszawa 2015.

As the magnetic stripe cards have many disadvantages, which result in an increasing number of abuses, there began analyses of the weaknesses of this model and attempts were made to eliminate them [Bogacka-Kisiel 2000]. One way to prevent card frauds is the implementation of the chip technology based on a microprocessor. Chip Cards (as their popular name goes) are practically copy-proof, therefore skimming is virtually impossible in their case. Moreover, all transactions made with chip cards are confirmed with a code instead of the customer's signature [Pietkun 2007].

The microprocessor cards constitute a foundation for the further development of banking services, because they are able to provide the customers, and the commercial and service entities, with more security, comfort and flexibility. The microprocessor enables also an individual customer

service and the execution of extra functions, not only payment related ones, such as: loyalty schemes.

Cash machines have also been drawing the attention of criminals for years. The cash machine designers and manufacturers conduct constant research over the implementation of modern solutions, including cash machines which verify the credibility and identity of the customer by scanning their retina or by using biometric customer identification systems. There are systems tested, which are based on the analysis of fingerprints, signature handwritten on a special plate or hand geometry. To eliminate the possibility of copying and illegal use of information about the retina, there are cryptographic functions applied which process the information and return the so-called hash code to the bank. The system confirms the customer's identity on the basis of the hash code. In the opinion of the manufacturers of these devices, they are proof to fraud attempted with the use of false pictures or holograms [Pluskota 2003].

Moreover, cash machine devices have a technical system of security means, which includes opening sensors of the upper and lower dispensing mechanisms, an electronic lock prohibiting access to the lower dispensing mechanism, seismic sensors, a temperature sensor, a camera to monitor the area around the cash machine, an alarm system connected with the structure in which the monitoring centre, security agency or the closest police station are located.

It is, of course, worth to remember, that the crimes remain marginal to the regular transactions and more than 99,9 out of 100 transactions made with a payment card are fully secure; therefore, it is not recommended to fear payment card crimes excessively, as they are additionally prevented by the banks themselves and the payment organisations which use the methods described above.

METHODS TO SECURE PHONE BANKING

In order to encourage bank customers to fully exploit the possibilities offered by the call centre service, not only does it need to be user-friendly and comfortable, but it also needs to have one essential advantage, which is important from the perspective of both the bank and its customers. It is, naturally, the security guarantee of the phone line. Each party to the phone banking service must be almost absolutely sure that the person making inquiries or orders is the person authorised to do it, i.e., that there is no possibility that an unauthorised person is pretending to be the account holder or is eavesdropping.

Unfortunately, just like many other security systems this one is also far from being perfect as far as order authorisation control is concerned. To prevent such situations and out of concern for its own and the customers' interests, banks additionally record all conversations conducted with the phone banking officers. Such records may be later used for the purpose of resolving complaints, and also for the purpose of potential penal proceedings [Dolecki 2003]. A promising sign of a new generation of security means preventing such frauds may be the automated interlocutor recognition system based on the latest developments in the field of audio forensics. This new IT development conducts an analysis of the individual speech signal parameters, which a fraudster cannot imitate, which in turn makes it impossible for them to steal someone else's identity [Rzeszotarski 2005]. A further advantage of the system is its swift reaction and the possibility to warn the phone service officer of any suspected customers before the transaction is executed.

For the encryption of data transmitted via a mobile phone equipped with WAP, however, the so-called WTLS[24] protocol is used, which implements the authorisation and encryption options by encrypting the data transmitted between the cell phone, the GSM operator and the bank [Wroński 2004]. Communication between the bank customer and the bank server is conducted via the GSM networks connected by a WAP gateway, which ususally belongs to a GSM operator. SSL

[24] WTLS – Wireless Transport Layer Security.

encrypting takes place on the route from the telephone to the gateway and from the gateway to the bank's server. Moreover, the customer is identified by the unique and confidential numbers known only to them, which they enter during the log-in stage, namely the customer identification number and the PIN [Borowski, Ślązak 2007]. The above allowed for an increased range of operations possible to conduct through the discussed distribution channel. As of today, the WAP-based bank services not only allow their customers to passively review the offer, but also enable them to actively manage their funds.

Apart from conversations, mobile phones enable data transmission, faxing and SMS. SMS are perfect for sending and receiving messages to and from the bank. SMS enable the customers to submit their orders to the bank, and enable the bank to send back a confirmation of the performed operations. There is, naturally, the problem of security of the transmitted data involved in the process of submitting orders through SMS. There are the relevant data encryption and sender identification systems dedicated to mitigate this problem. Moreover, the orders usually must be confirmed, for instance by the PIN [Grzywacz 2004].

The role of SMS passwords is to ensure security of the account transactions conducted on-line**.** It is a convenient, modern and safe alternative to one-time passwords, because it concerns one, particular transaction only and may not be re-used. Moreover, the SMS password is sent to the mobile phone exactly at the time of the operation which requires such authorisation.

Despite a variety of the security means in the area of phone banking, it needs to be borne in mind that there exist no fully secure distribution channels, and that any development of security systems will be followed by attempts to break or get round them.

TECHNICAL-TECHNOLOGICAL SECURITY OF INTERNET BANKING SERVICES

Security, as defined in information technology, is a state characterised by a determined level of the attributes which are most important in a given case. The following belong to the most important attributes of internet banking security [Grandys 2001, Kosiur 1997]:

1. Confidentiality - which guarantees that only authorised persons have access to the data which is stored and processed in the system.
2. Integrity - which guarantees that the data transmitted during the electronic transaction is not altered.
3. Authenticity - which allows to find, whether the person signing the transaction order is in fact the one he/she claims she is.
4. Non-repudiation - which does not allow to challenge the fact of sending or receiving an electronic message.
5. Accessibility - which guarantees constant access to the e-banking system.
6. Reliability - which guarantees that the system works as expected.

The security of transactions conducted in an internet bank depends on the construction of the entire information system in the bank and at the customer's, and on the connection between the bank and the customer (Table 1). It is obvious, that neither the measures taken by the bank to secure the access to accounts or the authentication systems are not sufficient to ensure transaction security. To conduct secure transactions, the customer must also ensure the security of their workstation system, because they are as exposed to cyber attacks as the bank is [Hanusik, Machulik 2004].

The need for secure internet banking services forces the development of effective systems protecting from the destruction of information systems and the unauthorised seizure of the values possessed by the bank's customers. The bank must implement such computer system security mechanisms which ensure protection from [Bogacka-Kisiel 2000, Wawrzyniak 2005]:

1. Computer hacking, which is defined as unauthorised intrusion in the computer system by way of violating the system's security.

2. Computer interception, which is unauthorised interception of information with the use of state-of-the-art technical devices.
3. Unlawful destruction of information, i.e. the deletion of changes or making it difficult for the authorised person to become acquainted with the information.
4. Computer sabotage, which is interference with or paralysis of the information systems which are essential to the state and citizens' security.
5. Computer fraud, i.e. a crime which consists in influencing the automated processing, collecting or transmitting of information with the purpose of financial gain or other detrimental activity.
6. Computer counterfeiting, which consists in the modification or counterfeiting of documents in the form of electromagnetic record performed by specialised devices.
7. Phishing[25] , which consists in fraudulent acquisition of confidential personal information, such as passwords, by masquerading as a trustworthy person in urgent need of the information[Górnisiewicz, Obczyński, Pstruś 2014].

Table 1. Customer's and bank's responsibilities in the area of security

USER'S RESPONSIBILITIES	BANK'S RESPONSIBILITIES
Observe the provisions of the current account terms and conditions.	Create backup systems encompassing computers, servers, power supply, electronic connection, information systems, including backup copies of data bases.
Use the allowed transaction functions in an adequate manner.	Provide protection of the entire tangible and intangible infrastructure.
Refrain from lending the devices linked to the on-line account and store them in a secure manner.	With the use of firewall systems[26], provide protection from unauthorised access to the banking systems through the Internet.
Keep log-ins, passwords, codes or private key, if any, confidential.	Adopt the latest security solutions in the area of internet connections.
Correct installation and use of the applications used by the individual banks.	Guarantee sufficient user identification.
Use safe internet browsers which support the relevant protocols and guarantee encryption of sufficient strength.	Possess a qualified certificate and secure devices.

Source: own work based on T. Koźliński, Bankowość internetowa, CeDeWu Sp. z o. o., Warszawa 2004: 75-76.

The issue of security of information resources in e-banking is extremely broad. It encompasses the technical, organisational and legal aspects. All issues must be resolved by teams of experts in the given fields. The offered internet banking systems must ensure the security of customer data during the transmission of the information in the system and provide protection from unauthorised access or unauthorised manipulation; to achieve this, the special security mechanisms are adopted,

[25] Phishing - the term was coined in the 1990s and it comes from the cluster of: password harvesting fishing.
[26] Firewalls - which control all connections between the local network and the Internet.

which cover all operational activities in the system [Michalski 2002]. Table 2 classifies the security measures adopted in e-banking.

The adoption of hybrid solutions which combine various authentication methods, definitely leads to the best results. The e-banking systems access control is based mainly on what the user knows and what the user has, i.e. passwords and additional attributes which explicitly identify the user, such as tokens.

Table 2. Security measures adopted in internet banking

PHYSICAL MEASURES	• anti-theft devices • safes • alarms • fire protection devices • architectural solutions • Rooms adequately adapted to accommodate operating computers • air conditioning devices
TECHNICAL MEASURES	• UPS devices • magnetic stripe and microprocessor cards • person identification devices, the so-called biometric devices • back-up devices and the methods of using them • firewalls and Proxy servers • hardware locks preventing access to keypads, drives, discs • duplication of wiring
SOFTWARE MEASURES	• system journals, i.e. the solutions obligatory for each system which record information which later enables the identification of users' activities; they are one of the most important monitoring tools • tracking software, i.e. the mechanisms which enable the real-time monitoring of the work of the system users • settlement mechanisms, i.e. the solutions which allow to identify the persons who performed the given operations in the system • anti-virus software • software detecting weak passwords existing in the system • error correction codes
ACCESS CONTROL MEASURES	• passwords, identification numbers • magnetic stripe cards • biometric methods
CRYPTOGRAPHIC MEASURES	• DES algorithm and its modifications • IDEA algorithm • RSA algorithm

Source: own work on the basis of: A. Gospodarowicz (ed.), Technologie informatyczne w bankowości, Wydawnictwo Akademii Ekonomicznej we Wrocławiu, Wrocław 2002: 193-203; cf. D. Wawrzyniak, Bezpieczeństwo bankowości elektronicznej [in:] A. Gospodarowicz (ed.) Bankowość elektroniczna, Polskie Wydawnictwo Ekonomiczne, Warszawa 2005: 77-78.

Internet banking viewed from the perspective of security is specific, in a sense; on the one hand the bank makes its information resources available, on the other hand the customer must make a connection through the internet, which may involve some risks. There are many works which describe the various security means adopted in internet banking. The majority, however, describe the four principal ones, which are [Wroński 2004]:

1. Encryption of data transmission.

2. Simple authentication, e.g. log-in, password.
3. Strong authentication, e.g. token.
4. Electronic signature.

The first method is strictly connected with cryptography, and it is used with a view to disable unauthorised access to confidential data transmitted by electronic means. The second and third methods, as their names suggest, serve to identify the transaction parties and are intended to prevent any instances of impersonation of other persons. The fourth method, in turn, is connected with the above mentioned non-repudiation principle. At the same time, the electronic signature also serves as a means of transaction parties authentication [Jurkowski 2001].

Encoding based on the SSL encoding protocol solutions, is the most commonly adopted security means, due to its relative simplicity and safety[27]. A secure connection with a website is signalled in the browser's status bar by a closed padlock icon. The following may be the examples of algorithms based on private keys [Chmielarz 2005], DES (Data Encryption Standard), 3 DES (this algorithm is much more secure than the single DES), IDEA (International Data Encryption Standard), RC2, RC4, and RC5 – RC2, Skipjack.

The second tier of security differs depending on the bank and it usually involves a log-in and a password which constitute the so-called simple authentication. Every customer has their own ID with a confidential password attributed to it. The password is stored in the bank's computer system an encrypted form. In this case, customer verification consists only in the comparison of the entered password and the ID against those recorded in the bank [Wroński 2004]. Usually, after an incorrect password has been entered several times, the access to the account is blocked for the individual customer and in order to unblock it, it is necessary to contact the bank.

Complimentary to the above method are the scratch-off one-time passwords which are used to conduct on-line transactions on an account. They are individually assigned to the customer by the bank's information system upon the account owner's request and are sent to the customer by post in the form of a one-time passwords list [Wroński 2004].

The devices which work on the basis of the question-answer method, are the quite frequently used tokens. The function of a token is to generate special, unique sets of digits which are later entered in the computer by the bank's customer [Jurkowski 2001]. The encrypting algorithm used for this purpose is usually the secret behind the token. The verification of the set of digits generated by the token is conducted by the bank's computer system, which knows the token keys and their algorithm [Wroński 2004].

One of the most promising security methods is the electronic signature. Thanks to its non-repudiation, it is assumed to enable unequivocal identification of an internet banking system user [Hołownia 2007]. Electronic signature is construed in Poland as: "a cryptographic conversion of data which enables the recipient to verify the authenticity and integrity of data and protects the sender from the recipient's counterfeiting the information" [Wroński 2004].

Apart from the basic security means, the banks adopt as well some additional security means, such as: a telephone contact with the customer, a daily transaction limit, an automatic notification service informing the customer by e-mail or SMS of all operations conducted on their account [Chmielarz 2005]. Moreover, it is recommended to use firewalls, anti sniffer software and to conduct frequent updates of both the anti-virus software and the operating system, in order to avoid unauthorised attacks, which, in consequence, may lead to gaining access to the customer's computer

[27] SSL - Secure Sockets Layer is a cryptographic protocol designed by Netscape Communications which ensures a safe communication channel between a customer and a server. It is used to transmit encrypted data through the Internet. It is supported by the majority of the popular browsers and WWW servers. It has been commonly adopted as an encryption standard for websites.

or to obtaining essential information sent by them. A further security factor should be the monitoring of access to the servers and work stations of the customer [Hanusik, Machulik 2004].

CONCLUSION

In conclusion, it needs to be said, that one of the biggest obstacles in the development of e-banking is the constant perception that Internet is not fully secure. Moreover, the increasing number of households with Internet access contributes to the dynamic development of this sector in Poland. It leads to: "[..]the creation of a modern ICT infrastructure providing common access to a wide range of services[...]" [Hanusik, Machulik 2004], which constiutes "[...] a technical basis for the implementation of some elements of modern economy [...]" [Hanusik, Machulik 2004], and, in consequence, for the development of electronic banking.

Banking and information technology have become inseparably linked, and their strict integration is characterised by significant dynamics. On the one hand, the expansion of information technologies offers new opportunities to banks, on the other hand the growing needs of the banks and other financial institutions, connected mainly with the need to secure the processing and transmission of electronic data, stimulate the development and improvement of these technologies. Moreover, the complex notion of security expands also on the technical, technological, organisational, legal and economic issues [Węsierska 2004].

REFERENCES

1. Bogacka-Kisiel E. (ed.). (2000). *Usługi i procedury bankowe*. Wrocław: Akademia Ekonomiczna im. Oskara Langego we Wrocławiu.
2. Bury A. (2001). *Karty płatnicze*. Wydanie IV zmienione i zaktualizowane. Warszawa: CeDeWu.
3. Chmielarz W. (2005). *Systemy elektronicznej bankowości*. Warszawa: Difin.
4. Dolecki J., Rzeszotarski J. (2003). Zidentyfikuj bankowego rozmówcę. *Bank* (03).
5. Górnisiwicz M., Obczyński R., Pstruś M. (2014). *Bezpieczeństwo finansowe w bankowości elektronicznej - przestępstwa finansowe związane z bankowoscią elektroniczną*. Warszawa: Komisja Nadzoru Bankowego.
6. Grandys A. (2001). E-bankowość – bankowość gospodarki cyfrowej. Cz. II. *Monitor Rachunkowości i Finansów* (6).
7. Grzywacz J. (2004). *Bankowość elektroniczna w działalności przedsiębiorstwa*. Warszawa: Szkoła Główna Handlowa w Warszawie.
8. Hanusik A., Machulik R. (2004). Norma bezpieczeństwa e-banking, oczekiwania i wymagania z punktu widzenia potrzeb klienta. in: Gospodarowicz A. (ed.), Zastosowania rozwiązań informatycznych w instytucjach finansowych. Wrocław: *Prace Naukowe* (1035), Akademia Ekonomiczna im. Oskara Langego we Wrocławiu.
9. Hołownia P. (2007). Zrozumieć także klienta. *Bank* (01).
10. Jurkowski A. (2001). *Bankowość elektroniczna*. Warszawa: Narodowy Bank Polski, Materiały i Studia, Zeszyt Nr 125.
11. Kosiur D. (1997). *Understanding Electronic Commerce*. Microsoft Press, Redmond.
12. Masiota J. (2003). *Elektroniczne instrumenty płatnicze*. Bydgoszcz-Poznań: Branta.
13. Michalski A. (2002).*Wykorzystanie technologii systemów informatycznych w procesach decyzyjnych*. Gliwice: Politechnika Śląska.
14. Piesik L. (2007). Zakotwiczona twierdza. *Gazeta Bankowa* (41).
15. Pietkun P. (2007). Kto rozdaje karty. *Gazeta Bankowa* (48).
16. Pluskota P. (2003). Współczesne kanały dystrybucji produktów bankowych. Szczecin: Uniwersytet Szczeciński, *Rozprawy i Studia* vol. (DL) 476.
17. Rabij M. (2004). Wirtualne kanty. *Newsweek* (26).

18. Rzeszotarski J. (2004/2005). Po mowie go poznacie. *Bank* (12–01).
19. Ślązak E., Borowski K. (2007). *Bankowość elektroniczna*. in: Zaleska M. (ed.), *Współczesna bankowość*. Vol I. Warszawa: Difin.
20. Wawrzyniak D. (2005). *Bezpieczeństwo bankowości elektronicznej*. in: Gospodarowicz A. (ed.), *Bankowość elektroniczna*. Warszawa: Polskie Wydawnictwo Ekonomiczne.
21. Wroński P. (2004). *Bankowość elektroniczna dla firm*. Warszawa: CeDeWu.
22. Węsierska E. (2004). Dywersyfikacja metod ochrony systemów elektronicznych jako warunek funkcjonowania przedsiębiorstwa bankowego. in: Gospodarowicz A. (ed.), Zastosowania rozwiązań informatycznych w instytucjach finansowych. *Prace Naukowe* (1035). Wrocław: Akademia Ekonomiczna im. Oskara Langego we Wrocławiu.