MONOGRAPH
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MANAGEMENT OF SUSTAINABLE DEVELOPMENT IN RURAL AREAS:

AT LOCAL AND REGIONAL SCALES

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MAIN ABBREVIATIONS

AAC – Agricultural Advisory Centers

ARMA – Agency for Restructuring and Modernisation of Agriculture

CAP – Common Agricultural Policy

CSO – Central Statistical Office

EAFRD – European Agricultural Fund for Rural Development

EC – European Commission

ESCO – European Skills, Competences and Occupations

ESF – European Social Fund

EU – European Union

GAC – Good Agricultural Condition

GDP – Gross Domestic Product

GUS – Główny Urząd Statystyczny (Central Statistical Office)

ICT – Information and Communication Technologies

LAG – Local Action Groups

MO – Municipal Office

MRiRW – Ministerstwo Rolnictwa i Rozowju Wsi (Ministry of Agriculture and Rural Development)

NGO – Non Governmental Organisations

OECD – Organisation for Economic Co-operation and Development

PES – Public Employment Services

PGR – Państwowe Gospodarstwo Rolne (State Farm)

RAF – Rural Accommodation Facilities

RDP – Rural Development Programme

SAPARD – Sector Operating Program and Rural Development Program

SME – Small and Medium-sized Enterprises

INTRODUCTION

In rural areas it is being implemented so alled European model of multifunctional and sustainable agriculture. The idea of multifunctional development of rural areas lies in finding a farmer's additional income in various spheres. The decisive factor in the creation of this concept was the changing social and economic situation of agriculture and the declining farm incomes.

Multifunctional rural development contributes to solving many problems and, consequently, to improve the situation of their inhabitants. It should be accompanied by development,, education, infrastructure, entrepreneurship, social capital, civil society institutions. "This is why entrepreneurship in rural areas is to promote the multifunctional development of rural areas. It should lead to the creation of new jobs in rural areas in enterprises of different directions of activity: manufacturing, trade, services micro businesses and larger.

Another, equally important is the concept of sustainable rural development. Considerations on the subject date back to ancient times and include, for example, Roman afforestation programs felling. This was due to the occurrence of awareness that natural resources are running out, and excessive human intervention will lead to their absence, and thus harm to humanity.

The beginning of work on sustainable development can be considered in Rio de Janeiro in June 1992 during ,,United Nations Conference on Environment and Development ". Global Programme of Action Agenda 21, was signed by the 179 countries.

According to the Brundtland Commission ,,Sustainable development meets the needs of the present without the risk that future generations will not be able to satisfy them". However, according to the new economics of environmental sustainability is focused on providing high standards of environmental, economic and socio-cultural, taking into account the natural strength of the earth.

The demand for sustainable (social and environmental) democracy, which gives today's and future generations quality of life including assured standards such as: economic, ecological and socio-cultural recognition of the absolute limits of natural strength, consisting in the designation of ecological barriers and protective. Followed by the appointment of inviolable borders and offer only sustainable products, integrative approach enables the realization of economic, social and ecological taking into account their interdependence.

The concept of sustainable development takes into account issues of eco-efficiency, which analyzes the relationship between economic growth and the environment. Environmental performance depends on many factors, including the: environmental standards, technological progress and investment taking into account the management of environmental resources by the different sectors of the economy. Reducing pollution is the objective of the EU and include economic and legal instruments conducive to attracting clean energy.

Neoclassical economics as the starting point for sustainable development considers the costs and benefits of environmental protection. Intersection curves costs of environmental damage and environmental costs determines the optimum point at which human activities and the running costs of environmental balance.

Sustainable development is useful in the management concept of the global economy. It is presented as an integrated governance which takes into account: ecological order implemented by environmental policy, social order, which lies at the basis of social policy, economic order associated with the economic development policies, spatial order resulting from the implementation of spatial policy, institutional order with the support of institutional policy.

The ideas of sustainable and multifunctional rural development has enabled a new approach to efficiency, called ecological efficiency. Measures to promote sustainable rural development include: promote the diversification of economic activities, preservation of the environment, development of infrastructure, improvement in quality of life and better access to services while maintaining efficiency.

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PART I
SUSTAINABLE DEVELOPMENT IN ECONOMY PARADIGM

THE BIO-ECONOMY SECTORS FROM A SUSTAINABLE DEVELOPMENT PERSPECTIVE

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Abstract: The aim of the study was to define and discuss the bio-economy sectors in a sustainable development perspective. The article presents a critical analysis of the bio-economy sectors definition prepared on the basis of the literature review. The division of the bio-economy sectors is based on the natural resources (plant or animal materials and micro-organisms) and the inextricable links with various fields of science (especially biotechnology, medical, biological, chemical, agricultural, food, environmental and technical sciences, mathematics, computer science and the socio-economic sciences), as well as with the principles of the sustainable development.

Key words: sustainability, bio-economy, the bio-economy sectors

1.1. Introduction

Europe and the rest of the world is facing new environmental, economic and social challenges. Bioeconomy as the direction of theoretical deliberating and empirical research is the answer to these key issues which should lead to reduction of dependence on natural resources and promotion of sustainable production of renewable resources of land, fisheries and aquaculture and their conversion into food, feed, fiber, bio-products and bio-energy. One of the objectives of the bio-economy is a shift from fossil fuels to the biomass usage as a renewable material for the industry. Currently, the bio-economy is becoming one of the fastest growing sectors of the European economy, accompanied by the industries perceived as the largest employers. Thanks to bio-economy a better quality of life can be provided and the industry based on the renewable natural raw materials will enable the introduction of sustainable industrial production. This, in turn, will improve the quality of food and translate it into a clean environment. The integrated bio-economy is not only about the science but more about the integration of science and nature, business and society. Bio-economy refers to a sustainable production and processing of biomass for food, health, industrial and energy products. To maximize the benefits, the bio-economy sectors need to work together, what is visible in the comparable indicators of innovation and efficiency. It is important that an effective policy of supporting entrepreneurship encourages the promotion and helps traditional businesses with changing their technological processes.

1.2. Objectives, Materials and Method

Theorists and practitioners have different classifications of the bio-economy sectors, hence this study which relates to the critical review of the literature, addresses, among others, the question of the definition of the bio-economy sectors and their size.

1.3. The Bio-economy Sectors

The scientists must face a challenge of determining the optimal sectors of the bio-economy activities, taking into consideration the economic and social point of view. The analyses using the most up to date knowledge of key processes of plants, animals and micro-organisms indicate the priorities in different areas of economic activities – from production of bio-products in agriculture and forestry through manufacturing processes in the food sector and such industry branches as paper, textile, chemical to the energy, pharmaceutical or cosmetic sectors[1]. According to the European Commission paper called: "Innovating for Sustainable Growth: A Bio-economy for Europe", the bio-economy encompasses the production of renewable biological resources (e.g. resources from plants, animals and micro-organisms) and the conversion of these resources and waste streams into value added products, such as food, feed, bio-based products and bio-energy[2]. As Chyłek indicated, the bio-economy covers many industry branches, mainly agri-food sector, as well as the associated forestry, chemical, biotechnology and energy sectors[3]. The bio-economy covers virtually all sectors and is related to services that produce, process or in any form use biological resources. As Gołębiewski indicates[4], a special role in bio-economy is dedicated to processing industries, mainly food industry, including feed, beverages and tobacco production. An increasingly important role is also played by the waste management, and the basic sectors of agriculture and forestry are used in the wood, paper, textile or chemical industries. In addition, the bio-economy is a strategic, integrating and suprasectoral form of action, affecting economic development and is in line with the currently dominant interdisciplinary approach to the research planning and funding rules. The area of bio-economy integrates also issues relating to energy from renewable sources, as well as manufacturing processes of textile, paper and to some extent of chemical, cosmetic and pharmaceutical industries. Their mutual connection and integration around the objectives of the bio-economy guarantee the rational use of technical, economic and human capital for solutions ensuring the improvement of the economy efficiency and work towards the customer satisfaction[5]. Table 1 shows several definitions of the bio-economy sectors.

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1 E. K. Chyłek, M. Rzepecka, [2011]: *Biogospodarka – konkurencyjność i zrównoważone wykorzystanie zasobów, [Bio-economy – competitiveness and the sustainable use of resources], Polish J. Agron., 7, 5.*

2 *European Commission (EC), 2012: Innovating for Sustainable Growth: A Bioeconomy for Europe; European Commission: Brussels, Belgium.*

3 E. K. Chyłek, [2012]: *Biogospodarka w sektorze rolno-spożywczym [Bio-economy in the agri-food sector], Przemysł Spożywczy, sierpień-wrzesień 2012 tom 66, Wyd. SIGMA NOT, Warszawa.*

4 J. Gołębiewski, [2013]: *Zrównoważona biogospodarka – potencjał i czynniki rozwoju [Sustainable bio-economy – potential and development factors], IX Kongres Ekonomistów Polskich, 2.*

5 E. K. Chyłek, M. Rzepecka, [2011]: *Biogospodarka – konkurencyjność i zrównoważone wykorzystanie zasobów [Bio -economy – competitiveness and the sustainable use of resources], Polish J. Agron., 7, 5.*

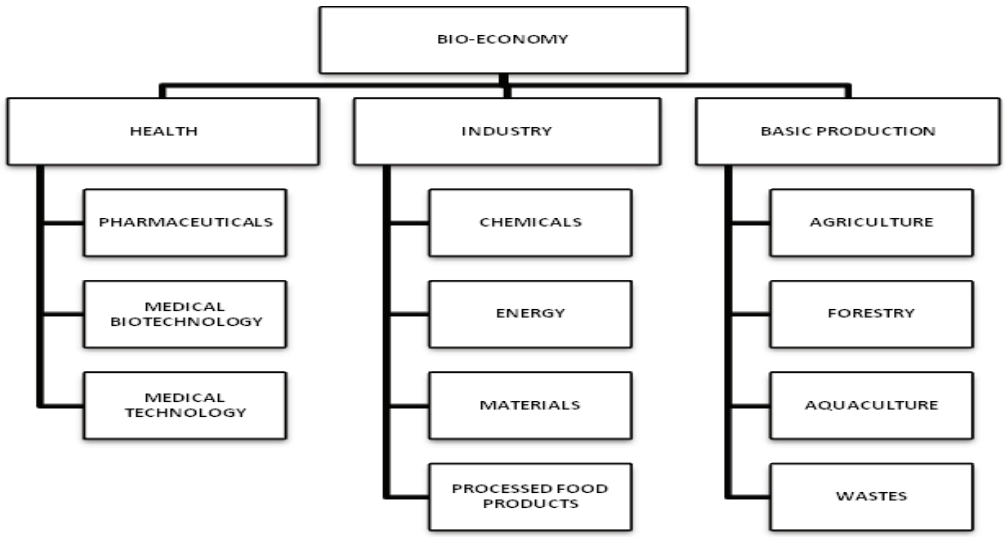

Figure 1. **Industries and sectors of the bio-economy**
Source: Maciejczak M. 2014. Is bio-economy and the scientific theory of business Practise? Basics of bio-economy. Warsaw, p. 10.

The bio-economy sectors offer an opportunity to build areas of smart regions specialization. Around the bio-economy sectors one can build a network of cooperative relations formed in so-called value-added chains (particularly important in the case of agri-food sector where there is the largest potential for the additional value increase). Multisectoral support of the bio-economy is an additional impetus for the development of the agriculture and rural areas.

The sectors of bio-economy are defined differently by the research literature and by the economy. The reasons for these discrepancies in the sectors classification mainly emerge from the details of isolating individual sectors and subsectors or from the problem with the statistical data, etc. The common ground for defining the bio-economy sectors is their reference to the usage of renewable natural resources of the environment in terms of new advanced technologies in accordance with the principles of sustainable development. Therefore, the list of the most frequently mentioned sectors includes: agriculture and forestry sectors, food sector, fisheries, aquaculture and biotechnology sectors.

Table 1. **Definitions of the bio-economy sectors**

Year of publication	Author	Definitions of bio-economy sectors
2014	The Seventh Framework Programme in Food, Agriculture and Fisheries, and Biotechnology (FAFB)	the areas of bio-economy by the Seventh Framework Programme (FAFB), which was created in order to set up a strong and competitive bio-economy, are food, agriculture and fisheries and biotechnology
2014	M. Maciejczak	the bio-economy sectors include health, industry and primary production along with subsectors (figure 1)
2014	Eurostat	according to the data on national accounts, Eurostat distinguishes the following sectors of the bio-economy: the cultivation of crops and animal husbandry, forestry, fisheries, food production connected with beverages and related products, the wood and paper manufacturing and sectors based on environmental technologies
2012	E. K. Chyłek	The bio-economy covers the production of renewable bio-resources and other wastes developed in this process and their transformation into value-added products, such as food, feed, bio-products and bio-energy. The bioeconomy includes many industries, including agri-food sector as well as the associated sectors as forestry, chemical, biotechnological and energy sectors
2012	The European Economic and Social Committee and the Committee of the Region	The bio-economy includes agriculture, forestry, fisheries, food sectors and production of cellulose and paper as well as parts of chemical, biotechnological and energy industry
2011	E. K. Chyłek	The bio-economy covers all sectors and related services that refer to production, processing or usage of biological resources occurring in every possible form. It includes chemical and pharmaceutical industries, services, global food suppliers, commerce, engineering and construction, agriculture and forestry, biotechnology, climate and environment protection, energy, wood industry and cellulose, food processing, aquaculture, animal husbandry and plant cultivation (figure 2)
2011	J. Wesseler, D. S. Spielman, M. Demont	The development of the biotechnology industry and its application to the agriculture, health, chemicals or energy sectors are classic examples of bio-economy business sectors
2011	European Comission	The bio-economy includes agriculture, forestry, fisheries, food and biotechnology sectors as well as several industrial sectors, from production of energy and chemicals to the construction industry and transport. They cover a wide range of generic and specific technological solutions that can be used by these sectors to enable growth and sustainable development, for example in the field of food safety
2010	BECOTEPS	all sectors which derive their products from biomass
2010	The Bio – economy Council within the national research strategy	The bio-economy covers all economic sectors that produce and reprocess biological resources; their activities should focus, among others, on the development of new products and production methods to increase efficiency in the raw materials usage, starting with biomass production in agriculture and forestry and ending with the final products of the food economy, industry and energy management

Source: own study.

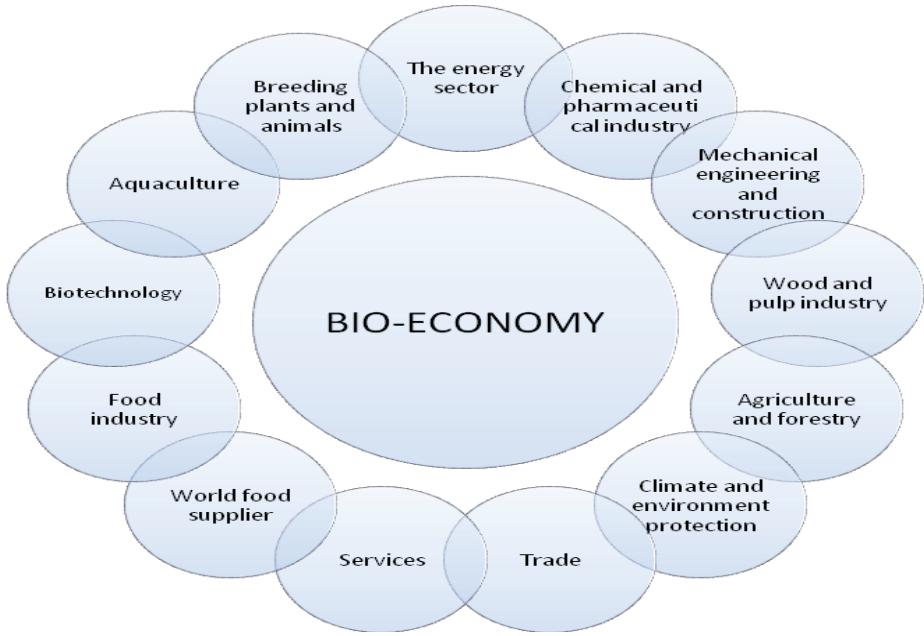

Figure 2. **The areas of bio-economy**

Source: own study based on: Chyłek E. K., [2011]: *Biogospodarka – konkurencyjność i zrównoważone wykorzystanie zasobów, II Kongres Nauk Rolniczych, Warszawa.*

1.4. The Size and Significance of the Bio-economy Sectors Market

About 70% of EU land area is covered by forests or areas used for agricultural purposes. Agriculture and forestry form an integral part of the European economy and society. They create the basis for food, feed and non-food products to meet the consumers demand and a need for a wide range of products within specific sectors. The basic manufacturing operations have a tremendous impact on the integrity of rural areas in terms of conservation of natural capital, quality of life and new jobs creation.

The food sector plays a very important role because the consumers should have access to safe, healthy and high quality food at affordable prices. The food and feed production affects human health, the environment and the global ecosystem. The challenges undertaken by the bio-based economy is the satisfaction of human needs in terms of optimal health and well-being while protecting the environment and ensuring European industry ability to fully develop its growth potential, provide new jobs and remain competitive in the global market. The biotech industry uses the advanced biotechnology and other life science methodology to create or change life forms and processes. It contributes to the improvement of the raw materials availability and to the development of small and medium-sized businesses or start-ups. The another bio-economy sector is based on the aquaculture. It has a large potential for development of healthy, safe and competitive food products as well as for environmental services and energy production. One of the main features of the living aquatic resources is that they are renewable and their sustainable exploitation depends on a thorough understanding of aquatic ecosystems. The sustainable

usage and wise management of water biological resources will contribute to maximizing social and economic benefits from the European oceans and seas, including the need to optimize the solid contribution of fisheries and aquaculture sectors to the food security.

The biotech sector is essential for economic development and it is not life – threatening for human beings and the environment[6]. The biotechnology relates to the use of biological processes, organisms or systems to manufacture products aimed at improving the quality of human life. Bio-technology sectors create the basis for significant competitive advantage of the European industry, stimulating economic growth and creating new jobs. The specific aim of biotechnology research is to develop competitive, sustainable, secure and innovative industrial products and processes and to contribute to innovation in many other sectors, such as agriculture, forestry, food, energy, chemistry and health sectors.

According to the European Commission[7], the bio-economy market in Europe is currently of the size of more than 2 trillion euro and offers 22 million new jobs in the various sectors, including agriculture, forestry, food, chemicals and bio-energy sectors, which amount to approx. 9% of the total EU workforce[8]. It is assumed that in the next few years every euro invested in the bio-based economy will result in at least tenfold return[9]. These data do not only highlight the importance of the bio-economy in the socio-economic policy but also indicate the possibility of better integration of activities within the various sectors and expand the market for bio-products. Europe is considered a global leader and pioneer in many areas of biological sciences and related technologies. However, the US and some Asian countries, like China, are investing heavily in the bio-based economy in order to strengthen their activities around the bio-economy sectors and bio-products[10].

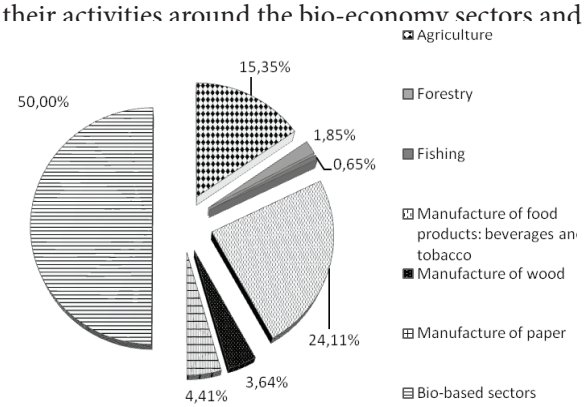

Figure 3. **The bio-economy sectors and their importance in 2011in EU, the added value at basic prices, million €**

Source: Philippidis G., Sanjuán AI, Ferrari E., M'barek R., 2014: Structural Patterns of the Bioeconomy in the EU Member States – and SAM approach, Report European Commission.

6 T. Twardowski, [2005]: *Biotechnologia w pracach OECD [Biotechnology in OECD], Biotechnologia, 2 (69) 234–236.*

7 *European Commission (EC), 2012: Innovating for Sustainable Growth: A Bioeconomy for Europe; European Commission: Brussels, Belgium.*

8 *Bio-Economy Technology Platforms (BECOTEPS),* The European Bioeconomy in 2030: Delivering Sustainable Growth by Addressing the Grand Societal Challenges*; Bio-Economy Technology Platforms: Brussels, Belgium, 2011.*

9 P. Bartoszczuk, [2014]: *Perspektywy rozwoju biogospodarki [Prospects for the development of bio-economy], Zeszyty Naukowe Wyższej Szkoły Humanitas. Zarządzanie, 357-364.*

10 *ENDS Europe,. EU biotech research plan. Available online: http://www.endseurope.com/ (access: 17.05.2015).*

Due to the limitations in extracting the aggregated data from the national accounts, Eurostat lists only the traditional sectors based on the agricultural and food bio-products and does not really feature the bio-energy and bio-chemical industries. According to the added value size of the bio-economy sectors, the largest share in bio-economy sectors goes to the sectors based on the environmental technologies (50%), followed by the manufacturing of food products (24.1%) and agriculture (15.4%). Forestry and fisheries account for the smallest share in the specified bio-economy sectors (figure 3).

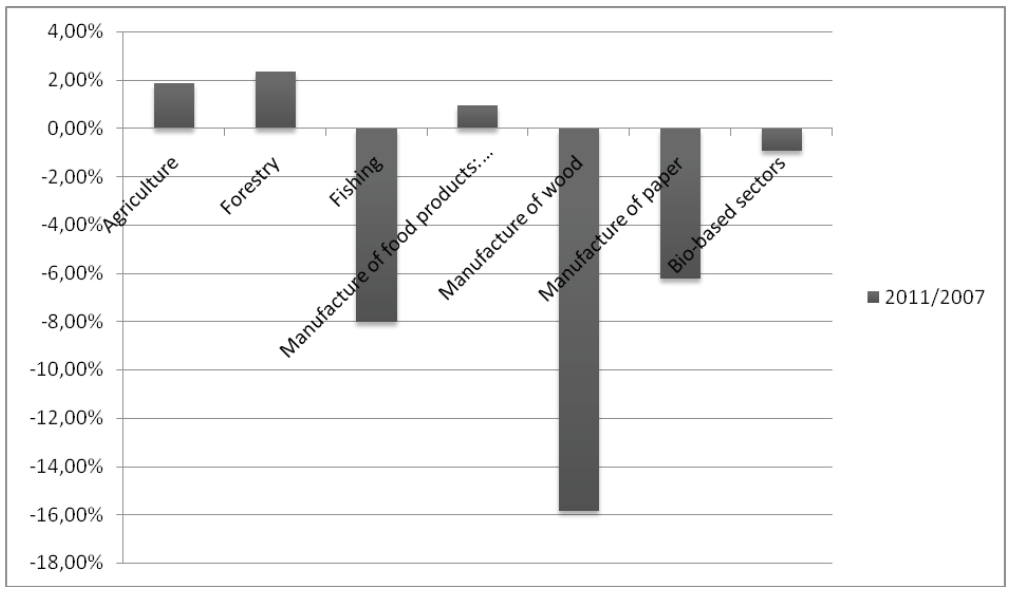

Figure 4. **The value added growth rate in 2011 in comparison to 2007 in EU**

Source: Philippidis G., Sanjuán AI, Ferrari E., M'barek R., 2014: Structural Patterns of the Bioeconomy in the EU Member States – and SAM approach 'Report European Commission.

The positive growth figures in 2011 compared to 2007 were recorded in sectors such as agriculture, forestry and food production. The biggest drop of 16% was experienced by the paper manufacturing industry (figure 4).

Figure 5. **Challenges facing the world and Europe today, in the area of bio-economy**

Source: Raport konferencyjny: Międzynarodowy Kongres Bioekonomii [Conference Report: International Congress of the bio-economy], Łódź 2014

1.5. The Development Prospects and the Bio-economy Challenges

The bio-economy is the basis for the present and future development of the global economy. The flagship initiative of the "Europe 2020 – Innovation Union" strategy shows

the challenges facing Europe in the field of science and innovation and the actions that should be implemented in the European Union countries in order to ensure that the stable economic development objective will be achieved. The challenges facing the world and Europe today, in the area of bio-economy, include six major pillars[11]:

I. *The sustainable human resources management*

In order to meet the growing demand, the natural resources in the developed countries are being exploited in a predatory way. At the same time, the overproduction and economic pressure in EU countries is leading to the abandonment of a good quality land. The agricultural production efficiency also increases accompanied by the effectiveness improvement of the soil utilization. The use of new technologies (movement control, modern equipment) minimizes the negative effects of crops on the soil and at the same time leads to the crop area maximization.

II. *The sustainable production*

The management of the natural resources in a sustainable manner is a necessary condition for the bio-economy functioning. An equally important task is to balance the entire supply chain to ensure the food safety for the increased human population in the world (the population is expected to rise by 30%, from 7 billion in 2012 to 9 billion in 2050, and the food demand by 70% resulting in doubling the demand for meat), to provide enough renewable raw materials and energy to reduce the environmental degradation and promote a healthy and effective rural economy.

III. *The public health improvement*

The improvement of plants quality and the development of other food ingredients will help in producing the high-quality food which in turn will influence a healthier diet for the whole population in a sustainable way. This will result in the public health improvement and problem reduction of the civilization diseases.

IV. *The climate change mitigation*

The bio-economy resources can be perceived as major contribution to the process of the greenhouse gas emissions minimization. The new products may be obtained from biomass and replace those based on the fossil fuels.

V. *The integration and the social development balancing*

In contrast to the Industrial Revolution, which led to the depopulation of rural areas, the evolving bio-economy will be the main driving force behind the development of the rural and coastal areas. The development of agriculture, aquaculture and forestry will be strengthened and coupled with the creation of highly qualified workforce dedicated to the rural and coastal areas, which are economically disadvantageous now.

[11] *Raport konferencyjny: Międzynarodowy Kongres Bioekonomii [Conference Report: International Congress of the bio-economy], Łódź 2014.*

VI. *The global sustainable development*

Currently more than a billion people exist in the extreme malnutrition. People are prone to diseases and experience a reduced life expectancy. Developed countries also face problems such as provision of a healthy food chain, crop increase and the genetic diversity of animals.

In order to meet the discussed challenges, the European program called "The Seventh Framework Programme in Food, Agriculture and Fisheries, and Biotechnology" (FAFB) was established, which offers solutions to the challenges facing Europe and the world, such as increased competition for natural resources, its impact on the planet, climate change and the need to ensure sustainable and secure food supply for a growing population while ensuring optimal use of renewable biological resources.

1.6. Conclusion

The sustainable development can be ensured by the rational use of plant, animal and micro-organism resources with the support offered by biotechnology, genetics, chemistry, physics and economics. Due to the integration and strengthening of the main components of the bio-economy sector, one can expect that the goal of efficient and fully functioning bio-economy can be obtained by 2030 with the bio-technology in food production and other industrial products as the major driving force behind innovation in Europe. The bio-economy is perceived as a tool for coping with global challenges, especially with the population growth, climate change and the increasing demand for materials and energy. On the one hand, this concept gained strong supporters, on the other hand was heavily criticized, not due to its objectives but rather because of their implementation strategy. Such a fundamental transformation, which is associated with the far-reaching changes in existing production systems, applies to all social sectors and requires a detailed analysis of the social, environmental, economic and political impact which up to now has only been partially carried out. In order to meet all the challenges we are to face over the next several years, a unified classification system of the bio-economy sectors would improve the information flow between these sectors.

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Maciejczak, M., Hofreiter, K., [2013]: *How to define bioeconomy? Rocz. Nauk. SERiA, t. XV, z. 4, 244-246.*

Pajewski, T., [2013]: *Biogospodarka jako strategiczny element zrównoważonego rolnictwa [Bio-economy as a strategic element of sustainable agriculture], Rocz. Nauk. SERiA, t. XVI, z. 5, p. 179-184.*

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2

EVALUATION OF SUTAINABLE DEVELOPMENT OF RURAL AREAS IN EUROPEAN UNION

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Abstract: The sustainable development of rural areas in European Union countries has been presented in the paper. The authors try to present the theories of sustainable development, the indicators of sustainable development and data about European Union countries. The tabular and descriptive methods were used in the study. The data proves that the European Union countries are developing well however with different pace. West European Union countries are developing better. The countries had introduced market economy just after Second World War. East European Union countries have market economy for 25 years. The distance in development is the effect of historical problems and solutions. East European Union countries have the biggest infant deaths and employment of economically active population in agriculture. Number of farms is the biggest in these countries, too.

Key words: sustainable development, rural areas, EU

2.1. Theoretical Consideration About Sustainable Development

Sustainable development is a process of equal development of economic, social and environmental functions. It is an intersection between environment, society and economy. However, the economy is given priority in policies and the environment is apart from humans[1]. Such a development creates the chance to leave public good for future generations in a state that we have today. The classical definition was created by the Brundtland Report and it included „*meeting the needs of present without compromising the ability of future generations to meet their needs*"[2]. The effect of discussion on Brutland Raport was to organize in Rio De Janerio in 1992

[1] B. Giddings, B. Hopwood, G. O'Brien, [2002]: *Environment, economy and society: fitting them together into sustainable development. Sustainable Development 10, 187-196.*
[2] WCED, [1987]: *Our common future. Oxford University Press. Oxford.*

signed agreements of United Nations (UN) in which two essential documents were elaborated „Declaration in Rio concerning environment and Development" and Global Programme Agenda 21" which concerns the matter of natural, environmental and ecological problems[3]. Sustainable development is a development which fulfills current society needs without their elimination in the future. The purpose of sustainable development is the survival of earth. The definition has two crucial elements. First, the way of life of poor people should be improved and their basic needs must be provided. Second, requires that the environment ability should be sustained to meet present and future needs[4]. The sustainable development discusses the issue of humanity's place on the planet[5].

Sustainable development is closely linked with agriculture and rural areas. Higher development is characterized for urban areas and places located close to capitals[6].

Globally food production is increasing and improves human life. Natural resources can be promoted by farmers by enhancing promotion of agrobiodiversity and agroforestry. What is more low-input resource-conserving technologies as well as integrated management systems should be implemented on farms. Agriculture is multifunctional naturally, as different activities are included in rural areas[7].

However, the important concept is how the social goals of sustainable development are met. People want to lead high quality life, they want to be safe and have equality of opportunity and good services. The community wants to sustain and reproduce itself at an acceptable level of functioning[8].

The concept of sustainable development helped to define the place of people in surrounding reality. The new look to define the place of human has led to a changing positioning to renewable environment resources[9].

The sustainable development concept cannot be considered as a defined end state of systems. It is evolving all the time and it is an evolutionary process. Sustainable development needs a strategy in terms of definition and planning[10].

The main initiator of the process of sustainable development at the local level is the role of local government, implemented on the basis of the development strategy. This is due

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3 E. Mazur-Wierzbicka, [2005]: *Koncepcja zrównoważonego rozwoju jako podstawa gospodarowania środowiskiem przyrodniczym. w: Funkcjonowanie gospodarki polskiej w warunkach integracji i globalizacji [The concept of sustainable development as the basis for management of the natural environment. In: The functioning of the Polish economy in the conditions of integration and globalization], Wydawnictwo: Katedra Mikroekonomii US, Szczecin.*

4 A. Sev, [2009]: *How can the construction industry contribute to sustainable development? A conceptual framework. Sustainable Development 17, p. 161-173.*

5 B. Hopwood, M. Mellor, G. O'Brien, [2005]: *Sustainable development: mapping different approaches. Sustainable Development 13, p. 38-52.*

6 I. Pomianek, M. Chrzanowska, P. Bórawski, [2013]: *Zróżnicowanie poziomu rozwoju społeczno-gospodarczego obszarów wiejskich województwa warmińsko-mazurskiego na tle kraju według miernika Hellwiga [Differences in socio-economic development level of rural areas in Warmia and Mazury province compared to the country by Hellwig development measure], Zeszyty Naukowe OTN w Ostrołęce 27, s. 442-456.*

7 *Towards Multifunctional Agriculture for Social, Environmental and Economic Sustainability*. International Assessment of Agricultural Knowledge, Science and Technology for Development. 2013.

8 N. Dempsey, G. Bramley, S. Power, C. Brown [2011]: *The social dimension of Sustainable development: Defining urban social sustainability. Sustainable Development 19, p. 289-300.*

9 E. Mazur-Wierzbicka, [2005]: *Koncepcja zrównoważonego rozwoju jako podstawa gospodarowania środowiskiem przyrodniczym. w: Funkcjonowanie gospodarki polskiej w warunkach integracji i globalizacji [The concept of sustainable development as the basis for management of the natural environment. In: The functioning of the Polish economy in the conditions of integration and globalization], Wydawnictwo: Katedra Mikroekonomii US, Szczecin.*

10 A. Bagheri, P. Hjorth, [2007]: *Planning for sustainable development: a paradigm Shift towards a process-based approach. Sustainable development 15, p. 83-96.*

to statutory obligations as well as the very nature of the local government of the host on its territory. Statutory obligations impose on the community tasks in the development of the local living environment[11].

Keeping in mind the fact of importance of sustainable development of rural areas for the economy, the authors wanted to develop the issue giving as an example the European Union.

The article is organized as follows. First we described the sustainable development process. Second the authors described the theories of sustainable development. The aim and methods of analysis are described in section three. Next, we evaluated methods of sustainable development. The final part is the conclusion.

2.2. Sustainable Development in Economic Theories

The concept of sustainable development is similar to the concept of multifunctional development. Some benefits of multifunctional development include: increase of food and environment quality, the production of bio-energy, animal welfare and development of recreation and tourism[12]. The basic functions of rural areas are delivering to society nutrition products and resources for industry[13].

However, Wilkin [2010] is introducing new functions of rural areas including:

— Green functions: management of green resources to keep it in good condition, including good condition for animals,
— Blue functions: management of water resources, improving water quality, flood prevention, and water and wind energy production,
— Yellow functions: keeping cohesion of healthy and rural areas, keeping and enhancing cultural tradition of agritourism development,
— White functions: preservation food security and healthy food[14].

The interests of the main stream economy of are economy of capital but the interests of the institutional economy are institutional conditions of functioning economy[15]. In analogy the concept of sustainable development refers to ecology, philosophy and social ecology in which the duty of people is to preserve natural resources for future generation[16].

Sustainable development is described in economic theories. One of the paradigms is a Johan Heinrich von Thunen (1783-1850) theory according to which areas located to towns are better developed. Agriculture is developing well when the land is located close to towns. The closer location creates lower costs of transport[17].

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11 J. Parysek, [2001]: *Podstawy gospodarki lokalnej [The base of the local economy], Wydawnictwo Uniwersytet im. Adama Mickiewicza, Poznań 2001, s. 213- 228.*

12 E. Kovtun, K. Gnatyshak, L. Chornenka, [2012]: *The future role of agriculture in multifunctional rural development. Applied Studies in Agribusiness and Commerce-APSTRACT., Agroinform Puiblishing House, Budapest, p. 81-90.*

13 B. Kutkowska, [2012]: *Nowe funkcje obszarów wiejskich na przykładzie terenu sudeckiego [*New features of rural areas on the example of the Sudety area*], Nierówności i wzrost gospodarczy 29, s. 97-110.*

14 J. Wilkin [2010]: *Wielofunkcyjność rolnictwa. Kierunki badań, podstawy metodologiczne i implikacje praktyczne [Multifunctionality of agriculture. Directions of research, methodological basis and practical implications], Wyd. IRWiR Pan, Warszawa.*

15 B. Poskrobko, [2011]: *Przedmiot, paradygmat i kategorie zrównoważonego rozwoju (w:) Kształtowanie teorii i wdrożeniowe aspekty zrównoważonego rozwoju [Object paradigm and the categories of Sustainable Development (:) in shaping the theory and implementation aspects of sustainable development (Poskrobko) Ed. Wyższa Szkoła Ekonomiczne, Białystok, p. 27-35.*

16 Z. Piątek, [2010]: *Ekofilozofia [Ecophilosophy]. Wydawnictwo Uniwersytetu Jagiellońskiego, Kraków.*

17 J. Siekierski, [2008]: Ład przestrzenny i lokalizacja w teoriach ekonomicznych a konkurencyjność regionów *[Spatial order and location of economic theories and regional competitiveness]. Roczniki Naukowe SERiA X(2), s. 1-4.*

Another theory of sustainable development is the concept of John Friedman according to which production and service activity is located in well-developed towns and developed centers govern the development of outside areas.

The growth pole theory is another paradigm of development of rural areas. The activity of the pole is characterized by focusing economic development in places, which have an impact on the development of other locations. This concept was developed by François Perroux, who introduced the economic space into theory. The theory addresses the need to harmonize economic forces for the general good. It emphasis not sustainable development which is the effect of that the development is emerging in points with different frequency and time. Perroux points out industrial complexes and all branches of industry which are sources of economy development and calls them development pools[18].

Sustainable development as a concept on global scale is a strategy of sustainable development. The strategy of sustainable development is organized using the following methods, tools and techniques:

— international regulations concerning sustainable development,
— global environmental programs which protect the environment,
— ecological and European politics,
— ecoinnovations,
— ecological risk evolution,
— ecological marketing,
— social business responsibility,
— ecological accounting,
— the program of clean production and other[19].

Introduction of the principle of sustainable development should be considered systematically in conjunction with the activities of the social, political and economic sectors. The concept of sustainable development is the most important for:

1. environmental protection,
2. meeting the needs of the local community,
3. economic development,
4. social order,
5. spatial order[20].

2.3. Objective and Methods

The main goal of the study was to recognize the sustainable development of the EU. The authors focused their attention on indicators of sustainable development of the EU. We presented the economic, social and environmental development of EU.

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[18] Ł. Piętak, [2014]: *Teoria biegunów wzrostu François Perroux i implementacja jej założeń w Hiszpanii w latach 1964-1975 [The theory of growth poles François Perroux and the implementation of its guidelines in Spain in the years 1964-1975.], Ekonomia XXI wieku (Economics of the 21 st century 1(1). Wydawnictwo Uniwersytetu Ekonomicznego we Wrocławiu, p. 185-205.*

[19] S.Czaja, [2011]: *Zrównoważona gospodarka oparta na wiedzy (in:) Poskrobko B. (ed.) Kształtowanie teorii i wdrożeniowe aspekty zrównoważonego rozwoju [Sustainable knowledge-based economy (in :) Poskrobko B. (ed.) Shaping the theory and implementation aspects of sustainable development].Wydawnictwo Wyższa Szkoła Ekonomiczne, Białystok, p. 37-53.*

[20] R. Kalbarczyk, [2001]: *Problemy ochrony środowiska naturalnego gmin w Polsce u progu XXI wieku. Raport. [Environmental problems of municipalities in Poland at the threshold of the twenty-first century. Report], Polska Oficyna Wydawnicza, Warszawa, s. 92.*

In the process of discussion the authors of the paper used descriptive, tabular and graphic methods.

The authors presented the data about EU countries what helped to compare the development of this region.

2.4. Methods of Sustainable Development Measurement

The sustainable development is measured by various indicators. These are s measured in the following thematic groups:

— social and economic development,
— sustainable production,
— demographic changes,
— public health,
— changes in climate and economy,
— sustainable transport,
— natural resources,
— global partnership and,
— good management[21].

The current state of indicators of sustainable development includes ten areas concerning economical, social, environmental, spatial and institutional and political orders. Social order includes the following indicators: natural increase, migration rate, public health, infants' deaths, social integration, poverty, and education, access to labor market, unemployment rate, handicapped employment, public safety and other[22].

2.5. Quality and Quantity Measure of Sustainable Development

The European Union is an important part of the world economy. The world is facing many problems of development particularly; increasing population, the life of people is becoming longer, a lower number of children per woman and society is becoming older. The European Union has the biggest percentage of people above 65 years old (16,81%) and the lowest rate of children per woman [Eurostat 2016]. The biggest problems are: a shortage of natural resources, the increased process of urbanization, energy safety and the changing way of life[23].

The social capital can be described by various indicators such as: demographic changes, rate of natural increase, the fertility rate, infant deaths, education and other. The sustainable development is determined by economic, ecological, political and spiritual development[24]. The survey proved that the highest decrease of population was found in Bulgaria (-3,6%), Latvia

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21 KKE_[2005]: *Sustainable Development Indicators to monitor the implementation of the EU Sustainable Development Strategy, Bruksela.*

22 *Wskaźniki zrównoważonego rozwoju Polski, [Sustainable development indicators for Poland] 2011: GUS Katowice.*

23 M. E. Zalewska ,[2013]: *Jak mierzyć zrównoważony rozwój Polski?, IX Kongres Ekonomistów Polskich: Ekonomia dla przyszłości. Odkrywać naturę i przyczyny zjawisk gospodarczych, [How to measure the sustainable development of Poland?, IX Congress of Polish economists: Economy for the future. Explore the nature and causes of economic phenomena], Polskie Towarzystwo Ekonomiczne, Warszawa, dokument elektroniczny, tryb dostępu: [http://www.pte.pl/kongres/referaty/, data wejścia: 14.03.2016].*

24 N. Szubska-Włodarczyk, [2014]: *Pomiar rozwoju społecznego na obszarach wiejskich w Polsce-analiza regionalna [Measurement of social development in rural areas in Poland-regional analysis]. Roczniki Naukowe SERiA, T. XVI, z. 6, p. 468-475.*

(-3,6%), Hungary (-3,4). The highest increase has been found in Ireland (10,2%), Cyprus (5,5%) and France (4,3%).

The fertility rate is a factor which helps to measure the process of generation succeeding (tab. 1). The highest fertility rate has been observed in Ireland (2,07%), France (2,0). The smaller fertility rate has been observed in Hungary (1,32), Portugal (1,32) and Latvia (1,31).

Another factor describing the social development is infant deaths. The biggest infant deaths has been found in Romania (10,1%), Bulgaria (9,0%) and Latvia (7,8%). The lowest deaths of infant has been observed in Slovenia (2,4%), Sweden and Luxemburg (2,5%) and Finland (2,6%).

Rural development depends on rural population. Generally when the state of country development is high than the employment in agriculture is low and the education is improving which has an impact on farm's economic results[25]. Poland has the highest employment in agriculture (7,12% of economically active population). High employment in agriculture is also in Latvia (4,7%) and Estonia (4,3%). The employment in agriculture in the years 2005-2013 decreased the most in Romania (1,9%), Poland (1,78%), Greece (1,5%) and Lithuania (1,3%).

Important indicators describing social development are people at risk of poverty or social exclusion. The highest rate of people at risk of poverty and social exclusion has been found in Romania (40,2%), Greece (36,0%), Latvia (32,7%) and Hungary (31,8%).

The farm labour force is another characteristic of rural development (fig. 1). Countries with lower development have big labour forces. In the most developed countries of the world, the employment in agriculture in below 1 percent, but that does not suggest a weak agricultural sector. Agriculture is producing a value added which flows to the distribution and processing sectors which fulfill the need of consumption and international trade.

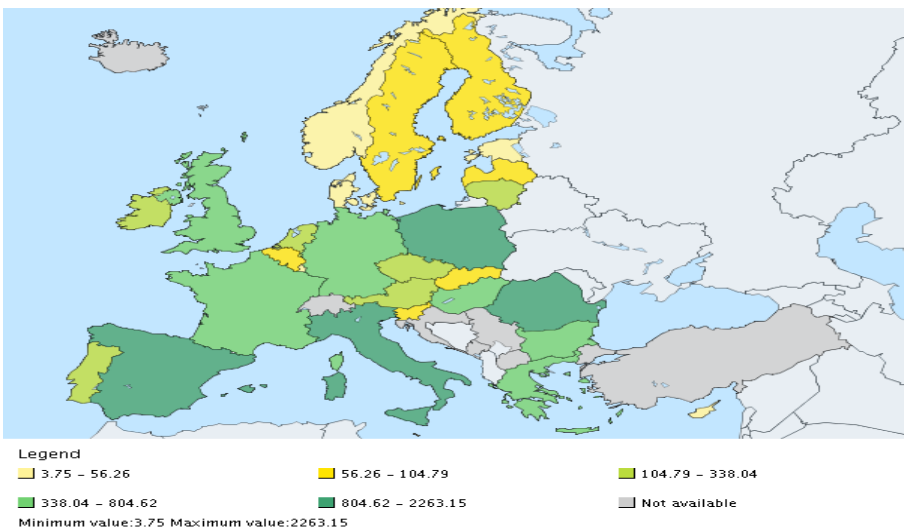

Figure 1. **Farm labour force**

Source: Eurostat 2016

[25] B. Klepacki, B. Gołębiewska, [2004]: *Wykształcenie rolników jako forma różnicująca sytuację gospodarstw rolnych [w:] Kapitał ludzki i intelektualny jako czynnik wzrostu gospodarczego i ograniczenia nierówności społecznych. (Ed. Woźniak M. G.) [Farmer's Education Level as a Reason of Farm Economic Differentiation [in:] Human and intellectual capital as a factor of economic growth and reduce inequality. Wydawnictwo Mittel, Reszów, pp. 457-465.*

Table 1. **Social development of European Union countries**

Countries	Rate of natural increase in 2009 (%)	The fertility rate in 2009 (%)	Infant deaths in 2009(%)	People at risk of poverty or social exclusion		Economically active population in agriculture in 2013		
				2005	2014	in thous.	in % of total population	Decrease in 2005-2013 (%)
UE	1,0	No	4,3	25,8	24,5	9694	1,9	0,7
Austria	0,1	1,39	3,8	17,4	19,2	129	1,5	0,6
Belgium	2,1	1,84	3,4	22,6	21,2	55	0,5	0,2
Bulgaria	-3,6	1,57	9,0	Na	40,1	99	1,4	0,8
Cyprus	5,5	1,51	3,3	25,3	27,4	27	2,4	1,0
Denmark	1,4	1,84	3,1	17,2	17,9	67	1,2	0,5
Estonia	-0,2	1,62	3,6	25,9	26,0	55	4,3	0,8
Finland	2,0	1,86	2,6	17,2	17,3	86	1,6	0,6
France	4,3	2,00	3,9	18,9	18,5	498	0,8	0,4
Greece	0,9	1,52	3,1	29,4	36,0	560	5,0	1,5
Spain	2,4	1,40	3,3	24,3	29,2	890	1,9	0,9
Ireland	10,2	2,07	3,2	25,0	27,6	138	3,0	0,8
Lithuania	-1,6	1,55	4,9	41,0	27,3	102	3,4	1,3
Luxemburg	4,0	1,59	2,5	17,3	19,0	3	0,6	0,1
Latvia	-3,6	1,31	7,8	46,3	32,7	97	4,7	0,6
Malta	2,2	1,43	5,3	20,5	23,8	2	0,5	0,0
The	3,1	1,79	3,8	16,7	16,5	196	1,2	0,3
Germany	-2,3	1,36	3,5	18,4	20,6	583	0,7	0,3
Poland	0,9	1,40	5,6	45,3	34,7	2724	7,1	1,7
Portugal	-0,5	1,32	3,6	26,1	27,5	488	4,6	1,1
Czech Republic	1,0	1,49	2,9	19,6	14,8	303	2,8	0,8
Romania	-1,6	1,38	10,1	Na	40,2	749	3,5	1,9
Slovakia	1,5	1,41	5,7	32,0	18,4	182	3,3	0,7
Slovenia	1,5	1,53	2,4	18,5	20,4	5	0,2	0,4
Sweden	2,3	1,94	2,5	14,4	16,9	106	1,1	0,3
Hungary	-3,4	1,32	5,1	32,1	31,8	288	2,9	0,9
Great Britain	3,7	1,94	4,7	24,8	24,1	457	0,7	0,1
Italy	-0,4	no	3,9	25,6	28,3	738	1,2	0,5

Source: Eurostat data 2016

Figure 2 presents total expenditures of governments on health in GDP. The countries with the highest expenditures on health are: Denmark, Finland and France. Countries with the lowest expenditures on health are: Slovakia, Cyprus and Latvia.

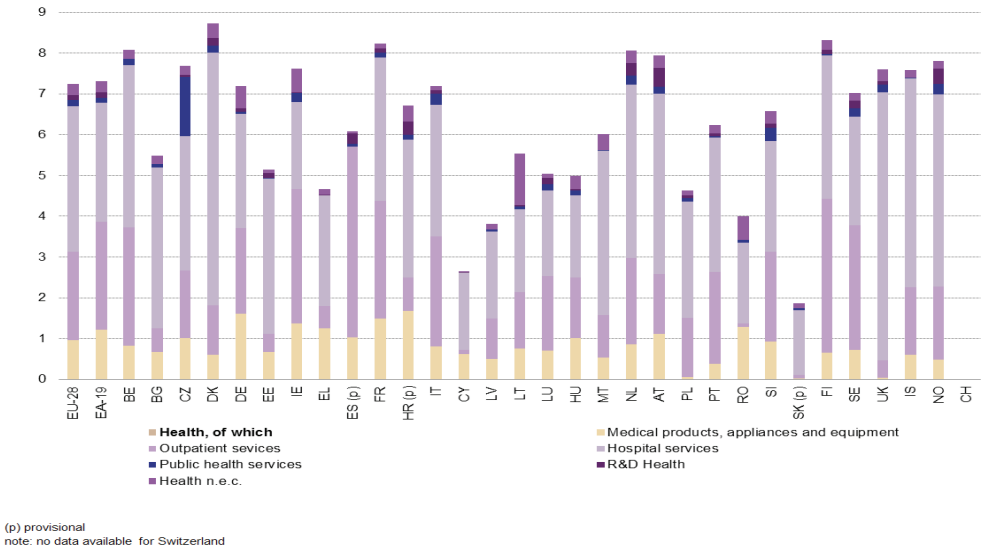

Figure 2. **Total general government expenditure on health, 2014 (% of GDP)**

Source: Eurostat 2016

Inequity of income distribution is another factor describing the economic development of EU countries (tab. 2). The highest inequity of income distribution has been observed in Latvia (7,3%), Romania (6,7%), Lithuania (6,3%), Spain and Portugal (6,0%).

The expenditure on education in relation to GDP is another indicator describing the development of EU. The highest public expenditures have been observed in Denmark (7,75), Cyprus (7,41), Sweden (6,74), Belgium (6,46), Finland (6,13) and Malta (6,01).

Unemployment is a factor describing the state of the economy. The long term unemployment is a state in which people who can work do not get a job through twelve months during two years. The long term unemployment was the highest in Slovakia (6,5%), Latvia (4,6%) and Hungary (4,2%).

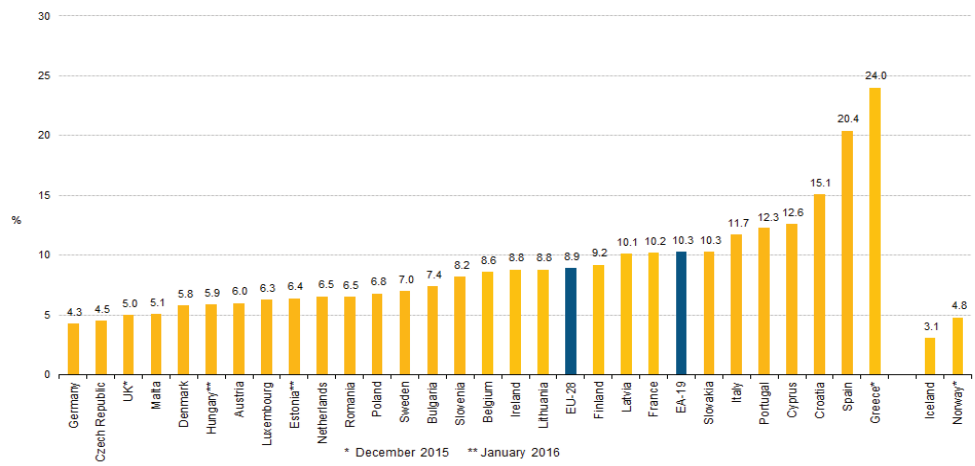

Figure 3. **Unemployment rate in February 2016**

Source: Eurostat 2016

The highest unemployment has been found in 2009 in Spain (18,0%), Latvia (17,2%), Estonia (13,8%), Lithuania (13,7%), Slovakia (12%) and Hungary (10%). However, the lowest unemployment rate has been found in 2015 in Czech Republic and Germany (each country 4,5%), Malta and Great Britain (each country 5,1%).

The last results of unemployment in EU countries in February 2016 show that the highest level of unemployment has been found in Greece (24,0%), Spain (20,4%) and Croatia (15,1%). Countries with the lowest unemployment rate in February 2016 are: Germany (4,3%), Czech Republic (4,5%) and Great Britain (5,0%).

Environmental development is closely linked with total farm numbers. The biggest farm numbers have been found in 2010 in Romania (3859 thousands), Italy (1621 thousands) and Poland (1507 thousands). Big farms; numberis a chance for many owners to transform it for ecological; production which is a chance not only to get healthy food but also higher subsidies. The biggest number of ecological farms have been found in 2013 in: Italy 45 969, Spain 30502, Poland 26598, France 25 469, Greece 23433 and Germany 23271.

Large farms are important for the efficiency of agricultural production (Figure. 4). The biggest number of farms with the area above 50 ha is in: Spain, France, Germany and Great Britain. Farms in these countries have the biggest chance to achieve better economic results.

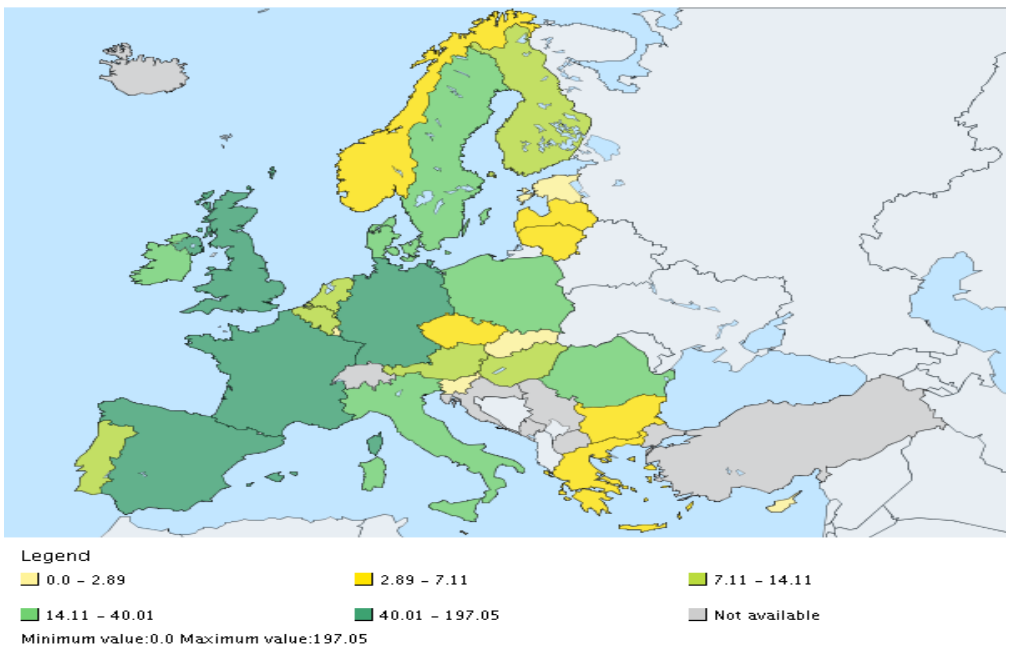

Figure 4. **Agricultural holdings with agricultural area above 50 ha**

Source: Eurostat 2016

The highest number of passenger cars per 1000 inhabitants has been observed in Italy (606), Austria (522), Malta (568) and Finland (521).

The electricity consumption in households per 1 capita has been smallest in Romania (511,8 kwh), Poland (721,8 kwh) and Lithuania (812,4 kwh). The highest consumption of electricity per 1 capita has been found in Scandinavian countries such as: Sweden (4423,9 kwh) and Finland (4139,9 kwh).

The highest capital formation in relation to GDP has been observed in Romania (26,2%), Slovenia (23,9%), Spain (24%), Czech Republic (22,5%), Estonia (21,6%) and Poland (21,2%).

Table 2. **Economic development of European Union countries**

Countries	Real GDP per capita growth rate and tools (chain linked volumes 2010)		Inequality of income distribution In 2009	Public expenditure on education in relation to GDP in 2009	The rate of long-term unemployment in 2009	Rate of unemployment in 2009 and 2015	
	2005	2014	2009	2009	2009	2009	2015
UE	24,8	25,9	4,9	5,07	3,0	9,0	9,0
Austria	33,6	36,0	3,7	5,46	1,0	4,8	5,8
Belgium	32,5	33,8	3,9	6,46	3,5	7,9	7,9
Bulgaria	4,2	5,5	5,9	4,61	3,0	6,8	8,8
Cyprus	22,9	20,1	4,2	7,41	0,6	5,3	15,7
Denmark	44,5	43,7	4,6	7,75	0,5	6,0	6,0
Estonia	11,0	13,2	5,0	5,67	3,8	13,8	6,5
Finland	34,2	34,1	3,7	6,13	1,4	8,2	9,5
France	30,5	31,1	4,4	5,58	3,4	9,5	10,2
Greece	20,9	17,0	5,8	Na	3,9	9,5	24,5
Spain	23,5	22,4	6,0	4,62	4,3	18,0	20,8
Ireland	38,4	39,5	4,2	5,62	3,4	11,9	8,8
Lithuania	8,0	11,2	6,3	4,91	3,2	13,7	8,5
Luxemburg	75,1	78,2	4,3	Na	1,2	5,1	6,1
Latvia	8,1	10,4	7,3	5,71	4,6	17,1	10,2
Malta	14,8	17,5	4,1	6,01	3,0	7,0	
The Netherlands	36,3	37,9	4,0	5,46	0,9	3,7	6,7
Germany	29,8	33,8	4,5	4,55	3,5	7,8	4,5
Poland	7,5	10,5	5,0	5,09	2,5	8,2	7,1
Portugal	16,6	16,3	6,0	4,89	Na	10,6	11,8
Czech Republic	13,5	15,2	3,5	4,08	2,0	6,7	4,5
Romania	5,1	6,9	6,7	Na	2,2	6,9	6,7
Slovakia	9,9	13,5	3,6	3,59	6,5	12,0	10,6
Slovenia	16,6	17,6	3,2	5,22	1,8	5,9	8,8
Sweden	37,8	40,3	3,7	6,74	1,1	8,3	7,1
Hungary	9,8	10,5	3,5	5,10	4,2	10,0	6,3
Great Britain	29,4	30,4	5,2	5,36	1,9	7,6	5,1
Italy	28,0	25,3	5,2	4,58	3,5	7,8	11,4

Source: Eurostat data 2016

Table 3. **Environmental development in European Union countries**

Countries	The number of passenger cars per 1000 inhabitants in 2009	Electricity consumption in households per 1 capita i n 2009 (kwh)	Gross fixed capital formation in relation to GDP in 2009 (%)	Arable land in 2013		Total farms' number in 2010	Number of organic farms in 2013
				Per capita in ha	In % of total area		
UE	473	1679,2	19,3	0,21	25,6	12015	258773
Austria	522	1965,4	21,1	0,16	16,4	150	21810
Belgium	483	1979,7	21,3	0,10	26,9	42,9	1487
Bulgaria	329	1354,6	Na	0,50	32,0	371	3854
Cyprus	579	2160,0	20,6	0,07	8,6	38,9	719
Denmark	Na	1941,3	18,2	0,40	56,7	42,1	2589
Estonia	407	1405,6	21,6	0,49	14,9	19,6	1553
Finland	521	4139,9	19,5	0,40	7,3	63,9	4284
France	Na	2672,7	20,6	0,30	33,4	516	25467
Greece	Na	1610,2	17,1	0,20	19,8	723	23433
Spain	480	1516,8	24,0	0,30	25,1	990	30502
Ireland	Na	1790,2	15,5	0,24	16,2	140	1263
Lithuania	506	812,4	17,1	0,76	36,5	199,9	2555
Luxemburg	Na	1767,5	17,3	0,12	24,1	2,2	212
Latvia	400	884,6	21,3	0,60	19,4	83,4	3473
Malta	568	1377,8	14,8	0,02	28,0	12,5	12
The Netherlands	462	1465,2	19,0	0,10	30,8	72,3	1646
Germany	509	1697,5	17,6	0,10	34,1	299	23271
Poland	433	721,8	21,2	0,30	35,3	1507	26598
Portugal	Na	1335,1	19,9	0,10	12,2	305	3308
Czech Republic	424	1403,3	22,5	0,30	40,8	22,9	3910
Romania	197	512,8	26,2	0,40	38,0	3859	15315
Slovakia	294	818,7	20,6	0,30	29,0	24,5	365
Slovenia	521	1545,0	23,9	0,08	8,6	74,7	3049
Sweden	465	4423,9	17,8	0,30	6,4	71,1	5584
Hungary	300	1120,0	20,9	0,40	48,6	577	1673
Great Britain	459	1989,5	14,6	0,10	25,9	187	3918
Italy	606	1147,8	18,9	0,10	23,2	1621	45969

Source: Eurostat data 2016

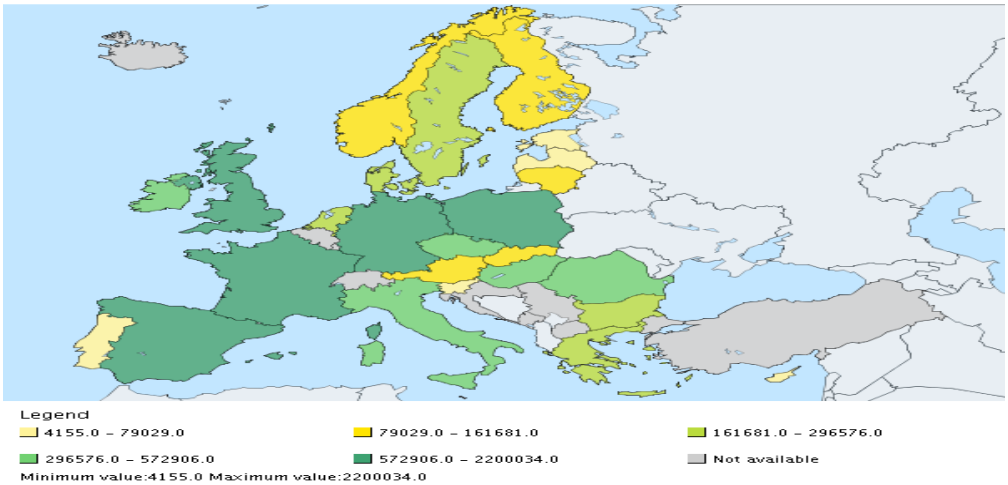

Figure 5. Consumption estimate of manufactured fertilizers: Nitrogen (tones of N)

Source: Eurostat 2016

The intensity of agriculture is closely linked with the consumption of manufactured fertilizers. Using fertilizers helps in achieving big crops on one hand but it destroys the environment on the other hand.

2.6. Conclusions

Sustainable development requires equal development in society, ecology and economics. Sustainable development requires more finance from the EU budget to raise social awareness in the society.

The social development of European Union countries divides EU for west and east countries. The east part of European Union has less sociallly developed countries. It is characterized by higher unemployment, a higher rate of infant deaths and higher employment in agriculture. The fertility rate is the highest in Ireland, France and Denmark, which is another factor differentiating the European Union. Moreover, the indicator of people at risk of poverty or social exclusion was the highest in 2014 in Romania (40,2%), Greece (36,0%), Latvia (32,7%) and Hungary (31,8%).

The authors characterized the economic development by the persistent risk of poverty and inequity of income distribution. These indicators were also higher in east European Union countries, which confirms the slower development pace.

The European Union as a set of 28 countries is developing well however with different pace as the conditions of countries was different historically. The east European countries are developing slower. This is the effect of an economy that is based on agriculture.

The important part of sustainable development is organic agriculture development. This form of activity is typical for countries with good conditions for tourism development. This is the most typical activity for farmers in Italy, Spain, Poland, France, Greece and Germany.

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Eurostat data 2016

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PART II
ECONOMIC DEVELOPMENT OF RURAL AREAS

3

THE SYNTHETIC INDEX AS AN EXPRESSION OF A PROCESS APPROACH TO ASSESS THE PERFORMANCE OF LOCAL GOVERNMENT

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Abstract: Financial situation is an important issue for the managers. The analysis of financial situation is essential not only for current management, but also for protection before side effects of economic downturn. Case management of public resources by the local government money is very important due to the ever-growing social needs and limitations of available resources. Assessment of the financial situation is a difficult task. Requires consideration of many different elements. The aim of the study is to select a set of statistical features defining the financial condition of a province and to determine the possibilities of using the synthetic index method to distinguish the spatial differentiation of the units. The situation of financial condition of provinces in Poland is difficult. The leading positions were held by śląskie and mazowieckie. At the end of the ranking were świętokrzyskie, lubuskie (2003), podlaskie (2005), warmińsko-mazurskie (2010). The value of the measure fluctuated between: in 2003 – 0.66 and 0.33; 2005 – 0.74 and 0.23; 2010 – 0.58 and 0.24; 2014 – 0.57 and 0.17.

Key words: municipal income, expenses municipalities, local governments, development, synthetic index

3.1. Introduction

Self-government actions, which include property management, services, finance management, investments etc., have influence on regional economy. The tasks from the public usefulness area are non-profit. They are financed from public funds1.

The process approach focuses on sequences of activities in and outside the organization and the relationships between them in order to achieve the intended results. It's a holistic way of thinking about processes as interrelated activities. That every unit is a set of mutually interwoven processes, whose identification allows for a better understanding of

[1] Por. M. Gorynia, E. Łaźniewska (red.) [2013]: *Kompendium wiedzy o konkurencyjności [Compendium of knowledge about competitiveness]*, Wyd. Naukowe PWN, Warszawa 2009.
A. Olak, A. Pawlik, [2013]: *Wrażliwość Regionu na zmiany[Sensitivity to changes in the Region],* WSBiP, Ostrowiec Św.

value creation of the organization. The processes taking place in organizations speaking in general can be divided into management processes, production processes and the processes of measurement, analysis and improvement.

Territorial self-government as the subject of economic, political and social life of the region plays an active role in the creation of qualitative and quantitative transformations[2,3]. Factors affecting this process include finance, modernity, variety and innovation of regional economy, the quality of spatial management, the level of infrastructure development and the human capital[4, 5, 6].

In order for the territorial self-government units to fulfil their role in shaping the living and managing conditions of the local communities in an active way, they must be equipped in the proper financial resources. The financial system should guarantee the proper amount of resources for the tasks, the ability of their unconstrained disposal and most importantly should secure the stability of income[7].

Financial resources are the basis for local government and provided implementation tasks imposed on them, it determines the development of the municipality. Finances is a synthetic expression of the potential for economic development[8]. The financial situation of self-government is a complex phenomenon. It consists of: the level of income, financial independence, the size of capital expenditures, ability to raise extra-budgetary funds[9].

What is the research problem?

3.2. Objectives, Methods and Data Sources

The aim of the study is to select a set of statistical features defining the financial condition of a provinces and to determine the possibilities of using the synthetic index method to distinguish the spatial differentiation of the units. The analysis include the comparison of the situation of as above in the studied years: 2003 (the year before the accession to the

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2 E.M. Sokołowicz, [2008]: *W kierunku nowej polityki regionalnej? Rozważania nad przyszłym kształtem polityki regionalnej w Polsce* (w:) *Polityka spójności – ocena i wyzwania. Materiały z konferencji[Towards a new regional policy? Reflections on the future shape of regional policy in Poland (w:) Cohesion Policy – Assessment and challenges], Ministerstwo Rozwoju Regionalnego, Warszawa, p. 7–22.*

3 P. Prus, B.M. Wawrzyniak, [2011]: *Zarządzanie projektami i funkcje gmin w zakresie programów rozwoju obszarów wiejskich[Project management and functions of municipalities in the field of rural development programs]. Studia i materiały Polskiego Stowarzyszenia Zarządzania Wiedzą, nr 44, p. 77-92.*

4 P. Dorčák, F. Pollák, S. Szabo, [2014]: *Analysis of the possibilities of improving an online reputation of public institutions (w:) IDIMT-2014, Sept. 10–12. Poděbrady: IDIMT Networking Societies-Cooperation and Conflict 22ndInterdisciplinary Information and Management Talks, p. 275-281.*

5 P. Prus, A. Sadowski, [2012]: *Rozwój przedsiębiorczości na terenie gminy Tczew w województwie pomorskim jako efekt wstąpienia Polski do Unii Europejskiej[development of entrepreneurship in the tczew county in pomorskie voivodship as a result of poland's accession to the European Union], Roczniki Naukowe SERiA, Tom XIV, Zeszyt 2, 126-130.*

6 M. Kowalska, W. Knapik, M. Bogusz i inni, [2015]: *Rozwój lokalny obszarów wiejskich w perspektywie społeczno – ekonomicznej, [Local development of rural areas in view of the socio – economic] Uniwersytet Rolniczy im. H. Kołłątaja w Krakowie, Kraków.*

7 B. Filipiak, S. Flejterski, [2008]: *Bankowo-finansowa obsługa jednostek samorządu terytorialnego[Banking and financial services units of local government], Wydawnictwo CeDeWu.pl., Warszawa, p. 22.*

8 B. Klepacki, B. Kusto, *Ocena kondycji finansowej gmin województwa świętokrzyskiego[The evaluation of fi nancial situation of communes in Świętokrzyskie voivodeship], <http://www.wne.sggw .pl/czasopisma/pdf/EIOGZ_2009_nr77_s127.pdf> (04.09.2015), p. 127-135.*

9 L. Ossowska, A. Ziemińska, [2010]: *Kondycja finansowa gmin wiejskich i miejsko-wiejskich województwa pomorskiego[The financial conditions of the rural and urban-rural communes of the pomorskie voivodeship], Journal of Agribusiness and Rural Development 4(18), p. 73–85.*

European Union), 2005 (a year after the accession to the EU), 2010 (a period of entering into force of the new act on public finance from 2009) and 2014 (a period of improvement of the social-economic situation after the crisis in the years 2007-2010).

Selected analytic variables (stimulants, destimulants) are characterized by high spatial variability and low correlation. Stability, in case of the variables, was the reason of their elimination from the set of variables creating the structure of synthetic index (index value ≤ 0.1; quasi-stable variables removed, stability of variables). The coefficient of correlation is the measurement of dependence between two features. The high level, index's value ≥ 0.75 means excessive correlation and similar analytical information of the variables. It means the removal of one of the variables from further study[10,11].

The following variables were chosen to build the synthetic index (per capita):

F1. total income, stimulant
F2. total own income, stimulant,
F3. personal income tax, stimulant,
F4. corporation tax, stimulant,
F5. income from property, stimulant,
F6. grants, destimulant,
F7. subventions, destimulant,
F8. total expenses, stimulant,
F9. assets and capital expenditure (investments), stimulant,
F10. current expenses, destimulant,
F11. expenditure on debt service, destimulant,
F12. expenditure on administration, destimulant,
F13. expenditure on health care, stimulant,
F14. expenditure on education and training, stimulant.

The method of unitarization has been used in the calculations. It enables the comparison of the diagnostic variables[12]. Its aim is to deprive the variables of names and unification of the orders of magnitude of the measurements results. Unitarization was done based on the formula:

$$\text{stimulant} \quad x = \frac{x_{ij} - \min\limits_{i} x_i}{\max\limits_{i} x_i - \min\limits_{i} x_i} \qquad \text{and destimulant} \quad x = \frac{\max x_i - x_j}{\max\limits_{i} x_i - \min\limits_{i} x_i} \ ,$$

[10] P. Dziekański, [2015]: *Koncepcja wskaźnika syntetycznego dla oceny sytuacji finansowej powiatów*, s. 98-108 (w:) D. Dziawgo, G. Borys (red.), *Rachunkowość na rzecz zrównoważonego rozwoju; Gospodarka – etyka – środowisko[The concept of the synthetic indicator for the assessment of the financial situation of districts], Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu, nr 329/2014.*

[11] P. Dziekański, *Wykorzystanie wskaźnika syntetycznego do oceny poziomu rozwoju samorządu na przykładzie gmin wiejskich województwa świętokrzyskiego* (w:) S. Owsiak (red.), *Determinanty rozwoju Polski. Finanse publiczne[The use of the synthetic indicator to assess the level of development of local government on the example of rural communes Świętokrzyskie province], PTTE, Warszawa, p. 261-279. Por. D. Strahl, Metody oceny rozwoju regionalnego, Wyd. AE, Wrocław 2006.*

[12] A. Zeliaś (red.), [2000]: *Taksonomiczna analiza przestrzennego zróżnicowania poziomu życia w Polsce w ujęciu dynamicznym, [Taxonomic analysis of spatial differentiation of living standards in Poland in terms of dynamics] Wyd. AE w Krakowie, Kraków.*

P. Bury, P. Dziekański, *Ocena kondycji finansowej powiatów województwa świętokrzyskiego w latach 2007-2011 za pomocą wskaźnika syntetycznego[Assessment of the financial condition of districts Voivodship in the years 2007-2011 using the synthetic indicator], p. 220-248 (w:) V. Jurcak, P. Dziekański (red.), [2013]: Czynniki zmian zjawisk regionalnych, Wyd. WSBiP Ostrowiec Św., Ostrowiec Świętokrzyski.*

where: x – is the unitarized value of a feature for the studied unit, x_{ij} – is value j-feature for the studied unit, max – maximum value of j-feature, min – minimum value of j-feature[13,14]. Sequentially calculated synthetic measure has values from the range [0, 1]. Next the studied units were sorted according to the value of index of financial condition. Synthetic index was build according to

the formula: $s_i = \frac{1}{p}\sum_{j=1}^{p} x_j \ (i = 1,2,...,p)$;

where: Si – synthetic measure of infrastructure in the studied period of time, x_{ij} – features of synthetic index structure, p – number of partial indexes used in the construction of aggregate measure of the potential's aspect[15,16].

As source material used data from the Central Statistical Office – Local Data Bank for years 2003-2014

3.3. Financial Condition and Finance Local Government Units

The financial resources are the basis for the realization of public tasks. Their decide about the economic conditions and investment activities of the public units. The limitation of financial resources becomes a problem in comparison with the range of realized tasks[17].

Funding the tasks performed by the municipalities on their own behalf and at their own risk should be done from the income left at their sole disposal. The general subsidy from the state budget is complementary in terms of own income. The targeted subsidies, which aim at funding or refinancing specific tasks, are the source of funding of tasks realized by territorial self-government units as entrusted or delegated tasks[18]. In case of technical infrastructure[19], social infrastructure[20], public order and safety[21], spatial and ecologic order[22], additional difficulties appear in results measuring of public expenses incurring on performing these services[23].

The financial condition is a complex phenomenon which is difficult to measure on the basis of one feature. Creating a synthetic variable, which aggregates a series of determinants of this phenomenon, is a way of assessing the financial condition. This

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13 F. Wysocki, J. Lira, [1996]: *Statystyka opisowa*, Wyd. AR, Poznań 2005.

14 F. Wysocki [1996]:, *Metody statystycznej analizy wielowymiarowej w rozpoznawaniu typów struktury przestrzennej rolnictwa[Methods of multivariate statistical analysis in identifying the types of spatial structure of agriculture], Roczniki AR w Poznaniu, seria Rozprawy Naukowe, z. 266, Poznań.*

15 P. Dziekański, [2011]: *Analiza sytuacji finansowej samorządu jako wyznacznik efektywności ekonomicznej jednostki samorządu terytorialnego*, s. 247-259 (w:) B. Filipiak (ed.), *Finanse publiczne i rozwój przedsiębiorczości w regionach[Analysis of the financial situation of local government as a measure of the economic efficiency of local government units], Zeszyty Naukowe 38, Wyższa Szkoła Bankowa w Poznaniu.*

16 P. Dziekański, [2015]: *The assessment of the functioning areas of the Kamienna Basin municipalities (finance, environment, infrastructure), p. 68-73 (w:) Košická bezpečnostná revue; Polročník Všbm V Košiciach; periodicita; polročník; 2.*

17 Por. W. Gonet, [2013]: *Naprawa finansów jednostki samorządu terytorialnego[Repair finance local government units], Difin, Warszawa.*

18 A. Hanusz (red.), Źródła *finansowania samorządu terytorialnego[Sources of financing of local government], < https://www.profinfo.pl/img/401/pdf40448702_4.pdf> (2015.10.29).*

19 roads, waterworks, public communication.

20 elementary schooling, health care, social services.

21 fire protection, sanitary protection.

22 local economy and environment protection.

23 S. Owsiak, [2002]: *Budżet władz lokalnych[The budget of local authorities]*, PWE, p. 51.

variable is a tool of comparative analysis which focuses on the study of subjects in terms of various features.

The financial condition refers to the financial state in a given interval. There is feedback between the financial condition and the level of local development, understood as a complex of quantitative and qualitative transformations concerning a given area and referring to both the level of living of the inhabitants and the economic operators functioning[24].

Financial strength is depends, among other things, from: performed tasks, achievement of budgetary balance, the level of income, financial independence, the amount of investment expenses, obtaining extra-budgetary funds and the financial result[25,26].

3.4. The Synthetic Index of Financial Evaluation

In the financial economy of the region, two major factors, which create the basis of development, are distinguished: own revenues, which indicate the economic activity; and investments, which indicate the tendency to increase one's ownership conditions. They contribute to the improvement of living conditions and the general development. Own revenues of self-government depend from economic situation in the local scale. They are the evidence of territorial self-government unit's affluence, as well as of high financial independence in the area of funds spending[27].

[24] A. Sobczyk, [2010]: *Rozwój lokalny – wybrane problemy finansowania[Local development – specific problems in financing], ZN SGGW, Ekonomika i Organizacja Gospodarki Żywnościowej 81, 125-136.*

[25] L. Ossowska, A. Ziemińska, [2010]: *Kondycja finansowa gmin wiejskich i miejsko-wiejskich województwa pomorskiego[the financial conditions of the rural and urban-rural communes of the pomorskie voivodeship], Journal of Agribusiness and Rural Development 4(18), 73–85;*

[26] Ł. Satoła, [2015]: *Kondycja finansowa gmin w warunkach zmiennej koniunktury gospodarczej [The financial condition of municipalities in variable economic situation], Journal of Agribusiness and Rural Development, Nr 1(35), s. 115-123.*

[27] T. Famulska (red.), [2009]: *Gospodarka finansowa jednostek samorządu terytorialnego w warunkach integracji europejskie[Financial management of local government units in the conditions of European integration]j, Wyd. AE w Katowicach, s. 7.*

Table 1. **Synthetic index of financial condition of provinces in Poland**

Groups	2003	2005	2010	2014
0,80 ≤ S < 1,00 very good (A)	-	-	-	-
0,60 ≤ S < 0,80 good (B)	śląskie 0,66 mazowiecki 0,65	mazowieckie 0,74 śląskie 0,61	-	-
0,40 ≤ S < 0,60 average (C)	małopolskie 0,57 pomorski 0,57 wielkopolskie 0,52 podlaskie 0,50 podkarpackie 0,49 dolnośląskie 0,46 kujawsko- -pomorskie 0,46 łódzkie 0,44 zachodnio- pomorskie 0,43 lubelskie 0,41 warmińsko- mazurskie 0,40	pomorskie 0,55 kujawsko- pomorskie 0,49 wielkopolskie 0,48 opolskie 0,48 łódzkie 0,45 dolnośląskie 0,45 małopolskie 0,42	dolnośląskie 0,58 mazowieckie 0,57 pomorskie 0,51 śląskie 0,48 łódzkie 0,46 wielkopolskie 0,43	mazowieckie 0,57 śląskie 0,56 dolnośląskie 0,51 pomorskie 0,50 małopolskie 0,48 podlaskie 0,44 wielkopolskie 0,42
0,20 ≤ S < 0,40 weak (D)	opolskie 0,39 świętokrzyskie 0,38 lubuskie 0,33	zachodnio- pomorskie 0,39 podkarpackie 0,36 lubelskie 0,33 lubuskie 0,32 świętokrzyskie 0,26 warmińsko- -mazurskie 0,25 podlaskie 0,23	małopolskie 0,39 zachodnio- pomorskie 0,38 opolskie 0,36 kujawsko- -pomorskie 0,34 świętokrzyskie 0,31 podkarpackie 0,29 podlaskie 0,29 lubuskie 0,26 lubelskie 0,24 warmińsko- -mazurskie 0,24	łódzkie 0,39 lubelskie 0,39 podkarpackie 0,39 zachodnio- pomorskie 0,39 świętokrzyskie 0,38 kujawsko- -pomorskie 0,34 warmińsko- mazurskie 0,25 opolskie 0,20
0,00 < S < 0,20 very weak (E)	-	-	-	lubuskie 0,17

Source: own elaboration based on Dziekański P., Finance region for sustainable development. Synthetic description of financial conditio, VADYBA Journal of Management, Volume 27/Number 2/2015, s. 33 – 40.

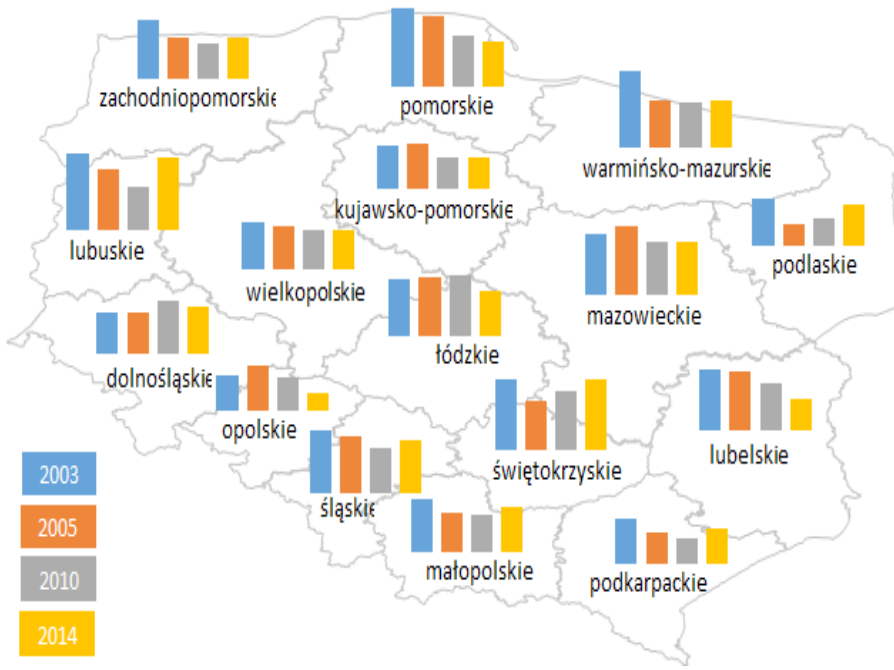

Figure 1. **Synthetic index of financial condition of provinces in Poland in the years 2003, 2005, 2010, 2014)**

Source: own elaboration

The research done confirm the existence of disproportions in the area of financial condition of the voivodeships in Poland. The order of the provinces in the ranking has not basically changed in the following years. During the studied period of time the leading positions were held by śląskie (2003 – 0.66, 2005 – 0.61, 2010 – 0.48, 2014 – 0.56) and mazowieckie province (0.65, 0.74, 0.57, 0.57). At the end of the ranking were świętokrzyskie (0.38, 0.26, 0.31, 0.38), lubuskie (2003 – 0,33; 2014 – 0,17), podlaskie (2005 – 0,23), warmińsko-mazurskie (2010 – 0,24; table 1, fig. 1).

The analysis enabled the division of voivodeships into 5 groups. The vast majority of voivodeships belongs to group C (2003 – 11 units, 2005 – 7, 2010 – 6, 2014 – 7) and D (2003 – 3, 2005 – 7, 2010 – 10, 2014 – 8). There are no voivodeships in group A and E (except for lubuskie province in 2014) and there were none in group B in 2010 and 2014 (śląskie and mazowieckie in 2003 and 2005). A shift in time can be observed between the groups (table 1, fig. 1).

The high index of financial condition of a provinces (śląskie, mazowieckie, dolnośląskie) is, inter alia, appropriate level of own revenues or expenditure potential of local budgets as well as the ability to realize pro-development investment projects. Worse situation in the area of financial condition characteristic for świętokrzyskie, podkarpackie, lubelskie, podlaskie, warminsko-mazurskie. The Units have difficulties with creating own revenues. These are usually voivodeships located in the poorly developed Eastern part of

the country, with significant development needs (for instance because of infrastructural gap or significant decapitalisation of a part of owned property).

Table 2. **Transformations of synthetic index in the studied years**

	2004/2003	2005/2004	2006/2005	2007/2006	2008/2007	2009/2008	2010/2009	2011/2010	2012/2011	2013/2012	2014/2013	changes +
Łódzkie	▼	▲	▲	▼	▲	▲	▼	▼	▼	▲	▼	5
Mazowieckie	—	▲	▲	▲	▼	▼	▼	▲	▼	▲	▼	4
Małopolskie	▼	▼	▲	▼	▲	▲	▼	▲	—	▼	▼	4
Śląskie	▼	▲	▲	▼	▼	▼	▼	▲	▲	▲	▼	5
Lubelskie	▼	▼	▼	▼	▲	▼	▲	▲	▼	▲	▲	5
Podkarpackie	▼	▼	▲	▼	▼	▼	▲	▲	▼	▲	▼	4
Podlaskie	▼	▼	▲	▼	▲	▲	▼	▲	▼	▲	▲	6
Świętokrzyskie	▼	▼	▲	—	▼	▲	▼	▲	▲	—	▼	4
Lubuskie	▼	▲	▼	▼	▼	▲	▼	▼	▼	▲	▼	3
Wielkopolskie	▲	▼	▼	▼	▼	▲	▼	▲	▼	▲	▼	4
Zachodniopomorskie	▼	▼	▼	▲	▼	▲	—	▲	▼	▲	▲	5
Dolnośląskie	▲	▼	▲	—	▼	▼	▲	▲	▲	▼	▼	5
Opolskie	▼	▲	▲	▼	▼	▲	▼	▼	▼	▲	▼	4
Kujawsko-Pomorskie	▼	▲	▼	▼	▼	▼	▲	▼	▼	▲	—	3
Pomorskie	▼	▲	▼	▲	▲	▼	▲	▲	▲	▼	▼	6
Warmińsko-Mazurskie	▼	▼	▼	▲	▼	▲	▲	▼	▲	▲	▼	5

▲ increase ▼ decrease — no changes Source: own elaboration
Source: own survey

In relation year on year the value of synthetic measure of financial condition does not have stable position. In the studied years 2003-2014 both positive relations year on year and negative relations were observed. The positive transformations took place in the following provimnces: podlaskie (6), pomorskie (6), mazowieckie (4), świętokrzyskie (4), lubuskie (3) and kujawsko-pomorskie (3. This can be interpreted as a development. Negative changes were noticed in all the voivodeships, which can assessed as period of regression (table 2).

Mazowieckie province belongs to one of the most internally differential voivodeships, with Warsaw (which affects significantly the region's position), which concentrates inter alia sizeable social and economic potential. The region of the remaining part of the province is poorly developed. The essential economic, capital and intellectual potential is concentrated in Warsaw and Warsaw agglomeration. Sub-regions of the provinces are characterized by poorer economic potential and lower development dynamic[28].

[28] *Regionalny Program Operacyjny Województwa Mazowieckiego 2007-2013 – Projekt wstępny[Regional Operational Programme Mazowieckie Province 2007-2013], <http://www.pozytek.gov.pl/RPO,woj.,mazowieckiego,2507.html> (20.01.2016).*

Śląskie province is one of the most competitive regions in Poland. It is caused by natural resources – the biggest in Poland coal deposits, fields of zinc and lead ores – which results in a significantly industrial character of the region – energy and raw materials and metallurgic. Moreover, there many other industrial plants, both heavy industry and advanced technology, in the voivodeship.

Świętokrzyskie province characterized agriculture, horticulture and gardening dominate. The region's economy is also based on extracting industry in the area of building materials (limestone, dolomites, marl, gypsum, sandstone, sulfur). Building companies belong to the biggest and the most dynamically developing in the country. Industry – metallurgic, machinery, precision and food processing – plays an important role in the region[29].

3.5. Conclusions

The financial condition of a local government is a complex phenomenon. Its accurate and comprehensive description requires consideration of many different aspects, eg. the level of income, financial independence, investment and current spendings, spendings on debt service, etc. Multidimensionality of this problem hinders an unambiguous assessment of the financial condition. A selected set of features of its description decides about the outcomes of the evaluation and the informational value of the final measure.

The model, which uses the aggregate index, can complement the traditional ratio analysis. The advantage of its use is the quantification of a complex phenomena with one numerical value, which facilitates any comparison and synthesizes partial images. It allows not only to observe how the financial condition changes with time, but also enables the comparison of units between one another or the identification of weak areas and improved functioning of the unit (eg. the analysis of standardized variables). The obtained measure can support the process of local financial management or monitor the situation in terms of the variable under consideration. The model allows to determine in which year, within the period considered, the financial condition was the best, in comparison with other years. It allows to evaluate the level of participation of each object in the development of the whole community and to make a hierarchy of objects from the point of view of adopted variables.

The financial strength in most provinces in the analyzed period (2003-2014) was at a level lower than at the beginning of the research. In the studied population the highest level of financial condition has been observed in the province of Silesia and Mazovia. These are units of large financial autonomy (measured by the share of own revenues in total revenues), a high level of investment activity (the share of capital expenditure in the total expenditure), a low level of current expenditures, well developed infrastructure and an industrial nature of the region. The size of incomes proves the wealth of a local government, as well as its autonomy and independence from the transfers from the state

[29] These are the elements that shape the ranking province. Dziekański P., [2015]: *Wykorzystanie wskaźnika syntetycznego do oceny poziomu rozwoju samorządu na przykładzie gmin wiejskich województwa świętokrzyskiego* (w:) S. Owsiak (red.), *Determinanty rozwoju Polski. Finanse publiczne[The use of the synthetic indicator to assess the level of development of local government on the example of rural communes Świętokrzyskie province], PTTE, Warszawa, s. 261-279.*

budget. They create opportunities for a fuller meeting of citizens' needs and improving the quality of services offered. The amount of expenses is the result of local needs and opportunities to satisfy them. Therefore, it becomes necessary to strengthen the capacity of local government income especially in a growing number of tasks and smaller funds, by strengthening the tax base, which should also reduce the dependency on subsidies and donations, and more economical expenditure, preceded by the payment analysis. At the end of the ranking there were Podlasie, Warmia-Mazury (regions with poorly developed industry and infrastructure). The metric value ranged in 2003 from 0.66 to 0.33; in 2005 – 0.74 to 0.23; in 2010 – 0.58 to 0.24; in 2014 – 0.57 to 0.17.

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UNEQUAL ACCESS: AN EXAMINATION OF THE BARRIERS RURAL AREAS CONTINUE TO FACE IN BROADBAND DEVELOPMENT

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Abstract: High speed, broadband Internet access in rural areas is crucial for meeting the needs of citizens and businesses. Facing a lack of broadband service due to private sector unwillingness to provide services, some rural communities have implemented independent, alternative models for delivering broadband access. While some attention has been given to public-private partnership (P3) and municipal delivery models as independent development strategies, limited research has focused on barriers confronting communities during the processes that lead to the successful implementation of such projects. Based on comparative case study research sponsored by the USDA National Institute of Food and Agriculture (NIFA) Rural Development Foundational Program, this paper explores six rural communities in Maine, Pennsylvania, and Wisconsin that utilized either a municipal or P3 strategy for independent broadband delivery. Results from a comprehensive analysis of the barriers these communities faced during these projects are presented. Findings suggest rural communities may be able to engage in successful, community-driven initiatives to decrease the digital divide with careful attention to these barriers through alternative institutional arrangements for broadband infrastructure and service provision, public education on the possibilities and potential associated with broadband Internet, community capacity development on technical knowledge, and public involvement in and outreach on broadband provision initiatives.

Keywords: rural, broadband, digital divide, community development, policy

4.1. Introduction

Access to information is one of the most critical needs for individuals, businesses, and communities to be able to engage in society. The speed and consistency of access to information is a substantial component of this engagement. With the advent of broadband Internet as a primary means of retrieving information and conducting business, access to digital communication with adequate speeds for accessing and transmitting information

is fundamental to modern citizenship, despite the fact that access is not geographically universal in the United States and worldwide[1]. This digital divide underscores the difference between places privileged with high-speed, business-level broadband Internet access, and those that lag behind in access across geographic space. The digital divide is the greatest between rural and urban areas, placing rural communities and residents at a severe disadvantage[2]. While there have been critics that indicate the digital divide is no longer relevant, there is clear indication that this issue still persists and remains an important one in our society[3].

Closing the digital divide between rural and urban America has proven to be a difficult task. Telecommunications providers argue that low population densities make it prohibitively expensive to extend fiber optic cables to sparsely populated areas. This private sector challenge associated with improving the rural telecommunications infrastructure has given rise to two alternative delivery models, each of which is designed to overcome some of the issues faced by private providers in rural areas. In the public private partnership (P3) model, a local or county government typically functions as the public partner and offers a right-of-way relationship to a private partner who then delivers and maintains broadband service. In the municipal model, a municipal government builds, owns, and operates the networks and provides ISP services to customers. While these models have received significant attention, research is limited on the obstacles to implementing these options for decreasing the digital divide in rural areas.

This paper presents findings from a comparative case study research project on bridging the rural digital divide, sponsored by the USDA National Institute of Food and Agriculture (NIFA) Rural Development Foundational Program. The cases of six rural communities in Maine, Pennsylvania, and Wisconsin that successfully utilized either a municipal or P3 strategy for independent broadband delivery are examined, explicating the challenges they faced during their local initiatives. We open by exploring further the digital divide. Following this, we explain the study methodology, present our findings, and finish with conclusions from our results.

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4.2. Contextualizing the Digital Divide

Even after more than a decade of documentation and research on the digital divide, this issue still remains a tangible and pressing problem for rural people and places. Compared to urban areas, rural areas face major disadvantages with regards to access to broadband connection[4]. The Federal Communications Commission (FCC) (2011 p. 2) defines broadband as "a transmission service that actually enables an end user to download content at speeds of at least 4 megabits per second (Mbps) and to upload content at speeds of at least 1 Mbps over the broadband provider's network (4 Mbps/1 Mbps).[5]" However, a 2010 report published for the U.S. Small Business Administration found that speeds much faster than 4 Mbps are often necessary, as distance learning and telecommuting activities require download speeds of at least 25 Mbps in order for a single user to have an "OK" experience, and 50 Mbps for a "Good" experience[6]. The disparity between urban and rural broadband utilization among residents is also quite large, with the Pew Internet and American Life Project indicating that 73% of suburban residents and 70% of urban residents have broadband Internet at home compared to only 62% of rural residents[7]. Nationally, there has been a slowing of provisional expansion and growth. The FCC

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5 Federal Communications Commission (FCC). [2011]: *Seventh Broadband Progress Report and Order on Reconsideration. Retrieved November 10, 2013 from: http://transition.fcc.gov/Daily_Releases/Daily_Business/2011/db0520/FCC-11-78A1.pdf.*

6 D. Beede and A. Neville [2013]: *Broadband Availability Beyond the Rural/Urban Divide. U.S. Department of Commerce's National Telecommunications and Information Administration and Economics and Statistics Administration. Retrieved June 6, 2014, from: http://www.ntia.doc.gov/files/ntia/publications/jobs_broadband_report_nov2013_final.pdf.*

7 K. Zickuhr and A. Smith [2013]: *Home Broadband 2013. Pew Internet and American Life Project. Retrieved, June 30, 2014 from: http://www.pewinternet.org/2013/08/26/home-broadband-2013/.*

reports that 20 percent of rural Americans lack access even to service at 4 Mbps/1 Mbps, down only 1 percent from 2011, and 31 percent lack access to 10 Mbps/1 Mbps, down only 4 percent from 2011[8]. This reality is disconcerting for rural areas, as the expansion of broadband provision is geographically linked to other previously established providers (Mack and Grubesic 2009), which many of these areas lack[9].

While residential broadband service is important for accessing information, and educational and employment opportunities, high-quality, high-speed access is becoming increasingly important for attracting and retaining business. Unfortunately, in many rural areas the telecommunications infrastructure is not advanced enough to allow entrepreneurs and communities to take full advantage of emerging economic development opportunities[10].

Advances in technology to increase broadband provision include the use of wireless networks. However, this provision is not universal, lagging in rural areas[11]. The National Telecommunications and Information Administration and the Economics and Statistics Administration released a report in 2013 which describes the percentages of the populations that have broadband services in Central Cities, Suburbs, Exurbs, Small Towns, and Very Rural categories. Under Census classifications, Central Cities, Suburbs, and Small Towns are considered "urban," while Exurbs and Very Rural are categorized as "rural"[12] . According to the 2011 data used in the report, "only 15 percent of rural residents had wireless download speeds of 10 Mbps or greater available, compared to 70 percent of urban residents"[13].

The report reveals that only 4.2% of residents in Very Rural areas have wireless download speeds of 10 Mbps or greater, compared with 24.3% of residents in Exurbs[14]. Additionally, as the percentages of Exurban residents with broadband access at highest speeds surpassed the percentages of Small Towns in several different comparisons, the report suggests that proximity to Central Cities "may be more strongly associated with the availability of the highest speed levels of broadband service than population density"[15].

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8 Federal Communications Commissions (FCC). [2015]: *Broad Band Availability in America. Retrieved from https://apps.fcc.gov/edocs_public/attachmatch/DOC-331734A1.pdf.*

9 E. A. Mack and T. H. Grubesic [2009]: *Forecasting broadband provision. Information Economics and Policy, 21, 297-311.*

10 T. R. Alter, J. C. Bridger, S. A. Sager, K. Schafft, and W. C. Shuffstall [2007]: *Getting Connected: Broadband Services a Key to a Vibrant Rural America. Rural Realities, 2(1), 1-10. Also published in The Rural Sociologist, 27(2), 2007, 24-33.* R. LaRose, T. Grubesic, J. M. Bauer, W. Ma, and S. Tsai [2011]: *Understanding Broadband Gaps: Predictors of Broadband Competition and Service Quality in the United States. Submitted to the 39th Telecommunications Policy Research Conference, August 15, 2011. Retrieved February, 28, 2012 from: http://www.tprcweb.com/jdownloads/2011/Evaluating%20Broadband%20Policy%202/tprc-2011-ebp2-1.pdf.*

11 J. Brodkin [2015]: *Internet nightmare: AT&T sells DSL to your neighbors, but not to you. http://arstechnica.com/business/2015/06/internet-nightmare-att-sells-broadband-to-your-neighbors-but-not-to-you/* A. Purcell [2015]: *Lack of wireless service vexes area residents, causes safety issue. Pughkeepsie Journal. Retrieved from http://www.poughkeepsiejournal.com/story/news/local/northern dutchess/2015/10/12/schumer-wireless-carriers-must-produce-accurate-coverage maps/73817062/*

12 D. Beede and A. Neville [2013]: *Broadband Availability Beyond the Rural/Urban Divide. U.S. Department of Commerce's National Telecommunications and Information Administration and Economics and Statistics Administration. Retrieved June 6, 2014, from: http://www.ntia.doc.gov/files/ntia/publications/jobs_broadband_report_nov2013_final.pdf.*

13 D. Beede and A. Neville [2013]: *Broadband Availability Beyond the Rural/Urban Divide. U.S. Department of Commerce's National Telecommunications and Information Administration and Economics and Statistics Administration. Retrieved June 6, 2014, from: http://www.ntia.doc.gov/files/ntia/publications/jobs_broadband_report_nov2013_final.pdf.*

14 D. Beede and A. Neville [2013]: *Broadband Availability Beyond the Rural/Urban Divide. U.S. Department of Commerce's National Telecommunications and Information Administration and Economics and Statistics Administration. Retrieved June 6, 2014, from: http://www.ntia.doc.gov/files/ntia/publications/jobs_broadband_report_nov2013_final.pdf.*

15 D. Beede and A. Neville [2013]: *Broadband Availability Beyond the Rural/Urban Divide. U.S. Department of Commerce's National Telecommunications and Information Administration and Economics and Statistics Administration.*

4.3 Policy Responses

With this clear distinction in unequal access across geographical areas, a number of policies aim to level the playing field. The Telecommunications Act of 1996 provided the basis for equal service across the United States[16]. More recently, the FCC (2010) released the National Broadband Plan outlining a strategy to increase the nation's connectivity in response to a congressional mandate. The third priority of the National Broadband Plan is to ensure universal access to broadband, including rural areas where costs are often deemed prohibitive because of low population density[17]. The National Broadband Plan also initiated the creation of the Connect America Fund, in order "to convert its $4.5 billion program that pays for telephone service in rural parts of the country into one that subsidizes high-speed Internet service in high-cost areas"[18]. Additionally, the American Reinvestment and Recovery Act of 2009 allocated $7.2 billion for the Rural Utilities Service (RUS) and the Department of Commerce's National Telecommunications Information Administration (NTIA), in order to facilitate broadband adoption, access, and awareness, with the ultimate goal of bringing community development to rural areas. However, the program offered through the NTIA proved more beneficial to urban areas than their rural counterparts[19]. The RUS program application process received an overwhelming amount of requests, nearly $28 billion, and funded over 1700 applications, equivalent to $24.5 billion[20]. These figures demonstrate the high demand among rural communities for broadband access.

While policy continues to advance, rural Americans still experience barriers to fully reaping the benefits of new policies. For instance, in 2015, the FCC issued a new policy, "Technology Transitions," mandating processes to aid in the transition from copper wire systems to wireless systems. While the policy requires that carriers provide up to 8 hours of backup power to all consumers as "optional," it does not stipulate that the company must do this without raising their rates to consumers[21]. Thus, even policies aimed at increasing broadband access do not fully address the range or complexity of obstacles

Retrieved June 6, 2014, from: http://www.ntia.doc.gov/files/ntia/publications/jobs_broadband_report_nov2013_final.pdf.

16 Federal Communications Commission (FCC). [1996]: *Telecommunications Act of 1996. Retrieved November 10, 2013, from: http://transition.fcc.gov/telecom.html.*

17 Federal Communications Commission (FCC). [2010]: *The National Broadband Plan: Connecting America. Retrieved November 10, 2013, from: http://www.broadband.gov/plan/.*

18 E. Wyatt [2014]: *Court Approves F.C.C. Plan to Subsidize Rural Broadband Service. The New York Times. Retrieved June 6, 2014, from: http://www.nytimes.com/2014/05/24/business/court-approves-fcc-plan-to-subsidize-rural-broadband-service.html.*

19 R. LaRose, T. Grubesic, J. M. Bauer, W. Ma, and S. Tsai [2011]: *Understanding Broadband Gaps: Predictors of Broadband Competition and Service Quality in the United States. Submitted to the 39th Telecommunications Policy Research Conference, August 15, 2011. Retrieved February, 28, 2012 from: http://www.tprcweb.com/jdownloads/2011/Evaluating%20Broadband%20Policy%202/tprc-2011-ebp2-1.pdf.*

20 J. Adelstein [2011]: *Statement of Jonathan Adelstein to the Subcommittee on Communications, Technology and the Internet, House Energy & Commerce. United States Department of Agriculture. Retrieved from: http://democrats.energycommerce.house.gov/sites/default/files/documents/Testimony-Jonathan%20Adelstein-CT-NTIA-RUS-Authorization-Return-Reclaimed-Stimulus-Funds-to-Treasury.pdf.*

21 National Rural Assembly. [2015]: *Rural Broadband Policy Group Supports FCC Actions on Technology Transitions, But Criticizes Lack of Option for Poor Consumers on Backup Power. Retrieved from http://ruralassembly.org/blog/2015/8/7/rural-broadband-policy-group-supports-fcc-actions-on-technology-transitions-but-criticizes-lack-of-option-for-poor-consumers-on-backup-power*

rural Americans experience in accessing broadband services. At the intersection of new policy, remaining challenges, and continued lack of access in rural communities, local initiatives and innovation may play a critical role in addressing the digital divide.

4.4. Local Initiatives for Broadband Development

The underfunding of broadband development projects in rural areas and the lack of investment by the private sector due to profitability reasons allows the digital divide to persist. However, there are local initiatives aimed at decreasing this disparity through alternative delivery models. These models utilize local governmental organizations to leverage support needed for broadband penetration. As mentioned previously, the two most popular delivery models are municipal delivery and public-private partnerships (P3), previously mentioned.

Municipal broadband delivery models use a variety of technologies including fiber to home, coaxial cable systems, twisted pair copper telephone lines, and point-to-point wireless. Regardless of the technology, the municipality owns and operates the network and owns the customers. This service delivery model is typically found in large cities or in smaller municipalities that provide electric or telephone service[22]. Local governments attempt to fill the gap by leveraging community resources such as right of ways, infrastructure, and other governmental property. However, private sector providers have worked hard to prevent municipalities from competing with them, successfully lobbying for the prohibition of these delivery systems in 14 states[23].

Public-Private Partnership (P3) Models are typically a contractual arrangement whereby the sources, risks and rewards of both a public agency and private company are combined to provide greater efficiency, better access to capital, and improved compliance with a range of governmental regulations regarding the environment and workplace[24]. In most public-private partnerships, a local government functions as the public partner and offers a right of way to a private partner who delivers and maintains broadband service. The private partner owns the customer and owns and operates the network. Each party shares in the potential risks and rewards associated with the delivery of the service and/or the facility. The service area is limited by municipal boundaries, making this approach impractical in many rural locations where population scale and density are too low to provide the return on investment that is necessary to sustain services[25] . However, the private partner may be able to expand this service area beyond the limitations of the public partner's jurisdiction.

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[22] W. Shuffstall, S. Sager, R. Montgomery, and D. Noonan [2009]: *Connecting Rural Communities. Southern Rural Development Center. Retrieved from: http://srdc.msstate.edu/ecommerce/curricula/connecting_communities/module2_7.htm*.

[23] W. Shuffstall, S. Sager, R. Montgomery, and D. Noonan [2009]: *Connecting Rural Communities. Southern Rural Development Center. Retrieved from: http://srdc.msstate.edu/ecommerce/curricula/connecting_communities/module2_7.htm*.

[24] D. Grimsey and M. K. Lewis [2004]: *Public Private Partnerships: The Worldwide Revolution in Infrastructure Provision and Project Finance. Northampton, MA: Edward Elgar.*

[25] W. Shuffstall, S. Sager, R. Montgomery, and D. Noonan [2009]: *Connecting Rural Communities. Southern Rural Development Center. Retrieved from: http://srdc.msstate.edu/ecommerce/curricula/connecting_communities/module2_7.htm*.

4.5. Methods

Our focus in this paper is to identify and address the obstacles rural communities face in developing and delivering local strategies for broadband access. The inquiry uses a multiple case study methodology in six communities (using methods detailed in Yin 2009) that have successfully launched an independent broadband network using a P3 or municipal delivery model to understand the challenges that were experienced, overcome, or that continue to be problematic to initiative leaders[26]. To examine the processes and strategies used to overcome these obstacles, multiple research methods were used to identify and triangulate the full range of issues facing the individuals and organizations that launched these networks. Site selection processes, case study methods, limitations, and data analysis procedures will be detailed in the following sections.

4.5.1. Site Selection

The study investigated and compared municipal and P3 sites across three states. Since the researchers are based in Pennsylvania, it was important to find states that were more or less equal to Pennsylvania in terms of rural broadband penetration, with similar regulatory environments. Using the State Broadband Index developed by Analysis Consulting for TechNet (Analysis 2004), we identified two other states with roughly equal rural broadband penetration as Pennsylvania – Maine and Wisconsin. These states were also had similar telecommunications policy environments as Pennsylvania in 2004[27]. Since the time of the Analysis (2004) report, one major policy change, the prohibition of municipal broadband delivery, was instituted in Pennsylvania and Wisconsin. However, existing municipal providers were "grandfathered" through the law, and allowed to continue operations.

After selecting the study states, one municipal and one P3 provider were selected in each state. In each state, there were a number of known, self-identified independent broadband initiatives, but many were very new, very small, or had not even reached the implementation stage. The research design allowed for key informants at the state level, and Cooperative Extension, to help to identify the most established municipal or P3 initiatives in each state. In some cases, there was only one choice. Pennsylvania and Wisconsin only had one municipal provider each, due to the prohibition on municipal provision. Wisconsin also had multiple startup P3 networks, all of which were in an early stage of service provision. Conversations with state-level key informants helped to identify six clear initiatives that were distinct, operational, and known in the telecom professionals' community, for study. This resulted in the following municipal delivery method sites: Hermon, Maine; Kutztown, Pennsylvania; and Reedsburg, Wisconsin. The P3 delivery method sites were: Washington County, Maine; Cambria County, Pennsylvania; and Kenosha County, Wisconsin.

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[26] R. K. Yin [2009]: *Case Study Research: Design and Methods, Fourth Edition. Applied Social Research Methods Series(5), SAGE Publications, Inc.*

[27] Analysis Consulting. [2004]: *The State Broadband Index. Retrieved November 10, 2013, from: http://technet.org/resources/State_Broadband_Index.pdf.*

4.5.2. Case Study Methods

An examination of these independent broadband initiatives was conducted using a mixed-method, multiple case study approach, relying on case study methodologies advanced by Yin (2009) and Stake (1995)[28]. Case studies are useful here because we wish to move beyond an examination of relationships between variables, to ask "why" and "how" these initiatives arise. Case studies provide a more in-depth examination of the processes underlying community initiatives, and by comparing multiple cases, a wider range of experiences across multiple circumstances can be presented[29] . For each case, mixed methods were used to gain multiple perspectives about the research question, and to weigh the perspectives of two distinct groups: individuals who were central leaders in the design and launch of the broadband initiative (referred to as key informants), and a general survey of citizens within the service territory of the broadband initiative (referred to as survey respondents or end-users). Survey respondents are residential users and are divided into individuals who subscribe to the local service, some other broadband service, or who do not have broadband. Key informants offer exclusive insights into the process of local broadband network development, while end-user responses allow comparison of the network of interest to other networks in terms of local attitudes toward broadband access provision at the local level. It is important to note that the results from the surveys are not meant to be a representation of attitudes regarding broadband infrastructure beyond our case study sites. This information is utilized to enrich the comparison among and analysis within each site. The final case studies were constructed utilizing information from community profiling, mail surveys, and key informant interviews.

4.5.3. Community Profiles

Data from the U.S. Census Bureau (2010), the Bureau of Economic Analysis Regional Economic Information System (REIS) (2010), and local government and community websites were used to construct brief community profiles: general population, economic, and historical features of the community. While community profiling is not the focus of the analysis presented here, it is useful for uncovering any specific or exceptional situations that may influence the results, such as a very high rate of out-migration, or abnormally low educational attainment levels. Community profiles are therefore a central dimension of our suite of analytical tools for the underlying study, and notable findings from the community profiles are considered in the analysis as they relate to local broadband development.

Mail surveys

Mail surveys were sent to residents within the six study sites. Respondents were selected using a sampling service that drew names randomly from post office records. Surveys inquired whether or not the citizen or business had a broadband connection, and if they did, which broadband provider they used (the initiative under study, or a mainstream provider, normally through cable or satellite). If respondents were subscribers, they were asked questions about the affordability, quality, accessibility, and service offered

[28] R. K. Yin [2009]: *Case Study Research: Design and Methods, Fourth Edition. Applied Social Research Methods Series(5), SAGE Publications, Inc*.
R. E. Stake [1995]: *The Art of Case Study Research. SAGE Publications, Inc.*

[29] R. K. Yin [2009]: *Case Study Research: Design and Methods, Fourth Edition. Applied Social Research Methods Series(5), SAGE Publications, Inc.*

by their broadband provider. The survey also collected attitudes regarding broadband utility and attitudes towards the role of government in providing access to broadband service and infrastructure. These attitudes were measured using a 5-point Likert-type scale (1=very dissatisfied through 5=very satisfied, for example). Surveys also tracked personal information, such as age, income, and education, for respondents.

The research design required sampling across primary sampling units (three states: Maine, Pennsylvania, and Wisconsin) and two strata, municipalities (for municipal delivery) and counties (for P3s). We received a total of 948 valid responses (508 municipal respondents, 440 county or P3 respondents) of the 4,800 surveys sent.

Key informant interviews

Initial interviews with state-level telecommunications professionals or Cooperative Extension staff were used not only to identify local broadband initiatives, but also leaders within that initiative. After initial contact was made with a leader within the initiative, chain referral, or "snowball sampling"[30], was used to identify other key players in the development of that initiative, and these individuals were then recruited for interviews. A total of 23 key informants (six in Maine, seven in Pennsylvania, and ten in Wisconsin) ranged from local and state-level politicians to public and private IT personnel, network developers and administrators, ISPs, and network-related personnel in educational and public institutions. Sometimes, the network initiatives were quite small – as small as three individuals – and sometimes they were larger – as many as seven key players and the departments or companies they directly represent. In only three cases, once in Hermon, ME and twice in Kenosha County, WI, were key informants unable to be reached for an interview. Otherwise, interviews continued until all key leaders in the initiatives' development were identified. Key informant interviews focused primarily on the process of launching a broadband initiative, but also asked about the risks that leaders faced, their motivations for launching an independent broadband network, the costs of implementing the network, how key financial and operational hurdles were overcome, and their perception of the network's benefits to the community.

Limitations

As with any study, there are limitations. We recognize that the sites selected are not able to represent the full extent of issues facing rural communities in their local initiatives to procure broadband access. However, the insights from these communities are useful and nuanced, providing a more expansive picture of the distributive justice barriers rural people and places face in the digital divide. Additionally, the quantitative data is not meant to be a representative sample of the attitudes of rural people. Instead, it is utilized to greater inform the perspectives of key informants from the case studies compared in this study. Finally, the issue of researcher bias is mitigated through our extensive use of triangulation through multiple methods. Although these limitations exist, we believe this study provides important and relevant information to assist in bridging the gap on the digital divide between urban and rural areas.

[30] P. Biernacki and D. Waldorf [1981]: *Snowball Sampling: Problems and Techniques of Chain Referral Sampling. Sociological Methods, 10(2), 141-163.*

Data Analysis

Data from two case study methods, face-to-face interviews and the mail survey, are analyzed and presented here. Community profile data, where relevant, are integrated within the key informant interviews to understand the context in which the initiative was launched.

Quantitative data analysis

Results of the mailing survey are intended to reveal the attitudes local residents in our study sites espouse in regard to broadband utility and access. These data come from the attitudinal, Likert-type questions mentioned earlier. We conducted a standard tabular analysis, as we utilized nominal variables. We included chi-square tests of significance.

Qualitative analysis

Qualitative data from the face-to-face interviews were transcribed into an electronic document by the interviewer, or with assistance under the direct supervision and revision of the interviewer. Multiple interviews for each site were then combined and compared for redundant information, and then organized by conceptual category (i.e., responses relating to the initiative's organizational process, improvements to public services, costs and benefits, etc.). This created a master transcript for each research site with the amalgamated responses of each key informant. All non-redundant data were included in the master transcript, and inconsistent information was specially noted. In very few instances, the key informants were called by phone for clarification on certain issues, when necessary. Relevant portions of the master transcripts are used to create narratives about the experience of launching a broadband initiative – in this case, focusing on the barriers to launching a local broadband network.

4.6. Results

The results presented here are in two sections. The first section outlines the major findings in regards to the attitudes of the mail survey respondents. The second section provides a list of the major barriers study sites faced in developing their local broadband initiatives.

Results of Mail Survey

The questions analyzed on the mail survey were intended to gauge attitudes toward broadband utilization of residents. Public opinion holds large weight in decisions regarding government action. If residents do not see the utility in broadband Internet access or oppose governmental intervention in the provision of broadband service, this could be seen as a major barrier for providing access to the local community. For this analysis, the data were collapsed across all sites.

For the first analysis, respondents were grouped into two categories, broadband Internet users and nonusers. In the sample, 329 respondents of the 948 indicated were nonusers. To explore why individuals were not broadband users, respondents were asked to specify why from the following options: "not available," "too expensive," "don't know enough about it," "too much of a hassle to install it," "poor quality technical support," "satisfied with my current connection," "don't like the choice of Internet service providers (ISP's) available," "can't see the benefit," and "other." A respondent was able to choose multiple answers that applied to their reasoning for not subscribing. These results are detailed in Table 1.

Table 1. **Why Respondents Do Not Have Access to Broadband Internet (n =329)**

Response	n	Percentage
Too expensive	83	35.3%
Not Available	57	24.3%
Don't know enough	54	23.0%
Other	50	21.3%
Can't See Benefit	31	13.2%
Satisfied with current	27	11.50%
Don't like ISP choice	13	5.50%
Too Much Hassle	9	3.8%
Poor Quality Technical Support	5	2.1%

Source: Data based on own survey (n=329)

The most common response for not subscribing to broadband was the cost of broadband, followed with lack of availability and knowledge of broadband. Additionally, 13.2% of respondents indicated they did not see the benefit of broadband Internet. Also interesting to note is that while 24.3% indicated broadband was not available, broadband access was available to these respondents in these sites. These two results may indicate a lack of awareness and knowledge of broadband Internet in the local community. The study findings were similar to the 2010 Census Data, which revealed that of the rural households without broadband, 42% said that it is not available in their area, 26% think that it is unnecessary, and 27% think it is too expensive[31] .

To gauge how respondents perceived governmental intervention in broadband access, we explored the responses to two questions for all respondents. The first question asks respondents if it is "fair to private companies for municipal or county governments to *build broadband infrastructure* (construct towers and lay fiberoptic cable) in areas where private, for-profit providers do not" (italics in original). The second question asks respondents if it is "fair to private companies for municipal or county governments to provide broadband service (provide broadband access to consumers for a monthly fee) in areas where private, for-profit providers do not" (italics in original). Not all respondents answered the questions, producing missing data for each question (27.1% for the first question, and 24% for the second question). The responses for the first question are detailed in Table 2.

The responses indicate that local opinion regarding governmental intervention in broadband participation may not be a barrier in these local initiatives for broadband development.

To examine the effects of other variables on users' views of fairness regarding local governmental intervention in broadband provision, we examined the responses to the previous satisfaction questions on this group. For the following analysis, both municipal and P3 provider users were combined into categories labeled "designated community provider users," and mainstream provider users were labeled as "other provider users." We tested both previously listed fairness questions against a range of variables including: age,

[31] P. Stenberg [2013]: *Rural Broadband at a Glance, 2013 Edition. United States Department of Agriculture, Economic Research Service, Economic Brief Number 23. Retrieved June 6, 2014, from http://www.ers.usda.gov/publications/eb-economic-brief/eb23.aspx#.U5InGpSwJvZ.*

sex, education, residence and work location, telecommuting, broadband provider, and income using a standard tabular analysis including chi-square tests of significance. All relationships were found to be not statistically significant at the p<.05 level unless noted.

Table 2 **Respondents Views on Governmental Intervention in Broadband Provision**

Respondents' View on Fairness for Municipal or County Governments to Build Broadband Infrastructure (n=888)	
Yes, it's fair	39.9%
Yes, it's fair as long as they partner with a private company	5.6%
Yes, it's fair as long as private contractors can compete to do the construction	17.3%
No	10.1%
Respondents' View on Fairness for Municipal or County Governments to Provide Broadband Service (n=885)	
Yes, it's fair	45.1%
Yes, it's fair as long as they partner with a private company	5.2%
Yes, it's fair as long as private contractors can compete to do the construction	16.8%
No	8.9%

Source: Data based on own survey

For the first question, of those that subscribed to broadband, those users that subscribed to the designated community providers were more likely than those that subscribed to other providers to agree that it is fair for municipal or county governments to build broadband infrastructure in areas where private, for-profit providers do not. Meanwhile, all other categories experienced the opposite relationship (p<.01). This same relationship is observed in the second question as well (p<.01). This relationship is important because it indicates that those users utilizing broadband access that includes a governmental intervention (either municipal or P3) are more in support of governments building infrastructure than those that are utilizing strictly private providers.

The only other significant relationship existed between male and female responses to the second question. We conducted a multivariate tabular analysis, crossing sex and education for the second fairness question, as both of these approached significance or were mildly significant in the bivariate case. This multivariate model was non-significant overall, but females, specifically, expressed a very weak statistical interaction with education when it came to fairness. That analysis contained thin cells, and in terms of theory, we did not find it to be very enlightening or pertinent.

4.7. Results of Key Informant Interviews

When analyzing the key informant interviews, we focus here on reporting the barriers encountered by local network founders in launching their local broadband initiative. While this is by no means an exhaustive list of barriers, some of the most commonly

encountered barriers that arose across all six communities studied are included here, as described by key informants. These barriers either deepened, or were deepened by, an existing power discrepancy between the community and other, more urbanized places with sufficient, business-class broadband access.

Private sector unwillingness – market failure

The central barrier facing the participating communities is the unwillingness of mainstream, private broadband providers to provide broadband to the community on the grounds that there is insufficient local demand to make the expansion profitable. Each community, in some way, struggled with either an outright lack of broadband access, or insufficient bandwidth for supporting businesses and institutions at a reasonable cost. For example, Hermon was refused access by two providers, one who claimed the community was too residential, and the other who promised to charge $600/month for each customer. Washington County's subscriber base was also too small, and provision could not be secured without the promise of public subsidies from the county. Several communities, including Reedsburg, never received responses from large, mainstream providers for inquiries about tapping into their network. Often, this is due to the high cost of providing service, which was quoted as costing as much as $17,000/mile in Wisconsin. If such service only serves three houses, not all of whom subscribe to broadband, the resistance of mainstream providers to move into highly diffuse markets is consistent with market behavior.

4.7.1. Negative Perceptions of Public Involvement

In some communities, like Hermon and Reedsburg – both of which have municipal delivery systems – public sector involvement in broadband provision was perceived to be unfair to use public monies to offer competitive service in an industry dominated by free-market competitors. Participants in both sites claimed they had difficulty convincing customers to support the government. Participants in Reedsburg also claimed that a local mentality exists, perceiving that the government moves more slowly than a private provider, and that this, consequently, must also apply to locally-provided broadband, including customer service. The extent to which the local population feels that government participation is unfair or that it is inefficient when compared to a private provider can impact the public sector's participation in local broadband initiatives.

Geography

Social factors are not the only barriers to launching a broadband network. Sites in Wisconsin enjoy a relatively low cost of installing fiber-optic cable; the state is mostly flat, not densely forested in many places, and the sandy soil is easy and inexpensive to excavate. Places like Maine, with its dense, rocky soil and many coastal inlets, and Pennsylvania, with its steep mountain ridges and dense forests, make rural communities very difficult to access cheaply. To overcome geographic challenges, even among municipal providers, partnering with a private contractor was critical for two reasons. First, private contractors have experience in "climbing towers," and installing and maintaining the network, while public entities generally are not trained for such activities. Second, private contractors often have alternative means of delivering broadband to remote areas besides fiber-optic cable, including the installation of tower-based wireless systems (used in Hermon and Washington County), and redundant tower-and-fiber rings (used in Cambria County), for

example. These alternatives can get broadband into hard-to-reach areas, often blanketing coverage zones with wireless access to the core network.

4.7.2. Insufficient Service for Business

Broadband penetration is commonly measured as a percentage of residents who have access to high-speed Internet. While a 1.5MB symmetrical connection may be enough to be classified as broadband, such low-bandwidth connections are insufficient for running a business, government, or other organization. Areas like Washington County and others have nearly universal coverage by DSL (digital subscriber lines) and, while faster than dial-up in some areas, this low-bandwidth technology is sorely insufficient for the growing needs of businesses and other organizations. In communities like Reedsburg, a "telephone mentality" existed among incumbent providers who were accustomed to connecting customers via fiber build-outs to antiquated copper node technology – faster than dial-up, but insufficient for the quickly changing needs of the business community.

Education and digital literacy

Another major barrier for independent broadband providers is that their potential customers may not have a full understanding of how broadband works, what it is, its potential for the community, or how they might use the service most effectively. As they build out their network, Washington County seeks to educate customers who are unfamiliar with broadband, and who may not understand the difference between a broadband problem and a computer problem. These efforts are informal, they typically occur during customer service calls, and they are aimed at improving "digital literacy" about how broadband works, and how to fix common networking problems. Reedsburg handles matters similarly, and prides itself on its level of personalized service in educating the public about their broadband services. However, Reedsburg and Washington County participants reported having to beat back myths, often started by competitors, such as fiber being an outdated technology, or that broadband is commonly available for free in urban areas.

Lagging community capacity

For many public providers, providing broadband is an entirely new activity, which partially explains why both P3 and municipal initiatives have partnered with private contractors to build their networks. In all six sites, building knowledge and skills related to network development, management, and customer service were (and still are) critical learning processes. Especially in the case of municipal providers, network specialists at the municipality had to "learn the ropes" through either formal education (hiring skilled network administrators), or learning themselves through interactions with private contractors, in order to become independent. In Reedsburg, for example, bringing cutting edge technology to the community meant taking risks that often ended in mistakes, with no place to get formal training for government employees. Fear of these risks in financially-strapped communities can paralyze an initiative if there is no room for error in the learning process. In the case of P3 initiatives, public partners still learned from their private partners, and worked diligently to maintain open communication within this relationship so that knowledge about network administration and customer service issues, and advancements in technology can be shared openly. In any case, knowledge of how to build and operate a broadband network is frequently not well understood by

governments and local companies, as it represents a departure from their core functions. In many communities, knowledge about Internet connectivity continues to focus on existing telephony technology, representing an area of path-dependent knowledge that can hold communities back from newer, faster broadband technologies.

4.7.3. Regulation and Political Cycles

Laws, regulations, and political cycles can quickly destroy a local broadband initiative in various ways, or prevent it from ever existing in the first place. In many states, municipal broadband delivery has been made illegal, or is severely restricted, as the result of lobbying by mainstream companies to stem the participation of public entities in broadband provision. This is the case in both Wisconsin and Pennsylvania, where current municipal delivery systems like Reedsburg and Kutztown predate the legislation, and thus have been "grandfathered in" despite laws restricting municipal delivery. This limits one option for providing local broadband in many places, and forces other public entities to carefully and restrictively structure their P3 initiatives in ways that do not violate these laws. However, even if a public partner does develop a new network with a private partner, the experience in Cambria County shows that political priorities can change quickly. Not long after Cambria's network had been built, candidates for county commissioner from the opposing party used the high cost of the initiative as political ammunition, promising to de-fund the broadband network and save the community taxpayer dollars. The commissioners who launched the project can demonstrate that the network has actually saved the county millions of dollars in public expenditures, but this fact carries little weight in politics where tastes and preferences can change quickly and threaten even the most successful projects with legislative restrictions or changing funding priorities.

Other legislative barriers are more closely tied to development. To build towers or get fiber to homes and businesses, it is often necessary to build infrastructure across private property. Obtaining "right of ways," access to existing towers, zoning variances, and navigating through other local restrictions and ordinances drain both time and money from public initiatives. For example, Cambria County overshot its labor cost estimates because it failed to take into account the federal Davis-Bacon Act specifying the payment of a set, prevailing wage for construction employees. In other cases, public initiatives leaders were able to barter with citizens to provide them with free Internet or rental fees in exchange for placing infrastructure on or near their property.

Latent competition

Before their initiatives, the six communities studied either lacked service or were underserved by the private sector. Once a successful model was built, however, a few initiatives quickly found themselves competing with the very same private sector providers, who originally disregarded the community, now that a profitable model had been built. In some cases, like Reedsburg, private sector competition in the wake of the network's construction was particularly fierce. Reedsburg participants complained that competition in the broadband market is an unequal playing field in favor of private corporations, even though the same corporations claimed the situation is unfair because Reedsburg's broadband service is provided to residents through public funds. However, corporations are frequently able to offer broadband packages at much more competitive rates than municipal and P3 providers. Reedsburg's solution has been to compete on service, and

the quality and speed of the connection – a strategy that appears to be working, as private competitors in their area have previously offered too-good-to-be-true deals to customers, only to raise the rates later. However, Reedsburg's strategy does not guarantee success. While the fierce competition from the private sector may potentially lower the price of service for the consumer, the competition may also undermine initiatives constructed through public funds.

4.8. Discussion and Conclusions

Broadband Internet is more than simply a technological consideration; it is fundamentally a distributive justice problem that affects *who* has access to information in modern American society. While services such as cable, DSL (digital subscriber lines), and wireless are increasingly available for residential access, certain entities, such as schools, businesses, healthcare providers, and local government offices, require "business-class" broadband services at thresholds, which provide guaranteed security, greater bandwidth, and synchronous upload and download capability[32]. Therefore not only access to the technology, but also access to higher speed thresholds is essential in rural communities. The ability to access information and participate in digital communications is a necessity for interfacing with the greater global society. However, without advancements, rural communities are unable to compete for industry steeped in the digital era. Our analysis of six case studies across Maine, Pennsylvania, and Wisconsin reveals many barriers that continue to impede broadband initiatives, as well as ways in which communities have been able to gain access to broadband Internet. The barriers identified through the study include: private sector aversion to servicing rural areas, negative perceptions of public involvement, differing geographic difficulties to installing the requisite infrastructure, insufficient service for business, lack of digital literacy, lagging community capacity, instability from regulations and political cycles, and latent competition between private companies and local initiatives. Recognizing the challenges facing the communities studied, we offer several suggestions below to overcome these obstacles.

Many obstacles facing rural community broadband access involve the reliance on mainstream, private providers to develop markets and access for broadband Internet. This strategy has thus far not created a viable outcome for rural communities to act independently to meet their own needs. As evidenced by the case of Hermon, Maine, Washington County, Maine, and Reedsburg, Wisconsin, private companies have expressed minimal interest in expanding into these low-density communities, even at the request of community leaders, leading to unfulfilled demand. While governmental intervention may be an option, our quantitative and qualitative data provide a mixed message. The quantitative data suggests that users are receptive to municipal or county governmental involvement in broadband access, as 39.9% of respondents said that it is fair for governments to build broadband infrastructure, and an additional 22. 9% said that it is fair under certain conditions specified in the survey question. Moreover, concerning the fairness of governments providing broadband service, 45.1% of respondents think it

[32] T. R. Alter, J. C. Bridger, S. A. Sager, K. Schafft, and W. C. Shuffstall [2007]: *Getting Connected: Broadband Services a Key to a Vibrant Rural America. Rural Realities, 2(1), 1-10. Also published in The Rural Sociologist, 27(2), 2007, 24-33.*

is fair, with an additional 22% stating that it is fair with given specifications. However, our qualitative data suggests that developing such initiatives may be a hard sell for struggling communities. Passing a multi-million dollar Internet initiative may seem frivolous to residents struggling with joblessness, hunger, or meeting other basic needs. Instead, it may be more beneficial in these cases to develop a telecommunications infrastructure upgrade as part of a larger community visioning strategy that will provide a more comprehensive, systemic solution rather than a sole focus on one issue. In so doing,

In addition to the need for communities to act independently of private companies, there is a clear need for education and capacity building in rural communities regarding telecommunications, specifically broadband Internet access. The surveys and key informant interviews suggest that residents could learn more about what broadband access is, how it could be of use to them, and the differences between local and (often insufficient or expensive) mainstream offerings. Increased awareness may help facilitate greater acceptance for initiatives to upgrade infrastructure. Additionally, education about broadband Internet could increase community capacity by developing community members as assets who could utilize this resource to a greater extent, with the potential for increasing entrepreneurial activity and innovation.

Although communities have been crying out for years for broadband access, the digital divide persists. The barriers identified through the six case studies provide insight into the complexity of broadband provision. The challenges of Hermon, Maine; Kutztown, Pennsylvania; Reedsburg, Wisconsin; Washington County, Maine; Cambria County, Pennsylvania; and Kenosha County, Wisconsin can advise other rural communities striving to gain access to broadband Internet. While rural communities face limitations, they can be empowered to find creative solutions, as the communities studied have shown that it is possible to develop alternative delivery models despite the barriers.

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THE EFFECTS OF USING STRUCTURAL FUNDS AT THE LOCAL LEVEL – THE RESULTS OF QUALITATIVE RESEARCH AMONG PROJECT BENEFICIARIES

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Abstract: The aim of this article was to define the effects of projects carried out and co-financed with structural funds at the local level. To do that, qualitative research in the form of in-depth interviews was conducted among project beneficiaries (territorial governments). The information about the projects was collected in the years 2013-2016 under the project „Regional Policy in Micro perspective – Remicro", itself a part of the „Jean Monnet European Module", the UE Longlife Learning Programme 2007-2013. The results of this study indicate the positive effects of the completed projects co-financed under the cohesion policy of the European Regional Development Fund and European Social Fund. Beneficiaries of the project emphasized they had seen a number of improvements – in the quality of life and increased attractiveness of the area in their local communities.

Key words: local development, European Union funds, Poland

5.1. Introduction

The growing needs of citizens, as well as territorial government units striving to capture or maintain a competitive position, require increased funding, both for current activities and for investments[1]. However, the most important task facing local government offices is guaranteeing the conditions conducive to local development[2].

[1] M. Grzebyk, [2012]: *Miejsce i znaczenie środków unijnych w zarządzaniu gminą, [The place and importance of the EU in municipality management], Zeszyty Naukowe Uniwersytetu Rzeszowskiego, Nr 27, Nierówności społeczne a wzrost gospodarczy. Wpływ funduszy unijnych na działalność gospodarczą, Rzeszów, pp. 148-162.*
A. Katoła, [2012]: *Wpływ wykorzystywania funduszy unijnych na wzrost konkurencyjności gmin, [The influence of EU funds on the development of municipality competitiveness] Studia i Prace WNEiZ, nr 25, pp. 161-177.*

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Poland's accession to the European Union has enabled territorial units – both regional and local – to secure funding to carry out a variety of projects. This has a meaningful effect on their ability to make up for funding lacking in local budgets, leads to improved living conditions for local society and also spurs development[3]. The availability of pre-accession funds, and also the 2004-2006 programming period enabled beneficiaries as well as individuals involved in implementing the operational programmes to learn about numerous legal and financial mechanisms that were important for regional policy, experience that could be used in further financial endeavours[4]. Along with enterprises, local government units are the main beneficiaries of EU funds, which are available through national and regional operational programmes[5]. Research shows that of all local government units, municipalities and, above all, cities, are the leading beneficiaries of EU funds[6].

Numerous studies and analyses have shown that EU funds are vitally important for local and regional development. According to Satoła[7], municipality activities geared toward applying for funds from the EU budget shows how seriously these units of government treat Structural Funds as a significant source of support for local development processes. However, its own revenues in the budget of the municipality are also an important source of support. Municipalities with a higher share of their own income more often carry out larger projects. Katoła's research[8] shows that investments in infrastructure co-financed by EU structural funds are of fundamental importance for a municipality's competitiveness.

Given their importance in multidirectional local development, infrastructure projects tend to take higher priority than "soft" projects. The results of empirical research on investments made by local governments clearly indicate that the greatest importance is attached to the development of technical infrastructure[9]. Research done by Wojarska and Zabielska[10] shows that the availability of EU funds contributes to the direction the

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[3] J. Szwacka-Mokrzycka, [2012]: *Znaczenie wsparcia unijnego w pobudzaniu rozwoju gmin, [The importance of the Union assistance in stimulating the development of municipalities], Zeszyty Naukowe Polityki Europejskie, Finanse i Marketing, nr 8 (57), pp. 453-460.*
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[10] M. Wojarska, I. Zabielska, [2015]: *Samorząd lokalny jako beneficjent funduszy unijnych (na przykładzie gmin województwa warmińsko-mazurskiego), [Local government as a beneficiary of EU funds (the example of municipalities*

investment plans of municipalities take, while local authorities acknowledge that the implementation of EU projects has significantly influenced the development of territorial units. What's more, potential limitations on the extent of EU support after 2020 will have notable consequences for municipalities.

The institutional efficiency of municipalities plays an important role in the absorption of assistance, for acquisition and effective use of European funds requires the skills of effective programming, financing and monitoring[11]. According to research done by Wojarska and Zabielska[12], despite the difficulties associated with applying for EU funding and the implementation of projects co-financed from these funds, the possibility of using them is the most visible effect of Poland's membership in the EU. Without the EU's financial backing, many projects would not be possible, and the scope of those undertaken would be far more modest[13]. Keep in mind that a shortage of funds can slow emerging local or regional initiatives, including innovative activity[14].

5.2. Objectives, Materials and Method

The aim of this article was to define the effects of projects carried out and co-financed with structural funds at the local level. To do that, qualitative research in the form of in-depth interviews was conducted among project beneficiaries. The information about the projects was collected in the years 2013-2016 by students in the Warsaw University of Life Sciences Department of Economic Sciences, under the project „Regional Policy in Micro perspective – Remicro", itself a part of the „Jean Monnet European Module" project, the UE Longlife Learning Programme 2007-2013. Before the empirical research was started the students were taught the basics of structural funds and conducting research with the use of in-depth interview elaborated for the needs of the project.

For this research, 100 projects where the beneficiaries were territorial governments were analysed. From this pool, 91 of the projects received co-financing from the European Regional Development Fund (ERDF), spread across 12 programmes (Figure 1). The other nine projects were co-financed from the European Social Fund (ESF) under the Human Capital Operational Programme 2007-2013.

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in Warminsko-Mazurskie Voivodship)] [in:] Pancer-Cybulska E., Szostak E. (ed.): Unia Europejska w 10 lat po największym rozszerzeniu [The European Union 10 years since the largest enlargement], Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu, nr 380, pp. 266-275.

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13 G. Czapiewska, [2011]: *Możliwości kreowania rozwoju społeczno-gospodarczego obszarów wiejskich (na przykładzie gminy Kołczygłowy) [Possibilities for creating social and economic development in rural areas (the example of the Kołczygłowy municipality)], Studia i Materiały, Miscellanea Oeconomicae, 15, 2, pp. 157-172.*

14 P. Pudło, [2011]: *Analiza działalności innowacyjnej przedsiębiorstw działających na terenie Podkarpacia, [An analysis of the innovative activities used by businesses in Subcarpathia], Zeszyty Ostrołęckiego Towarzystwa Naukowego nr XXV, Ostrołęka, pp. 117-127.*

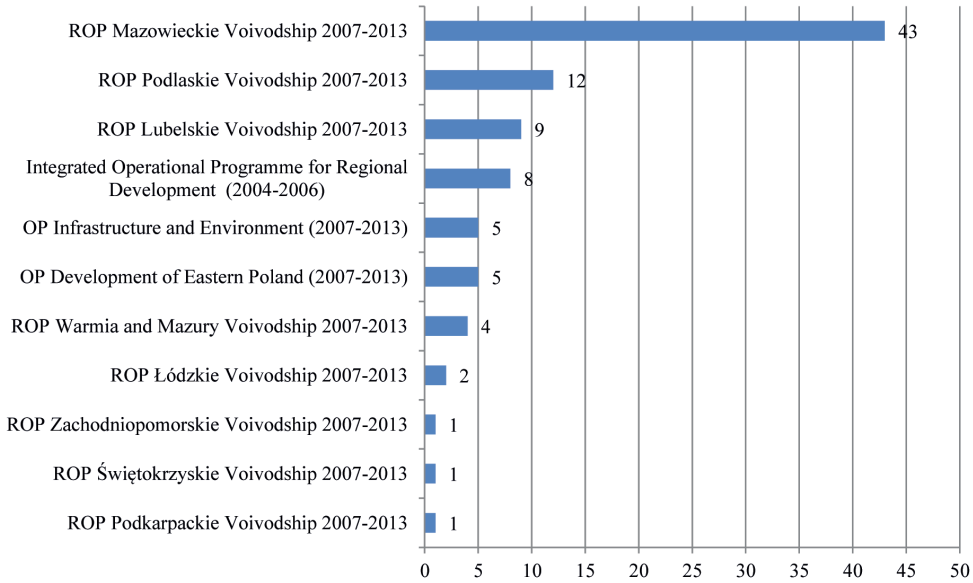

Figure 1. **Projects co-financed by ERDF operational programmes**

Source: The authors survey.

The projects analysed were carried out in nine voivodships. The lion's share (60) were done in Mazowieckie Voivodship (home to the country's capital, Warsaw), followed by Podlaskie Voivodship, with 16 projects, and Lubelskie Voivodship, which hosted 11 of the projects. 80 projects were carried out in cities (urban municipalities and cities in urban-rural municipalities), and another 20 in rural areas (rural municipalities and rural areas in urban-rural municipalities). In four voivodships: Łódzkie, Warmia and Mazury, Pomorskie and Zachodniopomorskie, projects were carried out exclusively in urban areas (a total or 8, see Figure 2).

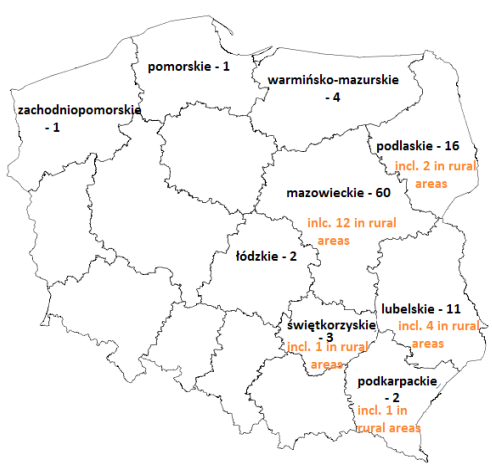

Figure 2. **Spatial distribution of the project analysed (voivodships)**

Source: The authors survey.

Projects done under the Integrated Regional Operational Programme (2004-2006) were completed in 2007-2008, while those carried out under the programmes available in the financial perspective 2007-2013 were finalised mainly in 2011-2014 (Figure 3).

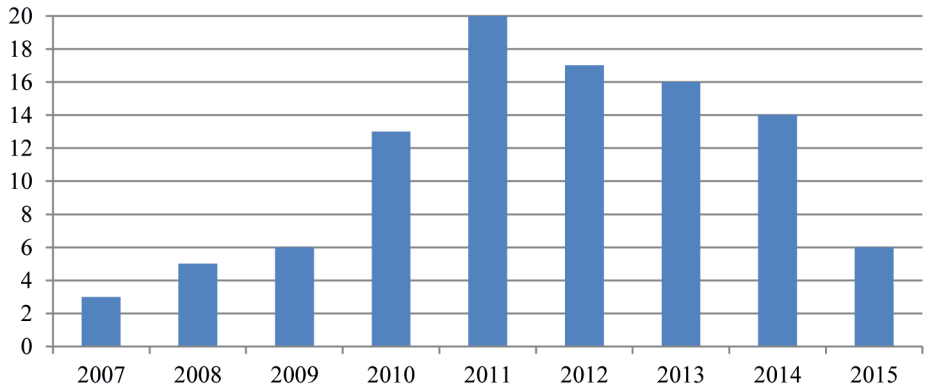

Figure 3. **Analysis of the projects according to year of completion**

Source: The authors survey.

Of the projects analysed 55%, were completed within 24 months were the most numerous overall, while the single most numerous type took 13-24 months (Figure 4).

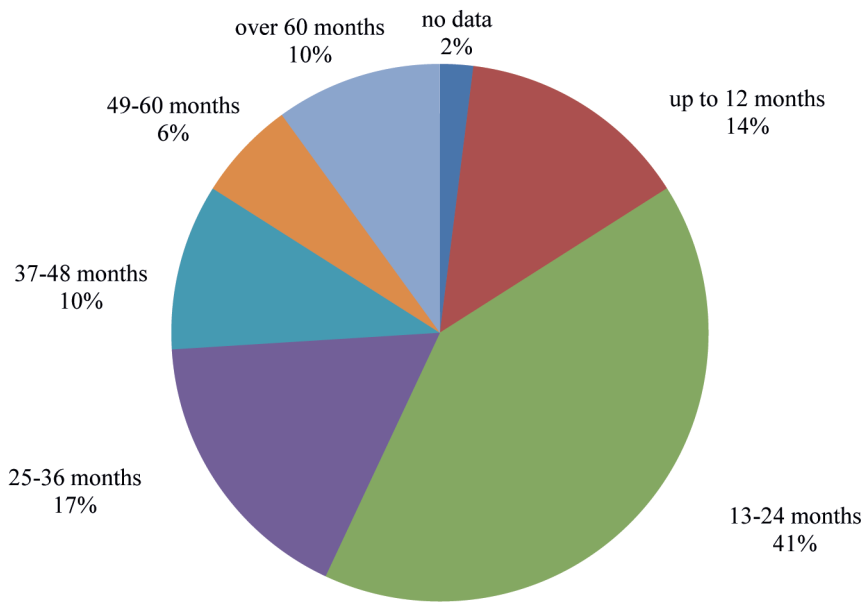

Figure 4. Projects by duration

Source: The authors syrvey.

In-depth interviews were conducted among project beneficiaries, including those working in local government units and involved with project implementation, employees

of the institutions subordinated to local governments and individuals benefiting directly from the completed project. Student presentations based on their empirical research are available in Polish and English on the project website: www.remicro.wne.sggw.pl.

5.3. The results of the Research

The greatest number of projects involved building and/or renovating infrastructure associated with tourism and culture (39), road and transport infrastructure (27), and educational support infrastructure (11). Less frequent projects included ones that created investment areas (9), work and social integration (5), equal educational opportunities (4), environmental protection infrastructure (4) and healthcare infrastructure (1) (Fig. 5). These numbers confirm that local governments do in fact prioritise hard investments.

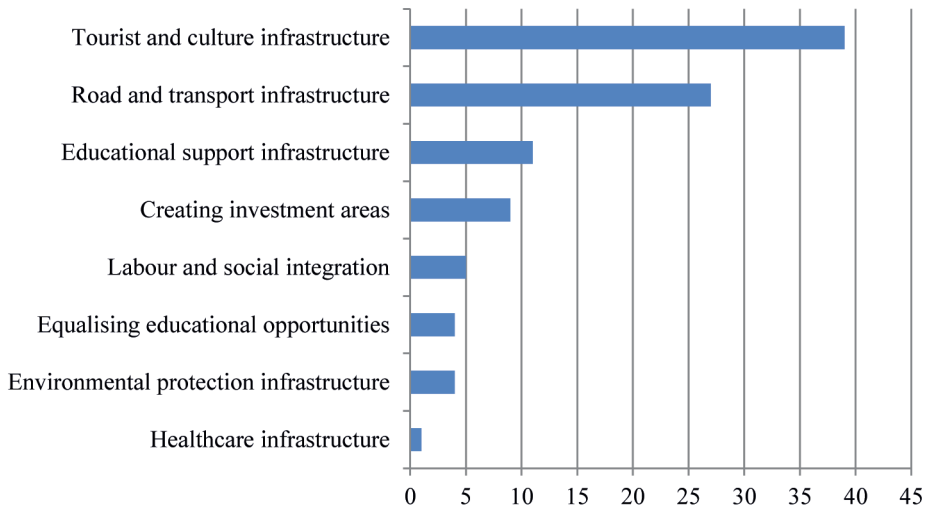

Figure 5. **Projects analysed by social-economic area addressed**

Source: The authors survey.

Due to the significant difference in the number of projects in rural areas compared to cities, it is difficult to directly compare the structure of the projects by area of the economy or society addressed. However, the following can be said: Among the projects done in cities, tourism – and culture-related infrastructure (45%) and road and transport infrastructure (30%) projects predominated. These two types accounted for 75% of all "urban" projects. In the rural areas, on the other hand, 30% of the projects were for the creation and modernisation of infrastructure for education (schools, kindergartens), which was the most common project type, followed by the creation of investment areas (20%). These observations (though a subjective selection of projects for analysis) are consistent with Stawicki's results [2009], which found that the most common activities undertaken in rural areas were investments in cultural facilities, especially the renovation of and equipping of cultural centers. Construction or modernisation of water and sewage networks and roads was the second most common project type. The development of sports facilities (primarily pitches and gyms) and recreational facilities (e.g. playgrounds) were

prominent projects, as well as the renewal of other public spaces and facilities played an important role. More money went to projects characterised by investments related to the development and modernization of road infrastructure and transport, as well as tourism-related infrastructure and culture and the creation of investment areas (Fig. 6).

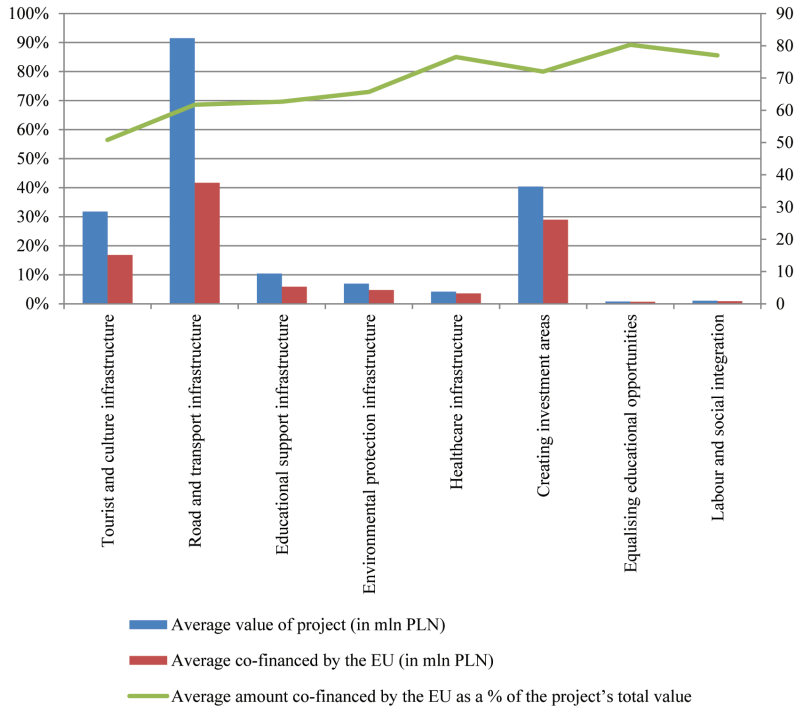

Figure 6. **Average value of project, EU co-financing (in PLN) and the percent of EU co-financing**

Source: The authors survey.

Analysis of the opinions and qualitative data obtained from the project beneficiaries yielded some thought-provoking results. Ideas for the projects generally arose from the lack of public facilities in the municipality, and the attendant need to either build them (e.g. the first kindergarten in the village), or upgrade existing ones (e.g., modernisation of a reservoir). Often the investment needs were apparent for a long time, but could not be addressed due to a lack of financial resources. Only when financing from the structural funds became available did it become possible to move forth with planned investments. Modernising existing roads, and expanding the network of roads and bridges all stemmed from the need to improve transport capacity, facilitate the movement of traffic, and improve driver and pedestrian safety. The rapid growth rate of cities – and, to take one example, the establishment of large distribution centers and manufacturing plants within them – gave rise to the aforementioned modernisation and improvements. Road infrastructure and environmental protection projects as well as the creation of investment areas were intended to lift the state of the environment, raise the living conditions of local residents, and create conditions for the development of entrepreneurship. The authorities of small rural communities and large cities alike sought to attract external investors who could

provide steady work for the local population. That meant investing in infrastructure, and building roads and markets (e.g. in Grodzisk Mazowiecki). One excellent example is Warsaw's Smolna Centre for Entrepreneurship, which was initially intended to function as a business incubator, but has grown into one of the most important investments Mazovia has made in stimulating entrepreneurship among the vodivodship's residents. In addition to the office space available to small businesses, there are also meeting rooms, a wide range of advisory services and a platform for Polish entrepreneurs to exchange experience with foreign entities.

The availability of EU funds was decisive, especially in tourism – and culture-related projects. The projects enjoyed the support of most residents, though some maintained the funds allocated for restoration of monuments and construction of swimming pools could have been better utilised, especially for the modernisation of local roads. The effects of the implementation were generally very positive, as attested by the large number of users with upgraded or newly established sports and recreation facilities, parks and cultural centers. Also monuments were only repaired when they had reached the point of collapse.

In terms of education infrastructure, preschools and schools were modernised or often the first such facilities were built in the municipality (including kindergartens, sports halls). There was notable interest in soft projects in support of education, especially childcare (e.g. Jasienica Rosielna) and the labour market. In municipalities where kindergartens were established, interest was declared to file subsequent applications for educational projects for pre-schoolers and teachers.

Of respondents, 86% expressed full support for ongoing projects. Residents have at times opposed the expansion of roads leading to new business development (fearing noise and exhaust fumes), or the designation of land for industrial facilities. To give a specific example, residents in Łuków protested the building of a plant because they did not want to endure unpleasant odours from processing operations. This caused a large investor, who could have built one that would provide many jobs in the area, to withdraw his bid. Elsewhere, evictions and home demolitions that had to be carried out in places where a road was to run caused criticism. Environmentalists also organised protests, and objections were put forward by previous local authorities to operations being led by those currently in power. Delays in road work and the need for detours caused problems for residents. Business owners also complained of reduced incomes. For example, in the town of Giżycko, where a pier was undergoing modernisation, the immediate neighbourhood was closed for two consecutive tourist seasons.

In 93 percent of cases, the inhabitants were aware that a project was co-financed from EU structural funds. This was in part thanks to signs/billboards displaying information to that effect. Unfortunately, they were not located in all of the municipalities in the areas where the project was carried out Furthermore, some individuals were not aware of how the co-financing of investments with EU funds works: they falsely believed that it was a loan the municipality would have to repay through taxes. Beyond that, the beneficiaries often associated project implementation with EU support, judging by the basic symbol marking them (the EU flag), but were not aware of the details of whether it was a fund or operational programme from which this support came. This led to a unified understanding of the support – e.g. from two different EU policies (agricultural policy and cohesion policy).

No significant problems were reported in 93% of the projects. In the remainder, delays occurred, mainly due to weather conditions, soil conditions (unanticipated), withdrawn tenders, residents protesting the solutions adopted or written in during the project for modernising a building or other site in the register of monuments. In only one of the projects were the goals not accomplished: involving an irreparably run-down historical hotel in a deeply indebted municipality. In some cases, particularly tied to the building of new facilities, the building's full potential was not utilised due to limited opportunities to take fees for using them because of the funding rules. The rest of the expected results were achieved, and the sentiments that the results exceeded expectations were expressed numerous times, as evidenced by the quotes from local government representatives (see below).

„The construction of the municipal pool in Łomża *is an investment considered to be one of the most capably done in Podlaskie. Deadlines observed, results consistent with the plans, and a lack of major problems during the project guaranteed it would stand out. This was chosen from among all of the projects financed under the Podlaskie Voivodship Regional Operational Programme. On the list of distinguished projects were 13 projects and 7 individuals responsible for their implementation".*

„The building of the road increased the attractiveness of investment in the area – a small estate was built".

„Thanks to the project, the quality and quantity of the sport and recreation infrastructure increased not only for the city, but for the entire region".

„There can be no doubt that the buildings will serve the city's cultural life. The culture and arts centre now boasts one of the most modern theatres in eastern Poland. Even more professional events can be offered, while organisers, artists and audiences alike are guaranteed greater comfort.

„The results of the project were very well received by visitors and residents. It was worth it to seek financing from the union—without it the project would never have been possible".

„Numerous sports and culture classes are held here. There is also a sauna, a gym, a children's library, a computer room and a coffee shop. There's also a number of rooms not in use, due to the EU requirement prohibiting their being rented out for commercial purposes for a period of five years".

„The project widened parents' awareness of preschool education issues and the emotional development of children".

„The use of unconventional sources of energy led to decreased emissions of gases and dust that have a negative impact on the environment. It decreased the demand for heat energy, decreasing the cost of domestic hot water for the swimming pool and sports hall. Surplus heat was transferred to the primary school. This is the first project on such a large scale for the use of renewable energy sources in public use buildings in Łomża."

«The project "My Chance" was carried out as expected and planned. All elements of the project – the workshops, training courses and counselling – have been implemented. In addition, all project participants have acquired the ability to move into the labour market, acquire new skills and certifications to assist them in their job hunt. In their interview, the beneficiaries emphasised that by participating in the project they have gained self-confidence and the motivation to make changes in their lives, above all in their professional lives. Coming into contact with people with similar problems was also important for them. It helped them to overcome the feeling of social exclusion. «

„This type of project is worth doing, especially given the large problems that exist financing education. Many parents are unable to help their children, but participating in such lessons has a host of benefits. Schools acquired equipment and valuable educational materials that are still in use today".

Encouraged by the positive results of the project, the beneficiaries indicated they would continue to apply for EU funding, not only from the structural funds, but also the cohesion fund, while in rural and urban-rural municipalities – from the European Agricultural Fund for Rural Development.

5.4. Conclusions

At the local level (in Poland this is a reference in particular to municipalities) EU funds are often the deciding factor in whether an investment or event will occur. The results of this study indicate the positive effects of the completed projects co-financed under the cohesion policy of the European Regional Development Fund and European Social Fund. Beneficiaries of the project emphasized they had seen a number of improvements – in the quality of life and increased attractiveness of the area in their local communities. The small scale of dissatisfaction and the identification of other possible goals for public spending gives credence to the studies. The investments were often moderate in range, but nonetheless took place in a complex system of local democracy, in which decision-making required numerous criteria to be considered.

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6

UNION FUNDS AS THE STIMULATOR OF DEVELOPMENT OF NON-AGRICULTURAL BUSINESS ACTIVITIES IN POLAND

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Abstract: Non-agricultural business activity in rural areas was supported during the pre-accession period (SAPARD Programme) and following the integration within the frameworks of the European Union financed programmes. Financial support was extended to both those farmers starting business activities and entrepreneurs creating jobs in rural areas. The research material consisted of data originating from the Management Information System of the Agency for Restructuring and Modernisation of Agriculture (ARMA) on performance of activities supporting enterprise in rural areas of Poland between 2004 and 2013. Based on the conducted analyses it was concluded that the activity of local communities in applying for Union funds is regionally diversified depending on the level of socioeconomic development of the region, agricultural development level and population density. That diversification should then be taken into account in distribution of funds for enterprise development and the support system should be adjusted accordingly. In the region of crumbled agriculture (Małopolskie, Podkarpackie) creation of new jobs should be supported more extensively because the possibilities of economic diversification of agricultural farms are limited. In the other regions, the financial support systems applied fulfil their role.

Key words: *rural areas, non-agricultural activities, European funds*

6.1. Introduction

Economic revival of rural areas depends on numerous factors, among which an important role is played by efficient support tools. Following accession to the European Union, Poland gained new instruments for influencing the development of enterprise. Development of rural areas was prioritised. The financial support was offered both to farmers that wanted to obtain additional sources of income and entrepreneurs creating new jobs in the rural areas. Thus, it can be said that economic activation of rural areas was progressing along two paths – towards economic diversification of agricultural farms[1]

[1] J. Wilkin, [2012]: *Czy badanie wielozawodowości rodzin rolniczych ma sens? [Is it porposeful to conduct studies into the pluriactivity of farmers'families?] Wieś i rolnictwo, nr 2 (155), s. 146-149.*

as well as economic activation of the other residents in the rural areas and entrepreneurs creating jobs in such areas. This is an example of supporting the "bottom up" development concept, which stresses occurrence and importance of bottom up initiatives stemming from the local communities and allowing more extensive use of the local resources[2].

When mobilisation of the local resources of human enterprise is understood as the striving of people towards activity, the search for new solutions, implementation of changes in the current activities and making use of emerging opportunities[3], as well as creating new jobs, it becomes a very important issue in stimulating economic development. The support within the frameworks of the Union funds is based on such activity of rural residents. On the one hand, the State defines the area of influence of the structural policy by identifying the target group to which the aid is addresses (e.g. farmers or members of their families, entrepreneurs) while on the other, the funds go solely to those who show activity towards obtaining the available funds. Here, another dimension of rural enterprise emerges that can be defined as the ability to use the aid funds within the frameworks of the EU structural funds. This enterprise is defined by P. Drucker as the "skill of making use of the emerging chances and opportunities and flexibility in adjustment to the changing conditions"[4]. Its intensity depends not only on the characteristics of the individual people but also of the local community, mentality and social patterns. Use of the financial support within the frameworks of the available instruments depends firstly on the human capital quality and activity in taking action towards obtaining those funds. Given the above, the objective of the article is to evaluate the level of investment activity of the entities eligible to support and to define the scope and direction of the influence of the financial support system on the processes of economic activation in rural areas.

6.2. Objectives, Materials and Method

Data originating from the Management Information System of the Agency for Restructuring and Modernisation of Agriculture (ARMA) concerning performance of applications lodged within the frameworks of the measures supporting economic initiatives in rural areas during the two programming perspectives, 2004-2006 and 2007-2013, formed the source material for the research. The analysis covered the data concerning implementation of measure 2.4 "Diversification of rural activities and similar activities in order to ensure variety of activities or alternative sources of income" implemented within the frameworks of the Sectoral Operational Programme "Restructuring and modernisation of the food sector and rural development 2004-2006". Within the frameworks of the Rural Development Programme for 2007-2013 the analysis covered the following measures: 311

[2] M. Kogut-Jaworska, [2008]: *Instrumenty interwencjonizmu lokalnego w stymulowaniu rozwoju gospodarczego [Instruments of local interventionism in economic development stimulation]. CeDeWu, Warszawa, 17-25.*

[3] K. Brodzińska, [2011]: *Fundusze unijne jako instrument pobudzania przedsiębiorczości w regionach [European Union Funds as a Tool of Stimulating Entrepreneurship in Regions]. Zesz. Naukowe Wyższej Szkoły Bankowej w Poznaniu 38: 43-54 .*
Z. Brodziński, K. Brodzińska, [2012]: *The role of the rural development programme 2007-2013 in stimulating the multifunctional development of rural areas In: Multifunctional development of rural areas Ed. Piotr Bórawski, 115-123.*
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[4] P. F. Drucker, [1992]: *Innowacje i przedsiębiorczość, Praktyka i zasady [Innovation and Entrepreneurship, Practice and Principles], PWE, Warszawa 1992, s. 34.*

– "Diversification into non-agricultural activities", 312 – "Establishment and development of micro-enterprises" and 413 – "Implementation of Local Development Strategies".

Horizontal comparative analysis of parameters concerning the number of applications lodged and approved for implementation by voivodship was conducted. The indicator of investment activity of the beneficiaries involved in agriculture was computed. The evaluation of the scope and direction of the influence of the financial support system on the rural areas economic activation process was carried out.

6.3. Support to Economic Initiatives of Farmers and Their Family Members

Economic diversification of agricultural farms is represented by skilful inclusion of an increasing number of new non-agricultural undertakings, most frequently using the farm resources, into the rural space[5]. The fundamental benefits resulting from economic diversification of agricultural farms are not only the possibility of increasing incomes and a better use of the resources held but also the prospects of development for agricultural farms that have limited potential for development of agricultural activities. Development of non-agricultural economic activity is then particularly important in those rural areas with unfavourable farming conditions, in the areas of crumbled agriculture with a low specialisation level of agricultural farms applying traditional and ineffective production techniques[6].

Undertaking additional economic activity using the resources of the existing farm had already been supported during the pre-accession period within the frameworks of the SAPARD Programme. Projects implemented within the frameworks of the SOP 2004-2006 were implemented within the available limit that was, of course, consumed fully. The largest numbers of applications were lodged in Lubelskie, Mazowieckie and Małopolskie voivodships. Also in those voivodships, the number of contracts made was the highest. As indicated by the ARMA data, individuals that earlier used the support within the frameworks of the SAPARD Programme were a relatively large group of beneficiaries, ca. 17% , which supports the conclusion that the funding obtained stimulated activity in that field. It can therefore be suggested that it upgraded the self-esteem of the beneficiaries, strengthened their entrepreneurial characteristics and stimulated further investment activities.

Throughout the entire implementation period of programmes covered by the analysis (2004-2014), the largest numbers of applications within the framework of the measure related to diversification of the income sources were lodged in the Wielkopolskie (6273), Mazowieckie (4286), Lubelskie (2969) and Podlaskie (2558) voivodships. This does not mean, however, that farmers or persons eligible to obtain support in that area[7] were the most active in those voivodships. Analysing the number of applications lodged

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5 B. Roszkowska-Mądra, [2009]: *Koncepcje rozwoju europejskiego rolnictwa i obszarów wiejskich [The concepts of agricultural and rural development in the European Union], Gospodarka Narodowa, nr 10, 83-102.*

6 J. Sikora, [2012]: *Wielofunkcyjność obszarów wiejskich w Polsce [Multifunctional charakter of rural areas in Polan] J. Agrib. Rural Devel., 2(24), 215-226.*
P. Bórawski, A. Pawlewicz, [2012]: *Evaluation of farms with alternative sources of income In: Multifunctional development of rural areas Ed. Piotr Bórawski, 33-42.*

7 *Support addressed to farmers or members of farmer households living in rural areas (or towns up to 5,000 residents) that were fully insured continuously based on the regulations on the social insurance of farmers during the period of at least last 12 months immediately preceding the month of lodging the application for award of support.*

compared to the number of farmers eligible to obtain the support it can be confirmed that the farmers from Wielkopolskie voivodship, where 5.2% of farmers eligible to obtain support lodged the applications and 3% obtained that support, were the most active. In case of the farmers from the other voivodships, the situation looks different. Farmers from Opolskie (4.7%), Lubuskie (4.6%) and Warmińsko-Mazurskie (4.1%) voivodships were significantly more active. On the other hand, farmers from the voivodships of south-eastern Poland, and particularly Podkarpackie (1.4%) and Małopolskie (1.4), were much less active in applying for funds for non-agricultural economic activities (fig. 1). In those voivodships, just fourteen out of 1000 eligible farmers attempted at obtaining the funds for non-agricultural economic activity. Those two voivodships hold the last two positions in the ranking of the average area of agricultural land. In 2015, the average area of agricultural land on farms eligible to support within the frameworks of the analysed measure, i.e. lodging the applications for area subsidies in Małopolskie voivodship, was 3.98 ha and in Podkarpackie voivodship 4.71 ha while the national average was at the level of 10.49 ha. In contrast, in Wielkopolskie voivodship, where the farmers were the most active in applying for funds within the frameworks of the measure "Diversification into non-agricultural activities", the average area of agricultural land of the farm was higher than the national average at 13.43 ha.

The percentage of applications approved for funding was diversified between the voivodships. The highest percentage of contracts signed occurred in Lubelskie voivodship (80.3% of the total number of applications lodged) while in Lubuskie voivodship the percentage was only 37%. Concluding, the financing within the frameworks of that measure was obtained by 3% of the farmers from Wielkopolskie voivodship, 2.2% from Warmińsko-Mazurskie, 2.1% from Opolskie and not more than 1% from the voivodships of Podkarpackie, Małopolskie, Łódzkie and Dolnośląskie (Fig. 1).

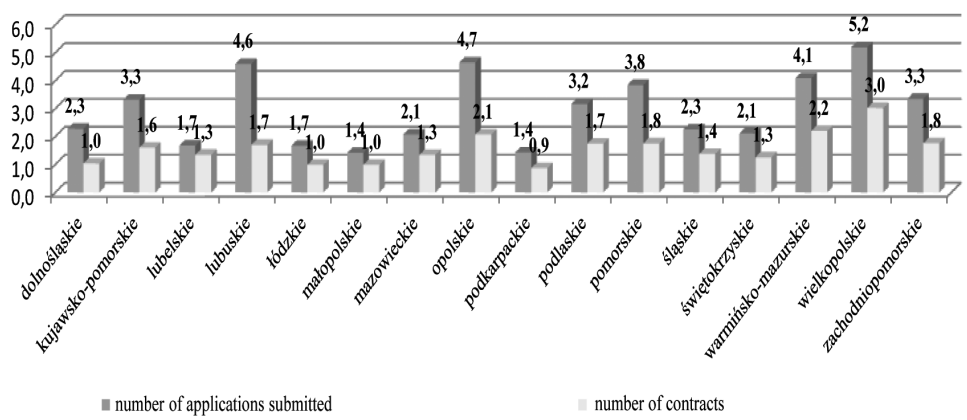

Figure 1. **Investment activity of farmers within the frameworks of the measure "Diversification into non-agricultural activities" [% of farmers eligible to support]**

Source: Own work based on the data of the ARMA

Projects implemented within the frameworks of the SOP 2004-2006 concerned mainly small services to the residents of rural areas (40.1%), services to agriculture and forestry (24.2%) and agrotourism services (20.7%)[8]. During the programming perspective of 2007-2014, the financial support concerned mainly services to agricultural farms and forestry (69.5%), services for the community (10.4%), tourist services and ones related to sports, recreation and rest/relaxation (6.9%), construction and installation services (6.4%), wholesale trade services (1.8%), retail trade services (1.6%) as well as crafts and handicrafts (1.1%)[9].

6.4. Support to Economic Initiatives of Individuals not Involved in Agriculture

Aid within the frameworks of measure 312 "Establishment and development of micro-enterprises" is provided to various entities, i.e. both individuals and organisational units that are not legal persons which operate or start operating economic activity in rural areas qualified for support within the frameworks of this measure. The level of support was 300,000 PLN maximum and depended on the number of newly created jobs (100,000 PLN if the business plan provided for creating at least 1 job, 200,000 PLN in case of creating at least 2 jobs and 300,000 PLN if the economic operational plan provides for creating at least 3 jobs. Similar to measure 311, the type of activity eligible for support is defined. As concerns the number of applications lodged, similar to the measure 311 "Diversification into non-agricultural activities", entrepreneurs from Wielkopolskie and Mazowieckie voivodships were at the top of the ranking. Interestingly, they were followed by the entrepreneurs from Podkarpackie and Małopolskie voivodships, i.e. the voivodships in which the farmers were the least active in obtaining funds from the measure 311 (Tab. 3). It is also worth noticing the large disproportions in the numbers of applications lodged within the frameworks of measures 311 and 312 in Małopolskie, Podkarpackie and Śląskie voivodships. This means that rural areas of those voivodships are perceived as attractive for investment but with limited opportunities for economic diversification of agricultural farms. Given the above, rather than greater focus on stimulating economic diversification of agricultural farms, better opportunities for improvement of the economic situation of farmers and members of their families should be linked to the increase in the number of jobs in rural areas created by beneficiaries that are not engaged in agricultural farming. The situation is entirely different in Podlaskie voivodship where the number of applications lodged within the frameworks of measure 311 was definitely higher than those lodged within the frameworks of measure 312. That is the only voivodship in which that situation occurred.

Investment attractiveness of rural areas depends on the specific characteristics of regions. In the enterprise development ranking the voivodships of eastern Poland with the domination of agricultural land (single function land) show the lowest indicators of enterprise. Low population density, domination of peripheral areas and a low level of economic infrastructure development surely do not encourage investing[10].

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[8] L. Droździel, [2007]: *ARiMR – trzy lata po akcesji. [ARMA – three years after accession]. Wyd. ARiMR Warszawa, 90-95.*

[9] Report from activities of the Agency for Restructuring and Modernisation of Agriculture for 2014 *http://www.arimr.gov.pl/fileadmin/pliki/zdjecia_strony/223/Sprawozdanie_ARiMR__2014.pdf [dostęp 20.04.2016 r.]*

[10] J. Lira, [2013]: *Rozwój infrastruktury gospodarczej a wskaźniki przedsiębiorczości na obszarach wiejskich województwa wielkopolskiego w latach 2004-2012 [Economic infrastructure development and entrepreneurship indicators in rural areas of wielkopolska Provence in the years 2004-2012], Rocz. Nauk. SERiA, t. XVI, z. 6, 320-325.*

Table 1. **Number of applications lodged for performance of activities supporting enterprise development in rural areas during the years 2004-2014**

Item	Number of applications lodged within the frameworks of the measure				
	2.4	311	312	413_311	413_312
Dolnośląskie	307	979	2150	324	509
Kujawsko-Pomorskie	395	1877	2410	311	297
Lubelskie	1275	2660	3100	391	368
Lubuskie	100	602	1235	190	204
Łódzkie	507	1750	2410	193	234
Małopolskie	724	1412	3974	301	671
Mazowieckie	768	3973	5325	722	909
Opolskie	165	972	1375	194	199
Podkarpackie	489	1351	3817	198	363
Podlaskie	480	2078	1491	222	173
Pomorskie	241	1226	2836	195	286
Śląskie	257	819	3264	217	354
Świętokrzyskie	523	1282	1906	150	284
Warmińsko-Mazurskie	225	1523	2510	248	353
Wielkopolskie	572	5701	5788	680	834
Zachodniopomorskie	144	794	1863	189	299

Source: Own work based on the data of the ARMA

Recapitulating, it should be concluded that the significant increase in the number of individuals working outside agriculture in rural areas is generated first by the increase in numbers of hired labour[11], meaning that larger support should be allocated to creating jobs. In the RDP 2014-2020, within the frameworks of Priority 6 "Increase of social inclusion, limitation of poverty and promotion of economic development" activities will be supported that aim at facilitating diversification of activity, establishment of new enterprises and creation of new jobs. The aid will take the form of subsidising the operations concerning development of non-agricultural activities as well as those influencing the increase of employment opportunities in rural areas. Preference will be given to enterprises implementing innovative projects. Within the frameworks of the measure "Premiums for commencement of non-agricultural activities", support will be provided to creating new jobs by means of support to the establishment of new enterprises conducting non-agricultural activities in rural areas.

M. Kłodziński, [2014]: *Kształtowanie się rozwoju przedsiębiorczości wiejskiej na tle ogólnokrajowych i europejskich tendencji [Rural entrepreneurship development in relation to national and euro pean trends], Rocz. Nauk. SERiA, t. XVII, z. 3, 175-179.*

[11] M. Bucka, [2014]: *Małe i średnie przedsiębiorstwa jako forma przedsiębiorczości na obszarach wiejskich [Small and medium-size enterprises as a form of entrepreneurship in rural areas]. J. Agribus.Rural Dev. 2(32), 35-44.*

6.5. Support to Entrepreneurial Initiatives Within the Frameworks of the Leader PROGRAMME

The Leader Programme represents the partnership approach to development of rural areas implemented by local action groups (LAG). The key is the harmonious cooperation of the representatives of local governments, non-government organisations, farmers and entrepreneurs in both planning and implementation of development-oriented activities. The aim of that programme is first to build civic capital through activation of the residents as well as better management of local resources resulting from indirect inclusion of local action groups in the management system of the given area[12]. Within the frameworks of the measure "Implementation of local development strategies" farmers and members of their families, as well as residents of the LAG area could apply for the award of aid within the frameworks of the earlier analysed measures, i.e. "Diversification into non-agricultural activities" 413_311) and "Establishment and development of micro-enterprises" (413_312) on principles defined in the regulations to those measures. As concerns the so-called small projects, funds (from 4500 to 100,000 PLN) were granted for economic activation of the LAG residents. Funds management by the LAG should on the one hand contribute to stimulating involvement of the local community in the area development and on the other to better use of the potential of rural areas and support to investments matching the concept of development of those areas. Within the frameworks of the Leader measures during the programming period of 2007-2013, 4725 applications relating to measure 413_311 and 6337 applications relating to measure 413_312 were lodged. The numbers of applications lodged were regionally diversified. The residents of Mazowieckie and Wielkopolskie voivodships were the most active (Tab. 1). It is also worth highlighting that only in three voivodships: Podlaskie, Lubelskie and Kujawsko-Pomorskie were farmers and members of their families more active in obtaining the funds than the other residents, as the number of applications concerning diversification into non-agricultural activities was larger than that of application for establishment and development of micro-enterprises. In the other voivodships the relations were the opposite and in Małopolskie voivodship the number of applications lodged for establishment and development of micro-enterprises (671) was more than double that for diversification into non-agricultural activities (301).

Analysing the scope and level of support of the applications lodged within the frameworks of the Leader programme, the relatively low level of funding should be highlighted. Within the frameworks of measure 413_311 from 31.9% of applications in Wielkopolskie voivodship to 50.5% in Kujawsko-Pomorskie voivodship were approved for financing. Within the frameworks of measure 413_312 "Establishment and development of micro-enterprises", the percentage of applications approved for implementation was significantly lower. Only in Podkarpackie voivodship were as many as 31.1% of the applications approved for implementation. In the other voivodships that percentage ranged within 20-30%, and in Warmińsko-Mazurskie voivodship it was 18.4% only.

[12] P. Szamrowski, M. Siemiński, [2011]: *Rola Lokalnych Grup Działania we wspieraniu przedsiębiorczości na obszarach wiejskich województwa warmińsko-mazurskiego [The role Local Activity Group in supporting entrepreneurship at areas of warminsko-mazurskie region] Rocz. Nauk. SERiA, t. XIII, z. 2, 465-470.*

The contracts signed within the frameworks of measure 413_311 "Diversification into non-agricultural activities" concerned mainly activities in agricultural services. The support in that area was the subject of ca. 45% of the total number of applications and it covered services supporting agricultural production as well as rental and lease of agricultural machines and devices. Around 18% of applications concerned projects related to agrotourism activities. On the other hand, within the frameworks of measure 413_312 "Establishment and development of micro-enterprises", the subject scope of projects approved for implementation was very wide. Projects related to tourist activities (overnight tourist facilities and short-term accommodation facilities, restaurants and gastronomic facilities, rental and lease of recreational and sports equipment) and services to the local communities (repair of automotive vehicles, production of sawmill products, catering services, preparation of land for construction or technical consulting services) dominated.

6.6. Conclusion

Economic activity of local communities depends on numerous factors among which efficient support instruments play an important role. Selecting the appropriate tools of support may lead to obtaining both an increase in economic activity of the population living directly in the rural areas and related to agriculture as well as an increase in the number of new jobs in those areas.

The conducted analyses confirm regional diversification in investment activities of the entities eligible to obtain support within the frameworks of the individual measures. The highest investment activity towards economic diversification of agricultural farms (exceeding 3%) was shown by the farmers or members of their families from Wielkopolskie, Opolskie, Lubuskie, Warmińsko-Mazurskie, Pomorskie, Kujawsko-Pomorskie and Zachodniopomorskie voivodships. The level of agricultural development in those regions is rather high and given the above, those are farms that have the appropriate investment potential available. They are able to generate funds for financing investments because the support is awarded as refinancing. Financial support to non-agricultural investments in those farms may contribute to improvement of the economic standing of the farms while it will contribute little to increasing the number of jobs.

On the other hand, in the regions of crumbled agriculture (Małopolskie, Podkarpackie) support in creating new jobs seems to be a more effective course of rural areas economic activation. Low investment activity of the farmers and members of their families in applying for funds confirms that opinion. The economic situation of agricultural farms in those regions limits the investment capacity and means that jobs created in rural areas by entities not related to agriculture might be the alternative for farmers and their families. That form of support to enterprise seems more rational.

It is difficult, however, to evaluate whether the enterprises of beneficiaries of the EU funds stand a chance in becoming the driving force of enterprise development in the regions and how much the funds obtained will strengthen them. Nevertheless, the opinion that Poland's accession to the EU had significant influence on the socioeconomic situation of the population residing in rural areas is common in the literature. Reaching out for the financial instruments of support to agriculture and rural areas within the frameworks of the common agricultural policy (CAP) and structural funds had positive influence not

only on the economic standing of the national food economy but also the quality of life in rural areas[13].

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7

SUSTAINABLE DEVELOPMENT OF PROVINCES IN POLAND

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Abstract: This study presents characteristics of provinces in Poland based on statistical data from 2004 and 2014 and provides a comparative analysis of individual provinces based on selected indicators of sustainable development. The starting point for the research was an assumption of great differences between provinces in the level of sustainable development. An analysis of statistical data and a comparative analysis of indicators of sustainable development confirmed this assumption.

Keywords: sustainable development, development of provinces, indicator of sustainable development, ranking of provinces

7.1. Introduction

The notion of development in literature is related to multiple social and economic phenomena. Heintz W. Arndt, in his book *Economic development. The history of an idea*, writes: *"(...) that the developing countries should develop further is almost universally desired by their own peoples (...). But anyone who asked articulate citizens in developed or developing countries, what they meant by this desirable objective of 'development' would get a great variety of answers. Higher living standards. A rising per capita income. Increase in productive capacity. Mastery over nature. Freedom through control of man's environment. Economic growth. But not only mere growth, growth with equity. Elimination of poverty. Basic needs satisfaction. Catching up with the developed countries in technology, wealth, power, status.*

Economic independence, self-reliance. Scope for self-fulfilment for all. Liberation, (...)"[1]. On the other hand, the term *sustainable development* is defined in Art. 3.50 of the Environmental Protection Law of 27 April 2001, pursuant to which it is: "*(…) the socio-economic development in which the process of integrating political, economic and social actions takes place, preserving the natural equilibrium and the sustainability of basic natural*

[1] B. Fiedor, K. Kociszewski [2010], (ed.): *Ekonomia rozwoju [Development economics], Wydawnictwo Uniwersytetu Ekonomicznego we Wrocławiu, p. 22.*

processes, to guarantee the ability to satisfy basic needs of individual communities or citizens, of both the present and future generations"[2].

The idea of sustainable development consists of three interrelated areas: society, economics and the environment. An equilibrium status occurs when all three areas contribute to the observed process of development to the same extent. Therefore, the main assumption is an improvement, or at least no deterioration, in natural conditions, with simultaneous economic and social development[3].

Numerous acts of national law, as well as decisions and regulations of the European Union have imposed on Poland an obligation to ensure regional development while preserving the principle of sustainable development.

7.2. Aims and Methods

The aim of the conducted research was to present characteristics of provinces in Poland based on statistical data from 2004 and 2014 (Tab. 1) in order to determine the trends and directions of changes in the development of individual provinces.

Table 1. **Selected statistical indicators of the Central Statistical Office**

Item	Indicator	Description
1	Revenue of province budgets in 2004 and 2014.	Revenue and expenditure of local government entities are grouped according to principles specified in the Act on Public Finance. The total revenue consists of 1) own revenue, 2) allocations 3) general subsidy, 4) funds for co-financing of own tasks. Data are presented to an accuracy of PLN 1.
2	Revenue of province budgets in 2004 and 2014 per capita.	Data concerning revenue of province budgets in 2004 and 2014 are combined with the "Population by age and sex groups" indicator, achieving in consequence the value of revenue of province budgets in 2004 and 2014 per one inhabitant of the province.
3	Gross domestic product per capita in individual provinces and in Poland in 2004 and 2014.	Macroeconomic categories calculated in regional accounts were analysed pursuant to principles of Polish domestic accounts and recommendations of the "European System of Accounts (ESA 2010)". In the system of regional accounts for each province, the following indicators are included: production account and generation of income account according to institutional sectors and activity type, and allocation of primary income account and secondary distribution of income account in the household sector.
4	Average gross monthly remuneration in the national economy in individual provinces in 2004 and 2014.	Data regarding remuneration are given in gross terms, i.e. including deductions for personal income taxes and since 1999, together with contributions for obligatory social insurance (pension, disability pension and sick insurance) paid by the insured employee. Data regarding social benefits are given in gross terms, i.e. including deductions for personal income taxes.

Source: Own study on the basis of the Central Statistical Office data.

[2] A. Mickiewicz [2007] (ed.),: *Ekonomiczno – Społeczne Problemy Rozwoju Zrównoważonego [Economic and Social Issues for Sustainable Development], Wyd. Akademia Rolnicza w Szczecinie Wydział Ekonomiki i organizacji gospodarki Żywnościowej, Szczecin, p.12.*

[3] A. K. Piasecki [2009]: *Samorząd terytorialny i wspólnoty lokalne [Local government and local communities], Wydawnictwo Naukowe PWN, Warszawa , p. 324 .*

The research also included a comparative analysis of sustainable development of individual provinces, based on selected indicators of sustainable development[4]. The analysis included selected indicators available on the website of the Central Statistical Office and making up a part of the Eurostat database. The choice of indicators was determined by the availability of data at the NUTS2 level, i.e. provinces (Tab. 2)

Table 2. **Selected indicators of sustainable development**

Item	Aspect of sustainable development	Area	Indicator
1	Social	Education	The share of persons aged 25-64 studying and training in the total population of the same age group (four weeks before the study) – Research of Economic Activities of the Population (BAEL)
2	Business	Innovation	Outlays on research and development in relation to GDP
3	Environmental	Land use	Forest coverage rate calculated as a share of woodland area in the total geographic area.

Source: Own study on the basis of http://wskaznikizrp.stat.gov.pl/index.jsf.

7.3. Characteristics of Provinces in Poland

Pursuant to the Act on introducing the basic three-tier division of administration of 1998, the three-tier system functioning in Poland consists of the following entities of the basic three tier division of the administration: communes, districts and provinces. The new territorial division of the state established sixteen provinces.[5] Polish provinces differ from each other in various aspects. The data of the Central Statistical Office presented below demonstrate the range of those differences.

First, the data concerning the revenue of provincial budgets were reviewed (Tab. 3) along with the same data reported per capita (Tab. 4).

In the compared period, i.e. 2004 to 2014, a significant increase in the revenue of province budgets can be observed. For provinces marked in green, this increase was higher than the average result for the rest of Poland. The highest increase in budget revenue was recorded for Warmińsko-Mazurskie and the lowest was for Śląskie.

As it can be clearly noted, the provinces with the highest budget revenues in 2004 were: Mazowieckie, Śląskie and Wielkopolskie, while Opolskie, Podlaskie and Świętokrzyskie had the lowest budget revenue. After ten years, the top group of provinces included: Mazowieckie, Dolnośląskie and Śląskie, while the lowest revenue was reached by: Opolskie, Lubuskie and Świętokrzyskie.

The data were set against the population of individual provinces in order to obtain an indicator – budget revenue per inhabitant of the province.

4 E. Czarski [2011]: *Wskaźniki zrównoważonego rozwoju [Sustainable development indicators], GUS, p. 4.*

5 Ł. Zaborowski [2009]: *Podział terytorialny Rzeczypospolitej – spojrzenie krytyczne [Polish territorial division – a critical look], Prace geograficzne, zeszyt 121, Instytut Geografii i Gospodarki Przestrzennej UJ, pp.263 – 275.*

Table 3. **Revenue of province budgets in 2004 and 2014**

Region	Revenue of budgets in 2004 [PLN]	Revenue of budgets in 2014 [PLN]	Increase in revenue [%]
Poland	6,970,305,927	17,745,621,590.04	254.6%
Łódzkie	325,068,821	751,603,935.81	231.2%
Mazowieckie	1,481,891,804	2,468,248,753.87	166.6%
Małopolskie	486,119,023	1,210,557,550.42	249.0%
Śląskie	1,016,236,391	1,641,351,765.60	161.5%
Lubelskie	325,493,632	1,331,524,751.12	409.1%
Podkarpackie	344,458,264	1,304,001,685.44	378.6%
Podlaskie	172,896,756	766,537,505.41	443.3%
Świętokrzyskie	200,468,251	633,051,466.00	315.8%
Lubuskie	215,301,741	536,770,194.66	249.3%
Wielkopolskie	538,531,507	1,144,296,797.42	212.5%
Zachodnio-pomorskie	254,595,472	844,636,890.88	331.8%
Dolnośląskie	483,309,652	1,727,621,357.52	357.5%
Opolskie	163,057,737	479,457,618.46	294.0%
Kujawsko-Pomorskie	330,931,915	843,490,017.10	254.9%
Pomorskie	378,055,078	890,259,161.09	235.5%
Warmińsko-Mazurskie	253,889,883	1,172,212,139.24	461.7%

Source: Own study based on Central Statistical Office data.

The result obtained is consistent with the data from Table 3, with only Kujawsko-Pomorskie ranking slightly below the national average after presenting the data per capita.

In the next step, the value of gross domestic product per capita was evaluated for individual provinces and for all of Poland (Tab. 5). The highest increase in GDP per capita after ten years was recorded in Dolnośląskie and Mazowieckie and the lowest was in Świętokrzyskie and Kujawsko-Pomorskie .

In 2004, the highest value of this indicator was achieved by the following provinces: Mazowieckie, Śląskie and Wielkopolskie, and in 2014: Mazowieckie, Dolnośląskie and Wielkopolskie. Particular emphasis should be given here to Dolnośląskie, where the highest increase in this indicator was observed.

The lowest value of GDP per capita in 2004 was recorded for the following provinces: Lubelskie, Podkarpackie and Podlaskie and, after ten years, the last three positions in the ranking were occupied by: Lubelskie, Podkarpackie and Warmińsko-Mazurskie, whose development was slower (a 173.8% increase within the 10 year period under analysis) than Podlaskie (180.3%).

Table 4. **Revenue of provincial budgets in 2004 and 2014 per inhabitant of the province**

Region	Revenue of budgets in 2004 [PLN/person]	Revenue of budgets in 2014 [PLN/person]	Increase in revenue [%]
Poland	183	461	252.6
Łódzkie	126	300	238.9
Mazowieckie	288	463	160.7
Małopolskie	149	359	241.0
Śląskie	216	358	165.6
Lubelskie	149	620	416.2
Podkarpackie	164	612	373.0
Podlaskie	144	643	447.3
Świętokrzyskie	156	501	322.2
Lubuskie	213	526	246.6
Wielkopolskie	160	330	205.9
Zachodniopomorskie	150	492	327.8
Dolnośląskie	167	594	355.6
Opolskie	155	479	308.9
Kujawsko-Pomorskie	160	404	252.2
Pomorskie	172	387	224.4
Warmińsko-Mazurskie	178	812	456.8

Source: Own study on the basis of the Central Statistical Office data.

The characteristics of the examined provinces also included average gross monthly remuneration in the national economy for individual provinces in 2004 and 2014 (Tab. 6).

The highest gross monthly remuneration in 2004 was found for the following provinces: Mazowieckie, Śląskie and Pomorskie, while in 2014 the top three included: Mazowieckie, Śląskie and Dolnośląskie, in which the growth of remuneration within the examined decade was 2.6% higher than in the case of Śląskie.

The lowest indicator, both in 2004 and 2014, was recorded in the following provinces: Warmińsko-Mazurskie, Kujawsko-Pomorskie and Lubuskie. Over the period of nine years, the highest pay increase was observed in Łódzkie and the lowest was in Mazowieckie. What should be emphasized is the slow increase of average remuneration in Mazowieckie, along with the highest average remuneration achieved by employees from the same province.

Table 5. **Gross domestic product per capita in individual provinces and in Poland in 2004 and in 2014**

Region	GDP per capita in 2004 [PLN/person]	GDP per capita in 2014 [PLN/person]	GDP per capita growth rate [%]
Poland	24,288	44,670	183.9
Łódzkie	22,365	41,793	186.9
Mazowieckie	36,602	71,661	195.8
Małopolskie	21,491	39,867	185.5
Śląskie	27,136	46,415	171.0
Lubelskie	17,193	31,233	181.7
Podkarpackie	17,654	31,664	179.4
Podlaskie	17,914	32,304	180.3
Świętokrzyskie	19,219	32,537	169.3
Lubuskie	21,579	37,585	174.2
Wielkopolskie	26,038	48,014	184.4
Zachodniopomorskie	21,917	37,439	170.8
Dolnośląskie	24,599	49,972	203.1
Opolskie	20,791	36,195	174.1
Kujawsko-Pomorskie	21,403	36,374	169.9
Pomorskie	23,862	42,580	178.4
Warmińsko-Mazurskie	18,397	31,977	173.8

Source: Own study on the basis of the Central Statistical Office data.

Table 6. **Average gross monthly remuneration in national economy in individual provinces in 2004 and 2014**

Region	Average monthly remuneration		Growth rate [%]
	in 2004 [PLN]	in 2014 [PLN]	
Poland	**2,409.69**	**3,809.31**	**166.2**
Łódzkie	2,123.36	3,735.46	170.4
Mazowieckie	3,095.96	4,980.99	159.2
Małopolskie	2,216.21	3,819.51	167.0
Śląskie	2,488.62	4,188.79	164.8
Lubelskie	2,096.15	3,659.25	172.0
Podkarpackie	2,018.59	3,496.79	169.0
Podlaskie	2,107.50	3,620.05	167.5
Świętokrzyskie	2,117.74	3,534.56	162.2
Lubuskie	2,067.56	3,514.50	165.7
Wielkopolskie	2,204.31	3,700.80	163.2

Region	Average monthly remuneration		Growth rate [%]
	in 2004 [PLN]	in 2014 [PLN]	
Zachodniopomorskie	2,221.63	3,753.80	164.3
Dolnośląskie	2,356.89	4,119.94	171.5
Opolskie	2,183.74	3,722.12	166.4
Kujawsko-Pomorskie	2,087.30	3,529.90	164.8
Pomorskie	2,374.71	4,100.07	168.9
Warmińsko-Mazurskie	2,050.21	3,472.41	165.2

Source: Own study on the basis of the Central Statistical Office data.

7.4. Indicators of Sustainable Development for Individual Provinces

A comparative analysis was carried out for selected indicators of sustainable development for three aspects of development: social, economic and environmental. These indicators are available at the website of the Central Statistical Office and form a part of the Eurostat database.

7.4.1. Social Aspect

Increasing, supplementing or acquiring new professional qualifications make up a significant element of adaptation to evolving economic situation and labour market requirements. It contributes to strengthening the position in the labour market, as well as personal development and self-esteem building.[6] Therefore, to start with, a ranking of provinces was created in the context of their social development, taking into account the area of education measured with the "Share of persons aged 25-64 studying and training in the total population in the same age group (four weeks before the study) – Research of Economic Activities of the Population (BAEL) in 2014" indicator.

Differences between regions in the area of education are significant. Education and acquired qualifications are among the most important social development determinants.

The share of persons in continuing education in Poland decreased by one percentage point within the decade under analysis, which should be considered as a negative phenomenon. In the table, the provinces marked in red are those for which the examined parameter in 2014 decreased in comparison to 2004, which resulted in their lower position in the ranking. There were ten such provinces, while other provinces achieved higher positions in the ranking in comparison to 2004, even despite a decrease recorded in the case of four provinces.

Consequently, an improvement in this parameter within the examined period was recorded only for two provinces: Mazowieckie and Pomorskie.

[6] E. Czarski [2011]: *Wskaźniki zrównoważonego rozwoju [Sustainable development indicators], GUS, pp. 48-49.*

Table 7. **The share of persons aged 25-64 studying and training in the total population**[7]

2004			2014			Change
Ranking position	**Region**	**[%]**	**Ranking position**	**Region**	**[%]**	
1	Lubelskie	6.2	3	Lubelskie	4.5	-1,3
2	Dolnośląskie	6.1	5	Dolnośląskie	4.2	-1.9
3	Mazowieckie	5.7	1	Mazowieckie	6.5	0.8
4	Zachodniopomorskie	5.4	9	Zachodniopomorskie	3.3	-2.1
5	Kujawsko-Pomorskie	5.2	6	Kujawsko-Pomorskie	3.8	-1.4
6	Śląskie	5.0	7	Śląskie	3.7	-1.3
7	Łódzkie	5.0	12	Łódzkie	2.7	-2.3
8	Podlaskie	5.0	10	Podlaskie	3.2	-1.8
9	Lubuskie	4.8	15	Lubuskie	2.5	-2.3
10	Pomorskie	4.8	2	Pomorskie	5.3	0.5
11	Opolskie	4.7	14	Opolskie	2.6	-2.1
12	Wielkopolskie	4.4	8	Wielkopolskie	3.3	-1.1
13	Małopolskie	4.3	4	Małopolskie	4.2	-0.1
14	Świętokrzyskie	4.1	11	Świętokrzyskie	3.0	-1.1
15	Podkarpackie	3.4	16	Podkarpackie	1.9	-1.5
16	Warmińsko-Mazurskie	3.2	13	Warmińsko-Mazurskie	2.7	-0.5
Poland		**5.0**	**Poland**		**4.0**	**-1.0**

Source: Own study on the basis of data at http://wskaznikizrp.stat.gov.pl/index.jsf.

7.4.2. Economic Aspect

The "Outlays on research and development in relation to GDP" indicator, describing the innovative activity of a given province, was used to prepare a ranking of provinces in the context of economic development.

Outlays on research and development (R&D) are a part of investment activity, which is aimed at accumulation of knowledge, creation and implementation of innovative solutions (products, services, organisational and marketing solutions) and, in consequence, increasing productivity of the capital and enriching the offer with products that provide a better response to the needs of the society/market. The aim of those activities is to ensure economic growth in long term, as well as to enhance the development processes and increase competitiveness of economies. They provide an opportunity to change the direction of development in specific branches of the economy through implementation of innovative, socially desirable solutions, e.g. environmentally-friendly, less energy – or material-consuming, as well as through development of human-friendly and health-protecting technologies, contributing to implementation of the sustainable development concept. In relation to gross domestic product, R&D outlays illustrate the scale of GDP redistribution into activities aiming at transformation of the economy towards a knowledge-based economy.[8]

[7] *The share of persons aged 25-64 studying and training in the total population of the same age group (four weeks before the study) – Research of Economic Activities of the Population (BAEL) in 2004 and 2014.*

[8] E. Czarski [2011]: *Wskaźniki zrównoważonego rozwoju [Sustainable development indicators], GUS, s. 102-103.*

Table 8. **Outlays on research and development in relation to GDP in individual provinces in 2004 and 2013***

2004			2013*			Change in %
Ranking position	**Region**	**[%]**	**Ranking position**	**Region**	**[%]**	
1	Mazowieckie	1.20	1	Mazowieckie	1.55	0.35
2	Małopolskie	0.96	2	Małopolskie	1.30	0.34
3	Łódzkie	0.52	5	Łódzkie	0.67	0.15
4	Pomorskie	0.48	4	Pomorskie	0.98	0.50
5	Lubelskie	0.46	9	Lubelskie	0.61	0.15
6	Wielkopolskie	0.43	7	Wielkopolskie	0.62	0.19
7	Dolnośląskie	0.41	6	Dolnośląskie	0.65	0.24
8	Śląskie	0.31	8	Śląskie	0.62	0.31
9	Podkarpackie	0.29	3	Podkarpackie	1.22	0.93
10	Kujawsko-Pomorskie	0.27	13	Kujawsko-Pomorskie	0.31	0.04
11	Podlaskie	0.24	10	Podlaskie	0.55	0.31
12	Warmińsko-Mazurskie	0.21	11	Warmińsko-mazurskie	0.36	0.15
13	Zachodniopomorskie	0.17	14	Zachodniopomorskie	0.30	0.13
14	Opolskie	0.13	16	Opolskie	0.23	0.10
15	Lubuskie	0.11	15	Lubuskie	0.26	0.15
16	Świętokrzyskie	0.08	12	Świętokrzyskie	0.35	0.27
Poland		**0.56**	**Poland**		**0.87**	**0.31**

*The data of 2013 have been used since the data of 2014 have not yet been included in the database.
Source: Own study on the basis of data at http://wskaznikizrp.stat.gov.pl/index.jsf.

Outlays on research and development in relation to GDP for all of Poland increased by 0.31 of a percentage point in the examined period between 2004 and 2013 – which should be considered a positive phenomenon. What is also significant is the fact that the value of outlays was observed in every province. Unquestionably, this increase is also related to the launching of special subsidy programmes for innovative projects.

The red colour in the table is used for the provinces in which an increase in the parameter was not sufficient for the province to keep the same place in the ranking – there were six such provinces. The green colour indicates the provinces in which an increase in the parameter resulted in achieving a better ranking position – there were five such provinces, while five provinces kept their previous ranking place.

Particular emphasis should be given to Podkarpackie, where outlays increased by 0.93 of a percentage point in relation to GDP, which resulted in a change from the ninth to the third place in the ranking of the provinces.

7.4.3. Environmental Aspect

To fully evaluate the level of sustainable development in individual provinces, the analysis also included an indicator related to the environmental area, "Forest coverage rate calculated as a share of woodland area in the total geographic area", which indicates the land use in a given province.

Forests form an integral element of the natural environment; they have a favourable effect on climate development, water balance, preserving biological potential of species and

preventing soil erosion processes. They fulfil important production and social functions. There are great needs and possibilities of increasing the forest coverage rate of the country by afforestation of productively inefficient or undeveloped arable land.[9]

Table 9. **Share of woodland area in the total geographic area of provinces**[10]

2004			2014			Change in %
Ranking position	**Province**	**%**	**Ranking position**	**Province**	**%**	
1	Lubuskie	48.7	1	Lubuskie	49.2	0.5
2	Podkarpackie	36.5	2	Podkarpackie	38.0	1.5
3	Pomorskie	35.8	3	Pomorskie	36.3	0.5
4	Zachodniopomorskie	34.7	4	Zachodniopomorskie	35.5	0.8
5	Śląskie	31.7	5	Śląskie	31.9	0.2
6	Warmińsko-Mazurskie	29.9	6	Warmińsko-Mazurskie	31.0	1.1
7	Podlaskie	29.7	7	Podlaskie	30.7	1.0
8	Dolnośląskie	29.1	8	Dolnośląskie	29.7	0.6
9	Małopolskie	28.4	9	Małopolskie	28.7	0.3
10	Świętokrzyskie	27.5	10	Świętokrzyskie	28.2	0.7
11	Opolskie	26.3	11	Opolskie	26.6	0.3
12	Wielkopolskie	25.4	12	Wielkopolskie	25.7	0.3
13	Kujawsko-Pomorskie	23.1	13	Kujawsko-Pomorskie	23.4	0.3
14	Lubelskie	22.3	14	Lubelskie	23.2	0.9
15	Mazowieckie	22.1	15	Mazowieckie	23.1	1.0
16	Łódzkie	20.6	16	Łódzkie	21.3	0.7
Poland		**28.7**	**Poland**		**29.4**	**0.7**

Source: Own study on the basis of data at http://wskaznikizrp.stat.gov.pl/index.jsf.

The share of woodland area in the total geographical area of Poland increased in the given period by 0.7%. It is also worth emphasizing that this indicator grew in every province. It should be considered a positive phenomenon, unquestionably related to the National Programme for Expanding Forest Cover.

As regards the positions of provinces in the ranking, they were the same in 2004 and 2014. The first place in the ranking is occupied by Lubuskie, which both in 2004 and in 2014 was characterized by the highest share of woodland areas in the total geographical area of this province. On the other hand, Łódzkie was ranked the lowest. Table 9 shows that as many as six provinces have the higher share of forests in the total area of the province in the examined period than the average for Poland, while the share of forests for two more provinces is equal to the national average.

[9] E. Czarski [2011]: *Wskaźniki zrównoważonego rozwoju [Sustainable development indicators], GUS, pp. 147-148.*

[10] *Forest coverage rate calculated as a share of woodland area in the total geographic area in individual provinces in 2004 and 2014.*

7.5. Conclusions

On the basis of the research carried out, certain progress of provinces can be observed towards sustainable development in its economic and environmental aspects, along with the occurrence of a negative social phenomenon.

A comparative analysis of selected indicators shows that:

— The percentage of persons in continuing education in Poland decreased in the decade under analysis, which should be considered a negative phenomenon.
— The outlays on research and development in relation to GDP for all of Poland increased by 0.31% in the examined period of 2004-2013, which should be considered a positive phenomenon. What is also significant is the fact that the value of outlays increased in every province. Unquestionably, this increase is also related to implementation of special subsidy programmes for innovative projects.
— The share of woodland area in the total geographical area of Poland increased in the examined period by 0.7%. It is also worth emphasizing that this indicator improved for every province. This should be recognized as a positive phenomenon, undoubtedly related to the National Programme for Expanding Forest Cover.

To summarize, provinces in Poland occupy various positions in the rankings of three aspects of sustainable development. The observed diversity provides a basis for further research with a higher level of complexity.

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8

AWARENESS AND KNOWLEDGE OF SUSTAINABLE MANAGEMENT POLICY AMONG MANAGERS OF SMALL AND MEDIUM-SIZED ENTERPRISES

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Abstract: This paper discusses the principles of sustainable development. It also presents results of research on the awareness of managers in the area of sustainable development. The studies have shown that managers working in the SME sector know and understand the issues of sustainability management. The companies in which they work express these principles and see the benefits of this outcome.

Keywords: manager, sustainable management.

8.1. Introduction

In the functioning of SMEs is very important the environmental surveillance, which provides about who is a man, therefore, is an important part of all of the key actions. Entrepreneurs through business, actively affect the state of natural resources and through their actions they can contribute to the conservation of resources, prevent pollution, increase recycling and promote attitudes that takes into account the client and which involve the development of environmentally friendly technologies. Carrying out activities in this regard is the introduction of the principles of sustainability management. Such action is defined as conducting socially responsible business (CSR: corporate social responsibility) means the acceptance by the organization responsible for the impact of its decisions and activities on society and the environment through transparent and ethical behavior[1].

Environmental aspects are becoming more visible in the daily life and economic activities of companies, waste, reuse them, production in environmentally friendly conditions, producing and buying organic products are examples of projects, becoming

[1] E. Stawicka, J. Wołszyn [2013]: *Praktyczne podejście przedsiębiorstw sektora msp do koncepcji społecznej odpowiedzialności w biznesie [Practical approach of SME enterprises to the concept of social responsibility in business], Roczniki Ekonomii Rolnictwa i Rozwoju Obszarów Wiejskich, T. 100, z. 1, p. 44.*

more and more popular. Access to information on the environment is increasing from year to year, and the issue of sustainable development should be to increasingly topics. Therefore, the implementation of the sustainable management policy also determines the implementation of eco-innovations. "Innovation can take on a different character, however, always remain the decisive factor for the development of the company. Most importantly, they can only ensure the company sustainable development, acting at the same time, for the sustainable development of the whole economy"[2].

8.2. The Concept of Sustainable Development

The concept of sustainable development was created by Hans Carl von Carlowitz. It stems originally from forestry, when it originally meant the way of the forest management where they cut only so many trees, how much can it grow so that the forest has never been abolished and always be able to rebuild[3]. Meeting the challenges of sustainable development is possible thanks to the integration policy:

- environment,
- economic,
- social.

However, this requires treating environmental resources as economic resources, which are limited and the use of natural capital in a way that maintains the ecosystem in the long term. The concept of sustainable development in the early nineteenth century to promote all German Higher School of Forestry and the German forestry enjoyed an excellent reputation throughout the world. This is because the term has been taken over by scientists from other countries (among others from France and Italy). It was translated into English, and there was talk of Sustained Yield Forestry. The term "sustainable" took over the environmental movement and in the 80s again introduced into the political debate. The traditional definition of sustainable development says that this is development, "in which the needs of the present generation can be met without diminishing the chances of future generations to meet their own needs"[4].

One of the most popular definition includes a report by the World Commission. Environment and Development, "Our Common Future" "Sustainable development is the social and economic development, which ensures meeting the needs of modern society without compromising the ability of future generations to meet their needs."

Many years ago it was found that civilization has reached a level of prosperity possible to maintain, subject to appropriate management. The model assumes the economy properly and consciously shaped the relationship between:

- economic growth,
- respect for the environment (not only natural but also artificial – man-made),
- and human health.

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[2] A. Mirski [2014]: *Innowacyjność a zarządzanie zrównoważonym rozwojem przedsiębiorstwa [Innovation and management of sustainable company development], http://www.ptzp.org.pl/files/konferencje/kzz/artyk_pdf_/T1/t1_140.pdf access 05.05.2016, p. 140.*

[3] W. Żuchowski [2014]: *Zrównoważone magazyny – definicja i oczekiwane efekty implementacji [Sustainable warehouses – definition and the expected results of implementation],* Logistyka 6, p. 13954, http://www.czasopismologistyka.pl/artykuly-naukowe/send/319-artykuly-na-plycie-cd-6/5678-artykul /

[4] L. Krostek [2013]: *Zrównoważony rozwój [Sustainable development], Wyd. AP, Wrocław, p. 29.*

International documents devoted to sustainable development, (especially the final documents of the Conference in Rio de Janeiro and Johannesburg conferences) emphasize that for the implementation of sustainable development are necessary changes in production processes and consumption. It is necessary to remember about the "traditional" environmental targets[5].

Thus, according to the idea of sustainable development of the society should live, taking into account the so-called. bill drawn cost of their decisions, which means that the cost of decisions should be added the cost of their consequences. Sustainable development is based on the realization of the key objectives considered in terms of ecology, economy and socio-cultural fields, and each of them includes five spheres of life[6].

Sustainable development means that economic growth leads to:

- enhancing social cohesion:
  - reduce social stratification,
  - equal opportunities,
  - prevention of marginalization and discrimination,
- and improve the quality of the environment for example:
  - by reducing the harmful effects of production and consumption on the environment,
  - protection of natural resources[7].

Today's definition of sustainable development is not limited to the sphere of forestry. For proper understanding the idea of sustainable development are two key concepts:

- concept of basic needs,
- idea of limited opportunities (especially the strength of the global ecological system)[8].

The definitions are as follows: *"Sustainable development is development that meets the needs of the present, not threatening opportunities meet the needs of future generations. It is based on two fundamental concepts:*

- *concept of "needs" – in particular the essential needs of the poorest in the world, which should be given the highest priority*
- *the concept of limits-imposed capacity of the environment to meet the needs of the present and future by the state of technology and social organization*[9]*."*

In order to ensure the continued existence of life on the Earth and the possibility of satisfying the basic needs of all people and future generations, you need to take care about sustainable development in all areas of life and business.

The definition of sustainable development contained in The United Nations documents and standards sounds as follows: „*Sustainable development of the Earth is*

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5 D. Kiełczewski, B. Dobrzańska [2009]: *Ekologiczne problemy zrównoważonego rozwoju [Ecological problems of sustainable development], Wyd. WSE, Białystok, p. 7.*

6 więcej P. Szulc-Fischer [2015]: *Zrównoważony rozwój a granica wzrostu gospodarczego [Sustainability and limit economic growth], [In:] Zasada zrównoważonego rozwoju w wymiarze gospodarczym i ekonomicznym [The principle of sustainable development in economic], edited by B. Rakoczy, K. Karpus, M. Szalewski, M. Walas, Wydział Prawa i Administracji UMK, Toruń, s. 223.*
https://repozytorium.umk.pl/bitstream/handle/item/2753/Zasada%20zr%C3%B3wnowa%C5%BConego%20rozwoju%20-%20monografia.pdf?sequence=1 dostęp 05.05.2016

7 Ibid, s. 21

8 Ibid.

9 J. Berdo [2006]: *Zrównoważony rozwój: w stronę życia w harmonii z przyrodą [Sustainable Development: towards living in harmony with nature], p. 87 http://www.sopockainicjatywa.org/earth/rozwoj_pdf/Zrownowazony-rozwoj-calosc.pdf access 05.05.2016 /*

development that meets the basic needs of all people and preserves, protects and restores the health and integrity of the Earth's ecosystem, without jeopardizing the ability to satisfy the needs of future generations and without exceeding the limits of long-term capacity of the Earth's ecosystem."[10].

In accordance with the idea of the sustainable development of mankind must take account of the rolling costs of its decisions. Sustainable development means that economic growth leads to increasing social cohesion, including among others:

- reduction of social stratification,
- equalization of opportunities,
- prevent marginalisation and discrimination

and improving the quality of the environment, including by reducing the harmful effects of production and consumption on the environment and protecting natural resources[11].

Among the supporters of the idea of balanced and sustainable development and its practical implementation there is a fairly widespread belief that the basic principles of this approach can and should be implemented in all socio-economic conditions[12].

The concept of sustainable development, to meet the needs (present and future generations) highlights the need to include in a business not only its economic but also social and environmental factors, which in practice means production responsible for the placing on the market products for which the manufacturer assessed various aspects of the ecological, social and economic. This assessment must take into account the equal treatment established criteria of the area of sustainable development throughout the life cycle of the product (design, manufacture, use, recovery of waste). A graphical presentation of the sustainable development of the area shows the figure 1.

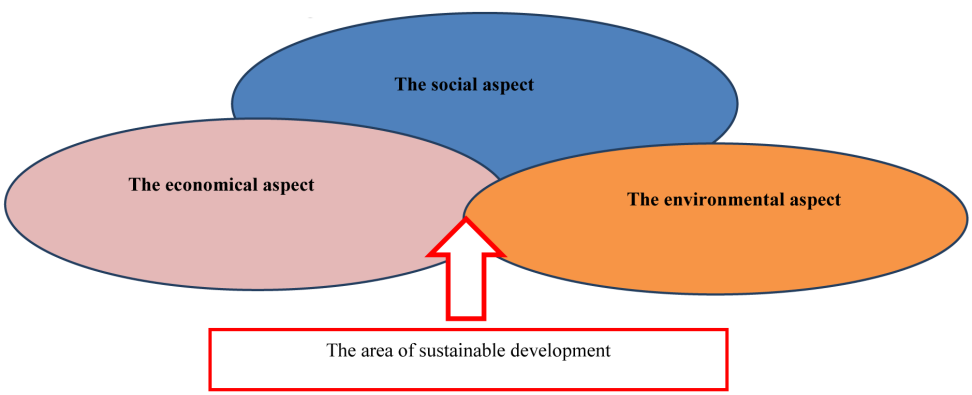

Figure 1. **The area of sustainable development**
Source: http://www.cobro.org.pl/nip/index.php?option=com_content&view=article&id=47&Itemid=55, access date: 05/05/2016.

[10] Ibid, s. 88.
[11] Ibid.
[12] S. Czaja, A. Becla [2011]: *Czterech jeźdźców ekologicznej zagłady we współczesnym świecie [The Four Horsemen of ecological destruction in the world today] [In:] Trendy i wyzwania zrównoważonego rozwoju [Trends and challenges for sustainable development] , ed. B. Kryk, Uniwersytet Szczeciński 2011, p.37 / http://www.wneiz.pl/cathedrala/kpsg/publications/Trends_and_challenges_contnts.pdf access date 05.05.2016.*

- Instruments of sustainable development:
- Environmental indicators,
- Strategy on the sustainable use of natural resources,
- Competitiveness and innovation framework program (CIP) (2007-2013),
- Program to help small and medium-sized, clean and competitive enterprises,
- Supporting the social responsibility of enterprises.
- Agenda for a sustainable and competitive European tourism
- Global Efficiency Energy and Renewable Energy Funds[13].
- Therefore, balanced development means:
- improving conditions for the entrepreneurship development, in particular with respect to SMEs,
- using the Europe's leadership to develop new, environmentally friendly technologies and production methods,
- building a more competitive low-carbon economy that uses resources in a rational way and frugal,
- protection of the environment, reduce greenhouse gas emissions and prevent the loss of biodiversity,
- the introduction of efficient, smart energy grids,
- the use of EU-wide network to provide an additional advantage for European companies (especially small manufacturing enterprises),
- helping consumers make informed choices[14].

A direct impact on components of the environment have companies, which use its resources[15].

Figure 2 shows the transfer of the concept of sustainable development at the microeconomic level – the level of the enterprise. On the one hand there are environmental demands, such as:

- respect of raw materials,
- protection of water quality,
- air, soil,

on the other, economic demands:

- profitability,
- production efficiency, competitive ability[16].

[13] http://europa.eu/legislation_summaries/environment/sustainable_development/index_pl.htm; data dostępu: 05.05.2016.

[14] http://ec.europa.eu/europe2020/europe-2020-in-a-nutshell/priorities/sustainable-growth/index_pl.htm; data dostępu: 20.05.2015.

[15] E. Mazur-Wierzbicka [2005]: *Koncepcja zrównoważonego rozwoju jako podstawa gospodarowania środowiskiem przyrodniczym., [Concept of sustainable development as the basis for management of the natural environment], [In:]: Danuta Kopycińska, Funkcjonowanie gospodarki polskiej w warunkach integracji i globalizacji [Functioning of the Polish economy in the conditions of integration and globalization], Szczecin, p. 42.*

[16] J. Adamczyk [2001]: *Koncepcja zrównoważonego rozwoju w zarządzaniu przedsiębiorstwem [The koncept of sustainable development In enterprises management], Wyd. AE, Kraków, p.31.*

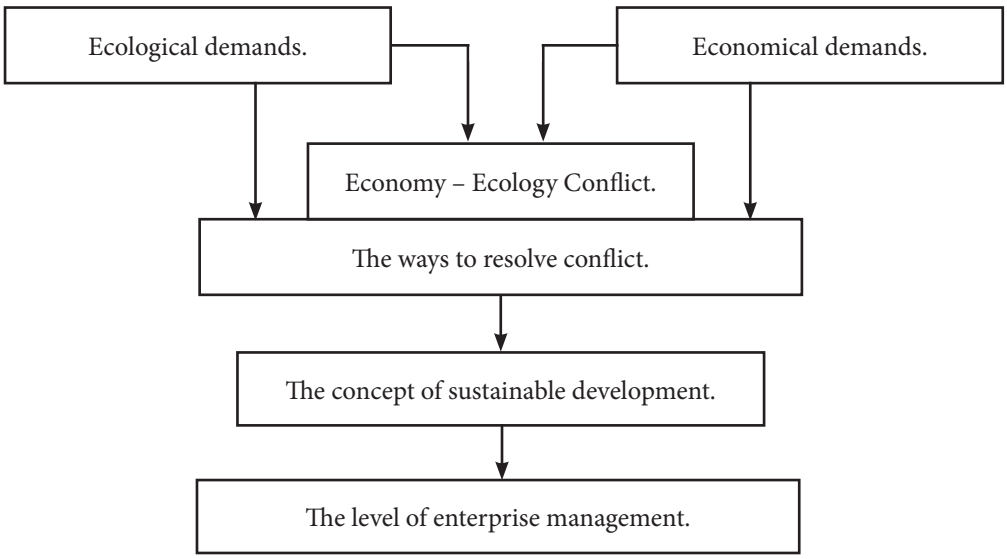

Figure 2. **The transformation of the concept of sustainable development to the level of the company.**
Source: J. Adamczyk, The concept of sustainable development in business management, Ed. AE Kraków 2001, p.31.

Often there is a conflict between economy and ecology, and the way to solve it at the enterprise level is the concept of sustainable development. Therefore it might be taking action consistent with the mission of the environmental respect in the company's philosophy to formulate a pro environmental strategy of the company[17]. 16 Today, sustainability is a very capacious concept, because it contains numerous, less or more specific concepts. For most associated with the concept of sustainable development there are concepts such as business ethics, CSR and TBL (Tab. 1).

Table 1. **The concepts of sustainable development**

concepts	description
business ethics	It concerns the morality practiced in the sphere of market economy · and focuses on human behavior in the sphere of interests, not to other aspects of his life
CSR corporate social responsibility	the company voluntarily take into account social and ecological aspects in their business operations and relations with its stakeholders[1]; among stakeholders very important role play the public and so-called „Silent stakeholder" – the environment[2]
TBL triple bottom line	It assumes that the company's success is influenced by developments in three dimensions: • economic, • ecological, • social.

Source: Based on the definition contained in the Green Paper: Promoting framework for Corporate Social Responsibility, a document drawn up by the Commission of the European Union,
http://www.iisd.org/business/issues/eu_green_paper.aspx access on 03.01.2011.

[17] Ibid., p.31.

Speaking about the sustainable development of enterprises, thoughts are usually two types of its behavior. The first type involves the actions taken by the company towards sustainability of the world, which may include financial, media, or moral support for the concept of sustainable development. Supporting sustainable development through the company applies to activities for: economic growth, ecological balance and social progress. The second example is the behavior of enterprises acceptance of the concept of sustainable development: a company developing in a sustainable way is environmentally friendly and adopt environmental criteria for choosing the path of development. The image of companies and their success in the market depends on effective environmental action and openness to development[18].

Sustainability of development for SMEs requires the use of two principles of sustainable development:

- knowledge of the complexity and diversity – in terms of understanding the context in which the company comes to function, that is, internal and external environment, very complex, in which there is a number of different connections,
- harmonization of the complexity and diversity – in the case comes to finding capability of dynamic equilibrium in this complex environment.

In the long term there is need the ability to deal with the multiplicity of interests, the ability to negotiate and finding the right proportion. Today's abuse or neglect, even in relation to one of the stakeholder companies can very quickly affect the future condition of the company for example: products boycott, leaving employees leaving, protests or negative publicity.

Targeting pro-environmental management in SMEs leads to an increase in the efficiency of the company, which manifests mainly in:

- reducing costs,
- reducing pollution as a result of self-regulation to ensure flexibility and greater effectiveness in meeting environmental requirements,
- gaining a competitive advantage,
- the possibility of obtaining government assistance for companies undertaking environmental initiatives.[19]

Examples of environmental activities that allow you to reduce costs in the company are:

- better use of consumable materials, eg. sale or reuse wastes / residues
- the use of eco-packaging, for example. the reduction of the weight and quantity of packaging reduces the costs associated with the transport of the goods, their handling in enterprises,
- buying coffee, tea, pastries etc. in eco-packaging, for example purchase coffee in a bag not in the box or the jar, and then pour it into a permanent, durable container,
- not overheating the rooms,
- avoiding the „barren" work of electrical equipment, gas, flue gas (e. g. off machinery,

[18] E. Mazur-Wierzbicka [2005]: *Koncepcja zrównoważonego rozwoju jako podstawa gospodarowania środowiskiem przyrodniczym [Concept of sustainable development as the basis for management of the natural environment] [in:] Danuta Kopycińska, Funkcjonowanie gospodarki polskiej w warunkach integracji i globalizacji [Functioning of the Polish economy in the conditions of integration and globalization], Szczecin 2005, p. 42.*

[19] Ibid, p.43.

equipment during breaks at work, reducing heating in non-working time-nights and on Saturdays, Sundays),
- buying recycled stationery[20].

8.3. State of Knowledge of Workers in SMES – the Results of Own Research

The research was conducted during January and February 2016 among 200 manager working in the SME sector companies in the Mazovian region. Among the tested 68% are men, and 32% are women. The largest group were people aged 35-50 – 53%, the second group were people aged 50 – 37%. Other persons i. e. 10 people under the age of 35. Interviewees have higher education – 65%, secondary education-25% and 10% of vocational qualification.

Surveyed managers were asked to answer the question whether they know the concept of management of sustainable development. The vast majority of respondents (91%) declared knowledge of this concept. managers indicated their attention to the environment in their enterprises. The most frequently reported symptom was to use energy-saving bulbs. These bulbs are used by 95% of companies (Tab. 2). This is probably due to the fact that such action can reduce the cost of electric power.

Table 2. **Symptoms of the environment care in SME enterprises according to the surveyed managers declaration**

Variant of the answer	The numer of respondents	The procent of respondents [%]
Using energy-saving bulbs	190	95,0
Applying stickers In switches „asking" about turning off the lights when an employee leaves the room	96	48,0
There are containers for waste segregation in the room	102	51,0
Using water-saving taps	22	11

Source: Own research.

Managers take action to protect the environment and motivate employees to them. The most common are: sorting waste (78%), energy saving light bulbs (56%), turning off light (11%). All surveyed managers declared that in their companies are conducted interviews with staff concerning the proceedings in accordance with the principles of sustainable development and motivating employees to share their ideas to help change business processes in such a way as to enhance implementation of the principles of sustainable development. This proves the high awareness of the surveyed managers and

[20] P. Szczypa [2006]: *Świadomość ekologiczna a ograniczanie kosztów u przedsiębiorców opodatkowanych na zasadach ogólnych [Ecological awareness and reducing the costs for businesses taxed on general principles] [in:] Finansowe uwarunkowania konkurencyjności przedsiębiorstw z uwzględnieniem sektora MSP [Financial considerations into account the competitiveness of the SME sector], ed. B. Mikołajczyk, Wyd. Difin, Warszawa, s.334-336.*

their perception of the benefits of such conduct for companies. Awareness of this is also confirmed by the declaration of all managers that their behavior both at work and outside it has an impact on the environment. Therefore they are trying to change their habit in areas having a negative impact on the environment. These areas are mainly saving water, energy, segregation of recyclable materials, as well as economical driving style. These data confirm also declared by the managers the criteria during buying everyday products. The most of them declared that draw attention to the type of packaging and prefer those that are environmentally friendly (Tab. 3).

Table 3. **Criteria for purchasing everyday products declared by respondents**

Variant of the answers	The numer of respondents	The percrnt of respondents [%]
Price	110	55,00
Quality	122	61,00
Brand	88	44,00
The origin country	46	23,00
Composition	142	71,00
Labeling, GMO-free	176	88,00
Methods of environmentally friendly production	182	91,00
Type of packaging (environmentally friendly)	164	82,00
Advertisement	24	12,00

Source: Own study based on the research.

In most companies, where managers took part in the study, the principles of caring for the environment were implemented. It declared 78% of respondents.8 % of the surveyed managers said they do not know it, the others declared that their company was not implemented these rules. Most of the respondents (85%) said that the implementation of the principles of sustainable development at the beginning generates extra costs. However, in the long term it gives benefits, as it allows to reduce costs for electricity, water, waste disposal and sewage. The majority of the managers 82% see in undertaking activities related to the implementation of the principles of sustainable development a chance to gain a competitive advantage are becoming more and more aware of the necessity of taking care of the environment.

8.4. Conclusion

The study shows that in the companies where work the surveyed managers, there is a high awareness of the principles of sustainable development. Optimistic is that not only are taken steps to rational management of environmental resources by managers, but also motivates workers to join in the process. The implementation of these principles is no longer seen as just a source of cost, but as an opportunity for reductions over a long period of time as well as a way to gain competitive advantage.

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9

THE ROLE OF COOPERATIVES IN THE DEVELOPMENT OF POLAND

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Abstract: The purpose of the paper is to present the contribution of cooperatives in the development of Poland, taking into account mainly economic aspect, covering also some social elements, as e.g. employment. Over the last 15 years, the number of registered cooperatives decreased by 7.5% to more than 17.6 thousand entities, and their share in the total number of entities of the national economy decreased to 0.4%. This decrease was recorded only for entities in traditional industries, while the number of cooperatives in the service sector increased. The largest number of cooperatives were operating in the following voivodeships: Mazowieckie, Wielkopolskie, Dolnośląski, Lubelskie, Śląskie, Małopolskie, Zachodnio-pomorskie and Pomorskie. In the period of the last twenty years, the share of the cooperative sector in global production of the national economy, its gross value added, sold industrial production has fallen, despite increasing absolute values of these categories. Cooperatives were systematically reducing costs incurred to purchase, manufacture or improve fixed assets. Cooperatives are still an important employer in the Polish economy. A positive phenomenon is growing average monthly gross remuneration in cooperatives and decreasing difference between them and the rest of the economy. In spite of the recent decrease in the number of cooperative apartments and their area, they still serve a significant part of population. Cooperatives keep on playing an important, though decreasing, role in agriculture. The only cooperative sector that maintained the dominant position on the market is the dairy industry. Cooperatives occupy also an important place in the banking system. Cooperative banks in Poland has had in recent years, especially in the period, given the financial crisis, a significant share in financing small and medium-sized enterprises (SMEs) needs. Cooperative banking in Poland has quite stable resources for its development. Thanks to dynamic growth in deposits, cooperative banks increased their lending activity, occupying a significant position in the domestic market of deposits and credits. The number of cooperative savings and credit unions, their members (now more than 2 million), and the value of gathered deposits and credits all increased. To sum up the conducted analysis, it can be concluded that cooperatives occupy a prominent place in the economic development of Poland although, unfortunately, this role has been decreasing.

Key words: cooperative, cooperative sector, development, national economy, sustainable development

9.1. Introduction

The creation and operation of cooperatives may counteract adverse globalization phenomena in regions or social groups, such as growth in income stratification and

development stratification at various levels. The cooperative movement operates and evolves in contemporary economies through care for interests of its members and as a result of professing ideas that are a model for moral conduct for many people. These are the following values: ideological (democracy, equality, self-aid), ethical (fairness, integrity, thoughtfulness, faith in cooperative ideas), related to cooperative principles (voluntary participation, participation in management, autonomy, training and personal development for the good of a cooperative, and interaction)[1]. According to data from the International Cooperative Alliance (ICA), the cooperative movement holds an important position in the global economy, as in 2012 cooperatives employed worldwide 250 million people (i.e. 150% more than in 2008), generated $ 2.2 trillion of revenues (38% more), and associated more than a billion people [ICA 2016]. Trust in this form of group activity results also from the fact that cooperatives perform numerous social, educational, developmental and cultural functions. Cooperative members trust each other. Cooperatives mainly serve local communities, since they often are their closest partner. They raise economic potential of those areas. The development of local resources of the means of production and service and commercial network may multiply benefits in the form of new jobs, improved income and material situation of cooperative members and their families, but also for other inhabitants, and encourage entrepreneurs to make investments[2]. One of the cooperative principles adopted by ICA says that cooperatives work for sustainable development of local communities of their members.

Sustainable development can be explained as a pursuit to ensure that all present and future generations live at sufficiently high environmental, economic and socio-cultural standards within the limits of tolerance of nature[3] through implementation of inter-generational and intra-generational justice principles and liability. Intra-generation fairness means that each generation has to be able to decide how to manufacture and fairly distribute certain goods. Inter-generation fairness indicates the equality of opportunities in life, use of resources, elimination of poverty. According to the principle of liability, states are accountable for opportunities for their inhabitants, other countries and continents, for a happy life, and that all members of the society enjoy human rights and the ability to satisfy their basic living needs. Sustainable development goals are as follows:

— economic goals: stability of the national economy, satisfaction of basic needs through sustainable products and prices, pricing stability, counteracting concentration and economic power, internalization of external costs, cooperation for the benefit of development, adequate income distribution, – ecological – protection of the atmosphere, refraining from damaging the nature, i.e. preservation of species and landscape diversity, sustainable use of renewable and non-renewable resources, and healthy living conditions (elimination of harmful substances, radiation and noise).
— socio-cultural goals: democracy and rule of law, elimination of poverty, social safety,

[1] W. Czternasty, [2013]: *Determinanty rozwoju spółdzielczości w różnych warunkach ekonomiczno-społecznych [Determinants of the development of cooperatives in different economic and social conditions], Wyd. Adam Marszałek, Toruń, p. 82.*

[2] Ibid*, p. 83.*

[3] Man may permanently use natural resources only to a certain degree so as not to destroy natural grounds of life. Since natural resources are a necessary condition of human life and management, it is unacceptable to abuse and destroy them. – H. Rogall, *Ekonomia zrównoważonego rozwoju. Teoria i praktyka, [Economics of sustainable development. Theory and practice],* Zysk i S-Ka, Poznań 2010*, p. 44.*

equality of opportunities, internal and external safety, human health and quality lifestyle protection[4].

The purpose of this paper is to show the contribution of cooperatives in the development of Poland, taking into account mainly economic aspects, and covering also some social elements, e.g., employment. The economic goal in sustainable development is basic, owing to the fact that its lack deprives the possibility to pursue other goals, i.e. social and ecological goals. The time scope of the analysis includes at least 15 past years to be able to characterize certain trends. The source material includes mainly statistical data collected by the Central Statistical Office (GUS).

9.2. Situation of the Cooperative Sector in Poland

Basing on the REGON register, whose basic function is identification of entities of the national economy on the basis of updated requests reported by entities with the legal obligation of making notifications in the register concerning entering, crossing out and changing features covered by the entry, the number of cooperatives in Poland can be analysed. Over the last 15 years, the number of registered cooperatives decreased by 7.5% to more than 17.6 thousand entities, and their market share in the total number of entities of the national economy decreased to 0.4% (Tab. 1). Industries with the largest number of cooperatives are real estate service, trade and repair of vehicles, agriculture, forestry, hunting and fishery. In these branches, as well as in industry, transport and warehouse management, and financial and insurance activity, the number of entities fell. In recent years, an interesting phenomenon can be observed, i.e. an increase in the number of cooperatives in the service sector (accommodation and gastronomy, healthcare and social assistance, education, culture, entertainment and recreation, service of companies, information and communication).

Considering that the change in the number of cooperatives each year is determined both by their registration and deregistration, it can be concluded that in 2014 the registered group doubled deregistered[5] entities (Tab. 2), and this was true for most industries except for agriculture, finance and insurance and real estate market service. This reversed the situation in 2004, when, beyond one industry (real estate market service), the number of deregistered cooperatives exceeded the number of newly entered in the register. Apart from financial and insurance activities and real estate market service, all other industries in 2014 the number of newly registered cooperatives was greater than in 2004.

[4] H. Rogal, [2010]: *Ekonomia zrównoważonego rozwoju, Teoria i praktyka [Economics of sustainable development. Theory and practice], Zysk i S-Ka, Poznań, p. 25, 44-47.*

[5] In 2014 the number of newly registered cooperatives (427) doubled exceeded the number of deregistered entities (204).

Table 1. **Number of cooperatives in Poland**

Specification	Years					Dynamics (%)	Structure ratio (%)	
	2000	2005	2010	2013	2014	2014/2000	2000	2014
Number of cooperatives	19011	18303	17156	17422	17605	92,60	100	100
Share of cooperatives in total entities of the national economy (%)	0,60	0,51	0,44	0,43	0,42	70,00	-	-
Number of cooperatives in industries:								
Agriculture, forestry, hunting and fishery	3448	3143	2724	2678	2645	76,71	18,14	15,02
Industry	2265	2132	1725	1704	1718	75,85	11,91	9,76
including industrial processing	2246	2111	1683	1637	1645	73,24	11,81	9,34
including production of food articles and beverages	529	528	-	-	444	83,93	2,78	2,52
Construction sector	914	921	2169	2192	2218	242,67	4,81	12,60
Trade, repair of automotive vehicles	3497	3198	2917	3007	3005	85,93	18,39	17,07
Transport and warehouse management	262	221	146	143	143	54,58	1,38	0,81
Accommodation and gastronomy	40	46	84	185	252	630,00	0,21	1,43
Information and communication*	33	34	133	142	153	463,64	0,17	0,87
Financial and insurance activities	1170	924	802	78 0	772	65,98	6,15	4,39
Real estate market service	6529	6823	5514	5430	5408	82,83	34,34	30,72
Service of companies	563	569	659	740	800	142,10	2,96	4,54
Education	37	36	49	79	92	248,65	0,19	0,52
Healthcare and social assistance	70	76	88	154	194	277,14	0,37	1,10
Culture, entertainment and recreation	31	35	39	60	73	235,48	0,16	0,41

* computer science and telecommunications in the years 2000 and 2005, – no data
Source: The tables "Entities of the national economy registered in the REGON register" – Statistical Yearbook of the Republic of Poland 2001, Central Statistical Office (GUS), Warsaw 2001, p. 579, Statistical Yearbook of the Republic of Poland 2006, Central Statistical Office (GUS), Warsaw 2006, p. 710, Statistical Yearbook of the Republic of Poland 2011, Central Statistical Office (GUS), Warsaw 2011, p. 722, Statistical Yearbook of the Republic of Poland 2015, Central Statistical Office (GUS), Warsaw 2015, p. 731

Compared to 2004, in 2014 almost all voivodeships (apart from Podkarpackie and Wielkopolskie) recorded fewer cooperatives (table 3). In 2014, the number of newly registered cooperatives exceeded those deregistered in fourteen voivodeships, whereas in 2004 only in three voivodeships. The largest number of cooperatives operated in the following voivodeships: Mazowieckie, Wielkopolskie, Dolnośląskie, Lubelskie, Śląskie, Małopolskie, Zachodnio-Pomorskie and Pomorskie (FIG. 2).

Table 2. **Newly registered and deregistered cooperatives by the activity classification in the REGON system**

Specification	2004		2014	
	Newly registered	Deregistered	Newly registered	Deregistered
Total	**112**	**228**	**427**	**204**
Agriculture, forestry, hunting and fishery	8	49	19	44
Industry	4	49	51	28
Construction sector	7	9	35	13
Trade, repair of automotive vehicles	21	53	43	43
Transport and warehouse management	1	6	5	4
Accommodation and gastronomy	0	1	71	4
Information and communication	0	0	10	0
Financial and insurance activities	18	24	3	10
Real estate market service	**53**	35	18	42
Service of companies	0	0	76	8
Education	0	0	15	0
Healthcare and social assistance	0	0	42	2
Culture, entertainment and recreation	0	0	16	1

Source: prepared by the author on the basis of "Structural changes in groups of entities of the national economy in the REGON register", electronic document at http://stat.gov.pl/obszary-tematyczne/podmioty-gospodarcze-wyniki-finansowe/zmiany-strukturalne-grup-podmiotow/zmiany-strukturalne-grup-podmiotow-gospodarki-narodowej-w-rejestrze-regon-2015-r-,1,17.html [10.4.2016]

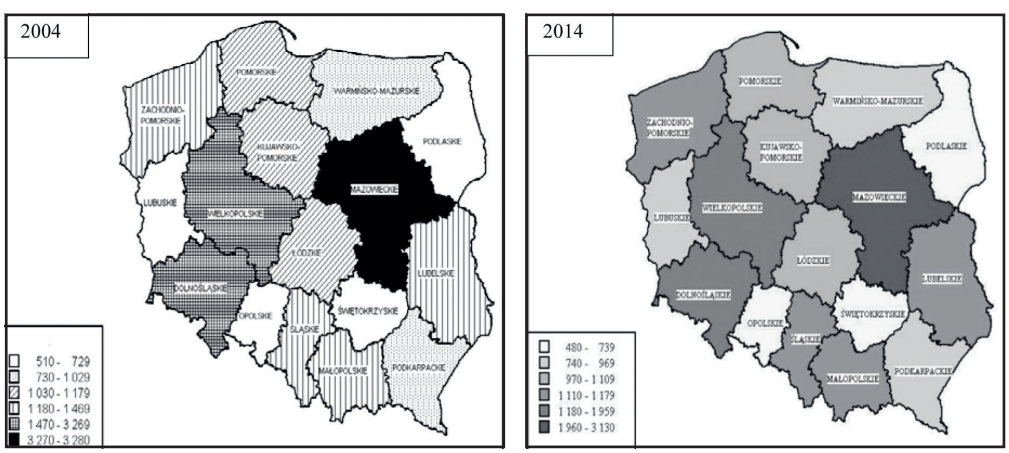

Figure 2. **Number of cooperatives in 2004 and 2014 in the voivodeships of Poland**
Source: prepared by the author on the basis of "Structural changes in groups of entities of the national economy in the REGON register", electronic document at http://stat.gov.pl/obszary-tematyczne/podmioty-gospodarcze-wyniki-finansowe/zmiany-strukturalne-grup-podmiotow/zmiany-strukturalne-grup-podmiotow-gospodarki-narodowej-w-rejestrze-regon-2015-r-,1,17.html [10.4.2016].

2004

Table 3. **Cooperatives, including newly registered and deregistered by voivodeships**

Specification	2004			2014		
	total	new	deregistered	total	new	deregistered
POLAND	18435	112	204	17605	427	204
DOLNOŚLĄSKIE	1495	3	15	1374	11	15
KUJAWSKO-POMORSKIE	1046	8	14	971	24	14
LUBELSKIE	1247	2	17	1175	42	17
LUBUSKIE	513	5	3	490	21	3
ŁÓDZKIE	1036	7	11	991	7	11
MAŁOPOLSKIE	1190	9	10	1142	29	10
MAZOWIECKIE	3293	27	26	3121	44	26
OPOLSKIE	540	5	8	488	19	8
PODKARPACKIE	789	5	5	816	21	5
PODLASKIE	526	6	5	500	22	5
POMORSKIE	1133	10	13	1053	35	13
ŚLĄSKIE	1256	10	14	1171	39	14
ŚWIĘTOKRZYSKIE	542	3	9	502	13	9
WARMIŃSKO-MAZURSKIE	750	2	11	741	28	11
WIELKOPOLSKIE	1863	6	29	1957	56	29
ZACHODNIO-POMORSKIE	1216	4	14	1113	16	14

Source: prepared by the author on the basis of "Structural changes in groups of entities of the national economy in the REGON register", electronic document at http://stat.gov.pl/obszary-tematyczne/podmioty-gospodarcze-wyniki-finansowe/zmiany-strukturalne-grup-podmiotow/zmiany-strukturalne-grup-podmiotow-gospodarki-narodowej-w-rejestrze-regon-2015-r-,1,17.html [10.4.2016]

9.3. Cooperatives as Entities of the National Economy

In the past twenty years, the share of the cooperative sector in the national economy was systematically decreasing, in spite of growing value of the domestic economy by over 150% (Tab. 4). In 1995, the cooperative sector produced 3.4% of the global domestic production, and in 2014 less than half that share. A similar trend can be noted in the gross domestic product produced by the cooperative sector, as measured by gross value added. Despite growth in the gross value added in this sector, the sector's share of goods and services manufactured decreased from 2.2% to less than 1%. Also, despite a more than 2.4 times growth in value, the production sold by cooperatives, , its role in industrial production has shrunk by more than 50%.

Table 4. **Cooperative sector in the national economy of Poland**

Specification	1995	2000	2005	2010	2013	2014	2014/1995 (%)
Global production of cooperatives (PLN billion)*	20,42	33,40	37,79	44,49	49,81	51,41	251,76
share in total global production (%)	3,38	2,40	1,93	1,53	1,49	1,50	44,38
Gross value added of cooperatives (PLN billion)*	5,95	10,94	10,15	13,10	12,72	13,00	218,49
share in total gross value added (%)	2,22	1,82	1,17	1,03	0,86	0,85	38,29
Gross value of fixed assets of cooperatives (PLN billion)	107,61	132,29	136,73	103,00	99,12	99,11	92,10
Share in total gross value of fixed assets (%)	12,05	9,20	7,48	4,09	3,23	3,04	25,23
Investment outlays of cooperatives (PLN billion)	2,81	6,86	3,50	3,09	2,60	2,48	88,26
Share in total Investment outlays (%)	5,96	5,20	2,67	1,42	1,12	0,99	16,61
Production of industry sold by cooperatives (PLN billion)*	8,28	11,40	13,60	16,00	19,32	19,99	241,43
Share in total sold industrial production (%)	3,39	2,33	1,95	1,62	1,63	1,65	48,67

current prices, *-cooperatives with the number of employees above 9

Source: prepared by the author on the basis of the tables "Capital expenditures by ownership sectors", "Gross value of fixed assets by ownership sectors", "Global production", "Gross domestic product", "Production of industry sold by ownership sectors" – Statistical Yearbook of the Republic of Poland 2006, Central Statistical Office (GUS), Warsaw 2006, pp. 646, 654, 674, 677, 493 and Statistical Yearbook of the Republic of Poland 2015, Central Statistical Office (GUS), Warsaw 2015, pp. 663, 670, 694, 698, 505.

Cooperatives were systematically reducing costs for fixed assets. In the period 1995-2014, their value decreased by 8%, whereas in the whole economy it increased by 265%. It caused reduction in the share of that sector by ¾ in total gross value of fixed assets, to 3%. Another adverse phenomenon is decreasing, for a dozen years the value of capital expenditures (financial and tangible) incurred by the cooperative sector to create new fixed assets or improve (reconstruct, expand, rebuild or modernize) the existing facilities fixed assets by a net 11%. Since 1995, these expenditures in the whole economy have increased by 430%, therefore the share of cooperative capital expenditures in them has plummeted, by more than 83[6]%.

The lower value of fixed assets result from the liquidation of cooperatives. Cooperatives were not renewing production means, which implied their gradual exit from the market.[7]

Cooperatives are still an important employer in the Polish economy, employing 232,000 people, i.e. 1.6% of all the employed, or 1/3 of the workforce share 20 years ago (Tab. 5).

[6] Cooperatives are undercapitalised. This means that there aren't funds for investments.

[7] B. Wyrzykowska, [2014]: *Polski sektor spółdzielczy w latach 2001–2011 [Polish cooperative sector in the years 2001–2011], Zeszyty Naukowe Szkoły Głównej Gospodarstwa Wiejskiego Ekonomika i Organizacja Gospodarki Żywnościowej nr 105, 2014, p.8.*

Table 5. **Employment in cooperatives**

Specification	1995	2000	2005	2010	2013	2014	2014/1995 (%)
People working in cooperatives (thousand people)*	642,00	442,60	322,10	278,20	240,10	232,00	36,14
Share in total number of the employed (%)	4,24	2,90	2,50	1,97	1,69	1,59	37,50
People working in cooperatives in industry (thousand people)*	192,80	130,20	84,30	60,90	50,80	49,20	25,52
Share in total number of the employed in industry (%)	5,17	4,04	2,89	2,10	1,77	1,66	32,11
Payments under share in balance sheet profit and surplus in cooperatives (million PLN)	1056,50	1003,40	451,00	333,00	195,00	166,00	15,71
							2014/2000 (%)
Average gross monthly remuneration in cooperatives (PLN)*	-	1553,72	1980,67	2764,95	3203,19	3332,16	214,46
Share in total gross remuneration (%)	-	82,05	83,90	85,76	87,53	88,22	107,52
Average gross monthly remuneration in cooperatives in industry (PLN)*	-	1478,62	1861,40	2659,40	3141,65	3277,56	221,66
Share in total gross remuneration in industry (%)	-	76,13	78,35	81,60	83,47	84,54	111,05

current prices, * – cooperatives with the number of employees above 9, – no data
Source: The tables "People working by ownership sectors", "Average gross monthly remuneration by ownership sectors" – Statistical Yearbook of the Republic of Poland 2006, Central Statistical Office (GUS), Warsaw 2006, pp. 237, 266 and Statistical Yearbook of the Republic of Poland 2015, Central Statistical Office (GUS), Warsaw 2015, pp. 242, 271; the table "Basic data about business entities in industry by sectors and ownership forms " – Statistical Yearbook of Industry 2006, Central Statistical Office (GUS), Warsaw 2006, p. 42 and Statistical Yearbook of Industry 2015, Central Statistical Office (GUS), Warsaw 2015, p. 41.

Almost 50 thousand people work in cooperatives in the industry and, unfortunately, this number is lower (by ¾) than in 1995, and their share of all the employed people in this sector was smaller by 2/3. A positive phenomenon is growing average gross monthly remuneration in cooperatives: in 2014, it amounted to PLN 3.33 thousand and was 11.8% smaller than in the economy, whereas in industry it was 3.28 thousand (i.e. 15.5% less than in industry). The difference in remuneration between cooperatives and the whole economy has been decreasing systematically (in 2000, it was 18% less and 24% in industry, and in 2014 it was 12% and 16%, respectively). Perhaps this compensates in some way for falling payments under share in balance sheet profit and surplus in cooperatives (by PLN 890 million).

Since the beginning of the 1990s, housing cooperative has not developed so dynamically as in the 1970s and 1980s, when it was practically the only investor option for ensuring satisfactory housing for city inhabitants. New, small cooperatives are established: they execute construction projects using own funds of their members and usually establish a separate ownership of residential premises for the benefit of these members. Attempts are taken to divide large cooperatives (with even a few dozen thousand members) into smaller, capable of effective operation. However, this is often hindered, as they do not have

a regulated legal title to the land on which they erected residential buildings.[8] Housing cooperatives still serve a significant part of population. Presently they accommodate more than 2.2 million apartments of the total area of 111.5 million m^2, which accounts for more than 16% of the number of all apartments and 11% of their floor area (Tab. 6). However, the number of cooperative apartments and their area have been decreasing for several years. It was the result of, among others, the Act of 14 June 2007 amending the Act on housing cooperatives and some other acts, which came into effect on 31 July 2007. The result of the introduced changes was the possibility to obtain ownership right to an apartment for a person (the so-called separate ownership) who was vested in cooperative housing tenancy right or ownership right to the residential premises, on more favourable financial terms previously.

Table 6. **Housing cooperative**

Specification	1995	2000	2005	2010	2013	2013/1995 (%)
Apartments in hosing cooperatives (million)	3,21	3,39	3,43	2,36	2,25	70,09
Share in total apartments (%)	27,79	28,61	26,84	17,50	16,23	58,40
Floor area of apartments in hosing cooperatives (million m2)	161,00	170,43	172,75	135,41	111,52	69,27
Share in total area of apartments (%)	22,99	23,40	19,52	14,30	11,01	47,89

Source: The tables "Apartments by ownership relations" – Statistical Yearbook of the Republic of Poland 2006, Central Statistical Office (GUS), Warsaw 2006, p. 332 and Statistical Yearbook of the Republic of Poland 2015, Central Statistical Office (GUS), Warsaw 2015, p. 333.

Agricultural cooperatives entered the period of transition as a significantly developed sector, with an extensive network of various kinds of field cooperatives and with strong regional and nationwide relations. It included many million members and had a significant economic potential. Companies of cooperatives were classified into the sector of socialized economy, which implied specified privileges and tasks. A view was established regarding the purposefulness of maintaining cooperative ownership and using its previous achievements with the goal of eliminating distortions of socialist realism and giving cooperatives a character consistent with the goals and mechanisms of the market economy. The point was to bring back its self-reliance, true democracy, entrepreneurship, effectiveness and market efficiency. These are characteristics necessary for effective, permanent and developmental actions of cooperatives. It was reminded that it was also necessary for cooperatives to respect traditional values of the cooperative movement, such as interaction, reliability of actions, care for those in need on a wider social scale than only the narrowly understood self interest of the associated members.[9]

In practice, however, development of cooperatives collapsed as a result of with the realities of the free-market economy (expensive credit, competition, decreased revenues, increased costs, etc.). Real socialism left in the society's awareness lack of knowledge,

[8] H. Cioch, [2011]: *Prawo spółdzielcze [Cooperative law], Wolters Kluwer, Warszawa 2011, pp. 143, 146.*

[9] K. Boczar, T. Szelążek, F. Wala, [1993]: *Spółdzielczość wiejska w okresie przełomu [Rural cooperative activity in the period of breakthrough], Fundacja im. Friedricha Eberta w Polsce, Warszawa, pp. 23-25.*

experience and trust in this form of business[10]. A myth was created saying that it was only a relic of the communist period, forgetting about its long-term history and achievements[11]. Additionally, cooperatives were deprived of state support. The previously existing cooperative unions were eliminated and the creation of new unions was forbidden. They were deprived of organizational, economic and legal consulting, professional control as well as staff improvement centres provided by unions. This led to many errors in the operation of cooperatives, helplessness causing restrictions in operation, losses or sale of property for the purposes of current consumption. The property of the liquidated unions, representing achievements of many years of work, was wasted, and some believe that it was looted.[12]

Within few years, over 1000 cooperatives related to the sphere of agriculture (as compared to 8 thousand operating, along with cooperative banks, in the early 1990s) were put into liquidation. This shrinkage was a result of the command-and-quota management system and transition to the market economy.[13] The main reasons were residing in:

— low share of own funds in financing current activities of cooperatives in the first period of transition with simultaneous large commitment in investments financed with bank credits,
— obsolete machinery, lack of funds for modernization, and competition from other business entities producing more modern market goods,
— little flexibility of cooperative capital, connected with the cooperative management system,
— a low level of rural income, reflected in reduced revenues of cooperatives, degree of use of their economic base as well as the level of costs from activities conducted,
— unfavourable or neutral approach of consecutive Polish governments to cooperatives,
— administrative deprivation of cooperatives of own scientific and research units.[14]

Despite all these difficult changes, the share of agricultural cooperatives in the global agricultural production did not collapse. This is owing to the fact that food industries[15] are a natural domain of cooperatives owing to the prolonged procurement processes.

Cooperatives still play an important, though decreasing role in agriculture (tab. 7). In the years 1995-2014, they increased the value of agricultural products procured more than 3.4 times, though their share in total value of agricultural products procurement decreased by 30%. The number of members of agricultural cooperatives working in

[10] The point is that cooperatives in the Polish lands was formed in the nineteenth century in a market economy and acted in accordance with its fundamental rights and mechanisms. People forgotten about this. Since 1948 to 1989, the cooperative movement in communist Poland was included in the system of a centrally planned economy. The central organs of state power and economic administration marked the objectives and fields of activities of different types of cooperatives and the methods and means of their implementation. Cooperatives have ceased to be conventional businesses with their entrepreneurial spirit, risk and marketing activity. They performed assumptions of the central planner. There has been nationalized cooperatives

[11] The first major cooperative on Polish territory was founded in 1816. It consisted of more than 300 peasants who received land from the priest S.Staszic. They had common the forests, pastures, ponds, mills. They built schools, hospitals. In the three partitions (Prussian, Russian and Austrian) on Polish territory in 1913 was 3,400 rural cooperatives and their members 1,217,400. In 1937 it was 5497 cooperatives in rural areas with 1,624,700 members and all cooperatives in the country was 12,860 with 3,016,000 members.

[12] Ibidem, p. 26.

[13] B. Brzozowski, [2003]: *Spółdzielczość wiejska. Wybrane zagadnienia [Rural cooperatives. Selected Issues]. Wyd. AR w Krakowie, Kraków, p. 32.*

[14] M. G. Brodziński, [2005]: *Spółdzielczość obsługująca wieś i rolnictwo w okresie przekształceń ustrojowych [Cooperatives serving rural areas and agriculture in system transition], KRS Warszawa pp. 120-122.*

[15] Cooperatives were not present in all industries, as e.g. sugar, spirit, potato, yeast, egg and poultry industry, because these industries, under decision of authorities, were transferred in full into the administration of state-owned companies.

agriculture decreased (by over 33 thousand people). The share of those people in the number of the employed in agriculture amounted to total less than 0.5%. The number of women as agricultural cooperatives members working in agriculture decreased (by 10 thousand) as did their share in total women working in agriculture.

Table 7. **Cooperatives in agriculture**

Specification	1995	2000	2005	2010	2013	2014	2014/1995 (%)
Value of agricultural products procurement by cooperatives (current prices, PLN billion)	3,15	4,58	6,59	7,60	10,18	10,83	343,79
Share in total value of agricultural products procurement (%)	26,09	20,45	21,30	18,39	17,27	18,34	70,30
Members of agricultural cooperatives working in agriculture (000 people)	44,10	23,20	15,30	11,80	10,60	10,30	23,36
Share in total number of people working in agriculture (%)	1,07	0,55	0,73	0,51	0,46	0,44	41,12
Agricultural cooperative members working in agriculture-women (000 people)	13,00	6,90	4,30	3,50	3,20	3,10	23,85
Share in total women working in agriculture (%)	0,66	0,32	0,47	0,31	0,28	0,27	40,91

Source: The tables "Value of agricultural products procurement by purchasing entities", "People working in agriculture by employment status" – Statistical Yearbook of Agriculture and Rural Areas 2006, Central Statistical Office (GUS), Warsaw 2006, pp. 337, 234 and Statistical Yearbook of Agriculture 2015, Central Statistical Office (GUS), Warsaw 2015, pp. 262, 126.

In 2011, agricultural cooperatives numbered 2.8 thousand, i.e. less than 50% of the number 20 years before (Tab. 8). They associated 385 thousand people and employed 143 thousand people. Almost a half of these entities are supply and sales cooperatives "Samopomoc Chłopska" (Peasants' Self-Help) whose number decreased least in the analysed period (by 24%). The only cooperative sector that maintained the dominant position on the market is the dairy industry. It was accompanied by the processes of consolidation, concentration and specialization in dairy cooperatives[16]. Although the share of dairy cooperatives in cow milk procurement in the country in 2014 was 65%, this decreases every year. The assessment of the operation of cooperatives by farmers is based on effectiveness of cooperation, for instance in milk purchase and prices[17]. For this reason, the condition of development of cooperatives is that relations between cooperatives and their members should be based on authentic, mutual benefits[18].

[16] M. Zuba-Ciszewska, [2015]: *Struktura mleczarń ze względu na skalę produkcji wybranych produktów mleczarskich w Polsce i Niemczech (w latach 2003-2012) [The structure of dairies regards to scale of the production of chosen milk products in Poland and Germany (in years 2003-2012)], Zeszyty Naukowe SGGW w Warszawie, Problemy Rolnictwa Światowego, tom XV (XXX), zeszyt 1, p. 170*; M. Zuba-Ciszewska, [2015]: *Wpływ koncentracji kapitału własnego na jego efektywność w wybranych spółdzielniach mleczarskich w Polsce w latach 2003-2012 [The influence of the concentration of equity capital on his efficiency in chosen milk cooperatives in Poland in years 2003-2012], Zeszyty Naukowe Szkoły Głównej Gospodarstwa Wiejskiego Ekonomika i Organizacja Gospodarki Żywnościowej, numer 109, p. 107.*

[17] A. Domagalski, [2012]: *O lepszy przyjazny świat [The better-friendly world], Wydawnictwo Spółdzielcze, Warszawa. p. 173.*

[18] M. Zuba, J. Zuba, [2013]: *Zmiany podstawowych uwarunkowań i zadań spółdzielni rolniczych w Polsce [Changes of basic conditionings and tasks of agricultural cooperatives in Polnad], Roczniki Ekonomii i Zarządzania KUL, Tom 5 (41), p. 108.*

Table 8. **Industries of agricultural cooperatives**

Specification	1989	2000	2011	Estimated number of members (thousand) in 2011	Estimated number of employees (thousand) in 2011
Supply and sales cooperatives „Samopomoc Chłopska" (Peasants' Self-Help)	1912	1648	1259	200	85
Agricultural production cooperatives	2089	1024	734	25	28
Cooperatives of agricultural circles	2006	1063	570	-	10
Dairy cooperatives	323	238	156	150	18
Gardening and apiarian cooperatives	140	128	73	10	2
Total	6470	4101	2792	385	143

Source: Spółdzielczość wiejska jako jedna z głównych form wspólnego gospodarczego działania ludzi, ed. W. Boguty, KRS, Warsaw 2011, p. 45; M. G. Brodziński, Oblicza spółdzielczości wiejskiej, FREL, Warsaw 2014, p. 183

Cooperatives also occupy an important place in the banking system. The last financial crisis showed that the operating model of cooperative banks is good. They are assessed by rating agencies often as more stable institutions than large commercial banks[19]. They stabilize the financial system of the country, because they are focused mostly on ensuring access to basic bank products, in particular beneficial credits for the local community, rather than on aggressive activities aiming at maximization of profit and growth in market value of a bank in a short term, as in the case of commercial banks. During the crisis, they turned out a safe place for savings deposits and other traditional, long-term financial investments, constituting the basis to grant credits to small and medium-sized enterprises and private individuals, including those with lower incomes, in whose business large commercial banks are not interested. Cooperative banks are characterized by a high relation of own funds to risk-weighted assets, stable income and decentralized decision-making structure, which is the basis for rational and active risk management. These banks face the problem of information asymmetry, a danger of "moral hazard" and wrong selection of credit requests to a smaller extent than commercial banks. It fosters determination of the optimum structure of credit portfolio[20]. Also social mission is important for cooperative banks, since they are cooperatives[21]. The conducted policy is favourable for social consistency, increase in employment, counteracting poverty, democracy, better management and stable growth[22].

[19] McCarroll, V., Habberfield, S., [2012]: *The outlook for co-operative banking in Europe Banking on values, building on agility http://www.oliverwyman.com/the-outlook-for-cooperative-banking-in-europe-2012.htm#.UeaGTW0SqZR (10.3.2016), pp. 23–24.*

[20] A. Szelągowska, (Ed.), [2012]: *Współczesna bankowość spółdzielcza [Contemporary cooperative banking]. CeDeWu, Warszawa, pp. 55-63.*

[21] M. Golec, [2010]: *Społeczne uwarunkowania działalności banków spółdzielczych [Social conditions of activity of cooperative banks]. W: StefańskiM. (red.): Banki spółdzielcze w Polsce w warunkach kryzysu finansowego i gospodarczego [Cooperative banks in Poland in conditions of financial and economic crisis].WSH-E, Włocławek, p. 66.*

[22] P. Dziekański, [2012]: *Banki spółdzielcze inkubatorami lokalnej przedsiębiorczości [Cooperative banks as incubators of local entrepreneurship]. W: Pawlik A., Dziekański P. (red.): Bank spółdzielczy gwarantem stabilizacji i bezpieczeństwa lokalnego systemu finansowego [Cooperative bank as a guarantor of stability and security of the local financial system]. Uniwersytet Jana Kochanowskiego, Kielce, p. 98.*

Their local character results from legal regulations (Article 5 of the Act on the Operation of Cooperative Banks). As a result, they play crucial role in regional and local development, especially in the areas far from large cities where commercial banks often do not serve well. The offers of cooperative banks are well adjusted to the needs of farmers, micro, small and medium-sized enterprises (SMEs), due to knowledge of their operating conditions[23]. Cooperative banks in Poland have had in recent years, especially in the period of financial crisis, a significant share in financing the SME needs. In 2010, their share in credits for this group of companies amounted to 14%, and in the following year it increased to 20%.[24] Currently, it is 15%. Cooperative banks in the country have a less favourable legal status than commercial banks because they are characterized by objective, subjective and territorial restrictions. They are not very attractive for their members (which results in the fall in the number of their members – table 9), because the purpose of cooperative banks should include implementation and satisfaction of social needs, but the banking law does not accept this cooperative mission.[25] Legal regulations, such as high capital requirements, a ban on privilege for its members related to the conduct of banking activities, make them act more like commercial banks.

The sector of cooperative banking in Poland was developing efficiently in the years 2004-2014. The number of cooperative banks decreased by over 6% to 565, while the number of bank outlets increased by 42% to nearly five thousand (Tab. 9). A long, several-century-long tradition of the development of banking cooperatives in Poland explains the large number of cooperative banks and the dense network of outlets. In the period 2004-2014, the number of cooperative banks' members fell by 60% (to a million people) with a maintained level of those banks' clients (approximately 10 million people).

Table 9. **Characteristics of the sector of cooperative banking in Poland in the years 2004-2014**

Years	Regional/ local banks	Banking outlets	Number of members (million)	Number of clients (million)	Number of employees (million)	assets (EURO billion)	deposits (EURO billion)	loans (EURO billion)	Market share deposits (%)	Market share credits (%)
2004	599	3383	2,5	10,5	0,028	7,0	5,2	4,0	9,4	8,8
2007	584	4021	2,5	10,5	0,030	13,3	10,7	8,1	8,8	6,5
2008	579	4199	-	-	0,031	13,6	10,2	10,8	8,8	6,5
2009	576	4416	-	-	0,032	15,8	11,7	9,2	8,2	5,8
2010	576	4395	-	7,5	0,032	17,6	13,4	9,9	8,9	5,7
2012	572	4193	1,1	10,0	0,033	28,4	25,0	14,6	9,4	7,7
2014	565	4810	1,0	-	0,033	31,8	20,2	16,0	10,0	7,9

– no data available, Source: prepared by the author on the basis of EACB data [Key Statistics… 2016].

[23] *According to European Commission the SME are the enterprises that follow this definitione: employees under 250 people, an annual turnover not exceeding EUR 50 million or annual balance sheet total not exceeding EUR 43 million.*

[24] M. Zuba, [2013]: *Zmiany działalności kredytowej banków spółdzielczych w Polsce i w Europie w latach 2007–2011[Changes of the credit-activity of cooperative banks in Poland and in Europe in years 2007–2011], Zeszyty Naukowe SGGW w Warszawie, Ekonomika i Organizacja Gospodarki Żywnościowej, nr 103, p.100.*

[25] H. Cioch, [2011]: *Prawo spółdzielcze [Cooperative law], Wolters Kluwer, Warszawa 2011, pp. 158-159.*

On the contrary, employment in the analysed sector increased by 1/5 to 33 thousand people. Cooperative banking in Poland has quite stable resources for its development. In the years 2004-2014, the value of its assets increased 4.5 times to EUR 31.8 billion. Cooperative banks increased their lending activity. The value of credits granted grew 4 times to EUR 16 billion. It was possible owing to equally dynamic growth in the value of deposits (2.9 times to EUR 20 billion). Deposits to credits ratio practically in all of the analysed years exceeded one, which means that cooperative banks were conducting a policy of careful transfer of deposits into credits. In 2014, the share in the domestic market of credits granted by cooperative banks was 8% and in the market of deposits this share was 10%. These shares were decreasing to 2009 and 2010 and increased later.

Important cooperative entities in the Polish banking system are cooperative savings and credit unions, presently numbering 47 with almost 1400 branches nationwide. Their objective is to collect cash only from their members, grant them loans and credits, conduct financial settlements to their order and serve as brokers in concluding insurance agreements [Article 3 of the Act on Cooperative Savings and Credit Unions]. Unlike cooperative banks, they conduct their activities only for the benefit of their members and they are not banks as defined by Article 2 of the "Banking Law Act".[26] Recent years have seen equally intensive development of this form of cooperatives as in the inter-war period, when up to 3.5 thousand Stefczyk Unions[27] associated 1.5 million people. Currently, they associate more than 2 million members. Deposits collected by the Cooperative Savings and Credit Unions total almost PLN 12 billion and loans granted reach almost PLN 8 billion (table 10).

Table 10. **Characteristics of cooperative savings and credit unions in Poland in the years 1992-2015**

Years	Number of cooperative savings and credit unions with branches	Number of members (million)	Assets (PLN billion)	Deposits (PLN billion)	Loans and credits (PLN billion)
1992	13	0,014	0,004	0,004	0,003
2000	560	0,39	1,20	1,00	0,87
2010	1851	2,18	14,01	13,03	9,79
1015	1441	2,04	12,20	11,59	7,95

Source: http://www.skok.pl/o-skok/skok-w-liczbach [20.3.2016]

9.4. Summary

The purpose of the paper was to present the contribution of cooperatives in the development of Poland, taking into account mainly economic aspect, covering also some social elements, e.g., employment. Over the last 15 years, the number of registered cooperatives decreased by 7.5% to more than 17.6 thousand entities, and their share in

[26] W. Srokosz, [2011]: *Instytucje parabankowe w Polsce [Quasi-banking institutions in Poland], Wolters Kluwer, Warszawa, p. 89.*

[27] Stefczyk Unions owe their name to Franciszek Stefczyk (1861 – 1924). His activity was focused on dissemination of rural cooperative unions within Galicia and arranging courses for employees of the cooperatives being established, as well as on creating legal and organizational grounds for agricultural and commercial cooperatives.

the total number of entities of the national economy decreased to 0.4%. This decrease was recorded only for entities in traditional industries, while the number of cooperatives in the service sector increased. The largest number of cooperatives were operating in the following voivodeships: Mazowieckie, Wielkopolskie, Dolnośląski, Lubelskie, Śląskie, Małopolskie, Zachodnio-pomorskie and Pomorskie.

In the period of the last twenty years, the share of the cooperative sector in global production of the national economy, its gross value added, sold industrial production has fallen, in spite of increasing absolute values of these categories. Cooperatives were systematically reducing costs incurred to purchase, manufacture or improve fixed assets. Cooperatives are still an important employer in the Polish economy, employing 232 thousand people, i.e. 1.6% of all the employed, or nearly 2/3 less than 20 years ago. A positive phenomenon is growing average monthly gross remuneration in cooperatives and decreasing difference between them and the rest of the economy. In spite of the fact that in recent years decrease in the number of cooperative apartments and their area has been observed, they still serve a significant part of population. Cooperatives still play an important, though decreasing, role in agriculture. Despite increasing the value of agricultural products procurement, their share in total value of agricultural products procurement has been decreasing. In 2011, agricultural cooperatives numbered 2.8 thousand, i.e. or less than half that 20 years before. They associated 385 thousand people and employed 143 thousand. The number of members of agricultural cooperatives has been decreasing. The only cooperative sector that maintained the dominant position on the market is the dairy industry. Cooperatives occupy also an important place in the banking system. Cooperative banks in Poland have had in recent years, especially in the period of financial crisis, a significant share in financing the SME needs. Given decreases in the number of cooperative banks, the number of bank outlets in the last 10 years increased by 42% to nearly five thousand. In the period 2004-2014, the number of cooperative banks members fell by 60% (to a million people) with a maintained level of those banks› clients (approximately 10 million people). On the other hand, employment in the analysed sector increased by 1/5 to 33 thousand people. Cooperative banking in Poland has quite stable resources for its development. Thanks to dynamic growth in value of deposits, cooperative banks increased their lending activity, occupying a significant position in the domestic market of deposits and credits. The number of cooperative savings and credit unions, their members (now more than 2 million) and the value of gathered deposits and credits increased. To sum up the conducted analysis, it can be concluded that cooperatives occupy a prominent place in the economic development of Poland although, unfortunately, this role has been decreasing.

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PART III
SOCIAL DEVELOPMENT OF RURAL AREAS

10

EDUCATION AS A FACTOR OF DEVELOPMENT OF RAPESEED FARMS

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Abstract: The role of education as a factor in a farm's development has been presented in the paper. The authors try to present the theories of human capital and economic situation of farms according to level of education. The tabular and descriptive methods were used in the study. The survey was conducted among 140 rapeseed farms in all voivodeships of Poland. The data proves that the education has an impact on economic results of farms engaged in rapeseed production. Farmers having higher education obtained better economic results, were bigger, and had higher values of fixed and current assets. The results prove that farmers having higher education take advantage of the opportunities given by scale economies. Farmers having higher and secondary education had more plans for the future than farmers having only primary or vocational education. The most important plans included purchase of land, purchase of breeding animals, and changing the current production direction.

Key words: education, economic results, development, farms, rapeseed, planned changes.

10.1. Introduction

Sustainable development is a process that includes economic, social and environmental functions. Higher sustainable development is more prevalent in urban areas than rural areas. Such development creates the chance to create public good for future generations[1].

Social development is a process of qualification, education life conditions and economic situation development. Social development is an integral part of sustainable development. Education is a key factor in the development. The social development is linked to economic, cultural, ecological, political and spirit development[2].

Human capital is one of the factors of sustainable development. It is responsible for the development not only farms but also rural areas and preservation of public goods. The

[1] I. Pomianek, M. Chrzanowska, P. Bórawski, [2013]: *Zróżnicowanie poziomu rozwoju społeczno-gospodarczego obszarów wiejskich województwa warmińsko-mazurskiego na tle kraju według miernika Hellwiga [Differences in socio-economic development level of rural areas in Warmia and Mazury province compared to the country by Hellwig development measure]. Zeszyty Naukowe OTN w Ostrołęce 27, s. 442-456.*

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actions undertaken within sustainable development lead to ecological or environmental citizenship. It implies that „environmental responsibilities flow from environmental rights as a matter of natural justice". Environmental citizenship includes a commitment to the common good[3].

10.2. Education in Theories of Sustainable Development

Sustainable development is described in many economic theories. One of the paradigms is a Johan Heinrich von Thunen (1783-1850) theory, according to which areas located near towns are better developed. Agriculture develops well when the land is located close to towns. The closer location creates lower costs of transport[4].

Human capital is the most important force in the process of shaping competitiveness of enterprises, farms, regions and countries. Today the education of employees is increasing, aspirations of many young people are growing and creativity is growing, too. Human capital can be recognized in the process of human intelligence, skills and expertise[5].

The quality of human capital is a factor determining the success of farms. Human capital can be improved by education, which should lead to the process of leading and obtaining new abilities[6]. Human capital can be improved by investment. The basis of human capital is knowledge. Each farm should be able to learn to adjust to changes in environment. In the market economy the adjustment of farmers to new and difficult conditions requires the farmers demonstrate entrepreneurship, elasticity and the ability to make fast and appropriate decisions[7].

The human capital was described in theory of T. Schultz and G. S. Becker in which men with the appropriate qualifications and competence are treated as the main source of the development of a company and the economy. Another economist William Petty (1626-1687) pointed out that the capital in a man is similar to fixed capital. Another economist, Adam Smith, divided fixed capital on four groups: machinery and production means, buildings, outlays on rural economy, and useful skills acquired by a man in the process of learning. The most important is a man and his entrepreneurial skills[8].

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[3] A. Dobson [2007]: *Environmental citiznenship: Towards Sustainable development. Sustainable Development 15, p.276-285.*

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[6] A. Bełdycka-Bórawska, E. J., Szymańska [2014*]: Human capital in Polish agriculture in the backgroud of European Union (In:) Bórawski P., Brelik A., Czyżewska B. (ed.) Rural Development in Poland: the role of policy, tourism and human capital. Wydawnictwo Wyższej Szkoły Ekonomiczno-Społecznej w Ostrołęce., p. 75-85.*

[7] A. Marcysiak, A. Marcysiak [2011]: *Wpływ cech jakościowych kapitału ludzkiego na wyniki ekonomiczne gospodarstw rolniczych [Influence of the quality characteristics of human capital on the economic performance of farms]. Zeszyty Naukowe SGGW w Warszawie. Problemy Rolnictwa Światowego Tom 11(26), z. 4, p. 129-137.*

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10.3. Objective and Methods

The main aim of the study was to recognize the sustainable development of rapeseed farms according to the educational level of the farmers. The author focused attention on the social and economic development of surveyed farms. The following objectives were identified:

— The evaluation of human capital on farms according to the educational level of farmers,
— Farm area according to educational level,
— The value of fixed and current assets,
— The economic results of farms according to educational level.

The authors conducted a survey in 2015 in 140 farms located in all provinces of Poland. We have divided the farms on four groups according to the level of education: primary, vocational, secondary and higher.

The authors used the purposeful selection to choose farms. The following criteria were used in choosing farms:

— Obtaining at least 50% of farm income from selling rapeseed,
— Having rapeseed production,
— The willingness to take part in the survey.
— The authors used tabular, graphic, and descriptive methods to describe the research results.

10.4. Social Development of Rapeseed Farms

Social development has an impact on a farm's development. Two of the most important factors describing social development are education and age.First of all, the authors divided the farms into four groups according to educational level on: primary (2,86%), vocational (11,43%), average (57,86%), and higher (27,85%). The highest percentage of average education correlates positively with human capital of these farms. However, 2,86% of farmers obtained primary and 11,43% had vocational education (Fig. 1). These results demonstrate that low education can be an obstacle in implementation new production means and farm development. Education is increasingly more important in dealing with the many challenges with compliance under the Common Agricultural Policy[9].

As K. Brodzińska [2015] points out, education is an essential factor deciding whether to begin the process of modernization of farms. The financial help for farmers is directed to well educated and younger farmers. These two characteristics are closely linked because young farmers are usually better educated[10].

[9] M. Zajdel [2010]: *Ocena wykształcenia ludności rolniczej w województwie kujawsko-pomorskim [Educational level of Farmers in kujawsko-pomorskie district]. Folia Pomeranae Universitatis Technologiae Stetinensis 282 (60), p. 185-192.*

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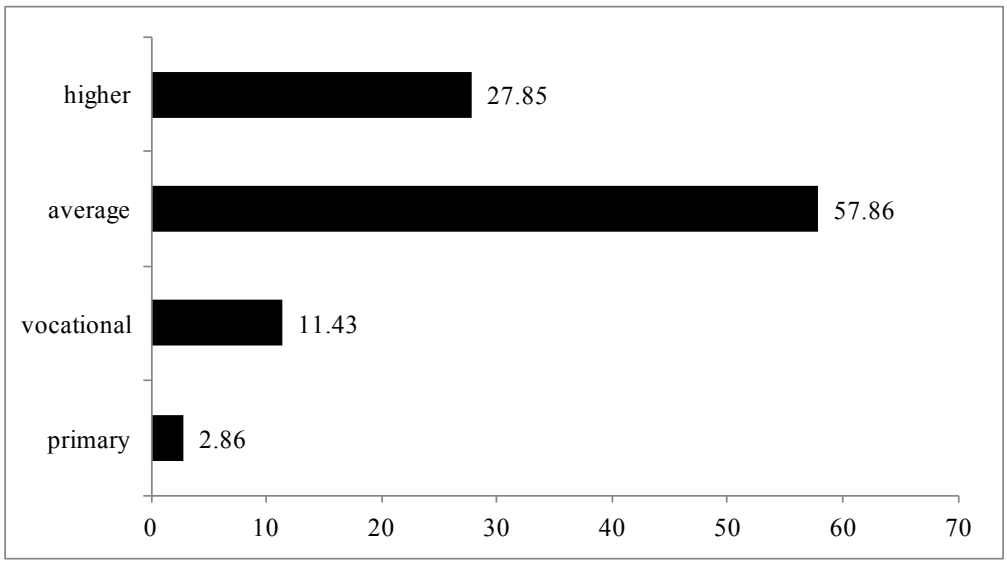

Figure. 1. **Structure of education level of surveyed farms (%)**
Source: Own survey

Human resources of the surveyed households strongly correlate with the level of education. Farms run by farmers with higher education differed from other groups. These farms have the smallest number of people in the family, the smallest number of employees on the farm and the biggest percentage of entities run by women. The owners of these farms were the youngest (Tab. 1). As W. Poczta points out, Polish agriculture has the highest percentage of farms run by farmers under 35 years old in the EU (14.7%) compared to the EU where the average is (6.4%)[11].

In turn, the farms run by farmers with basic education have the most number of family members and pensioners. Their owners were the oldest. According to Marcysiak and Marcysiak [2012], as they age the farmer loses his professional activity, decreases his ability to work and is less likely to introduce technical progress and investment. This thesis is confirmed by studies and Hamerski and S. Roczkowskiej-Chmaj [2008], which show that older farmers exhibit fewer trends of modernity and innovation in relation to young people wanting to work in the spirit of existing practices and provide farm successors[12].

[11] *Gospodarstwa rolne w Polsce na tle gospodarstw Unii Europejskiej. Praca zbiorowa pod kierunkiem W. Poczty [Farms in Poland in the European Union households. Collective work under the direction of W. Poczta]*. Powszechny Spis Rolny 2010, GUS, Warszawa 2013, s. 162.

[12] I. Hamerska, S. Roczkowska-Chmaj [2008]: *Wykształcenie i wiek rolników a wskaźniki postępu naukowo-technicznego [Farmers education and age versus scientific-technological Progress index]*. Inżynieria Rolnicza 11(109), s. 75-82.

Table 1. **Education and human resources on farms cultivating rapeseed**

Number of people	Education			
	Primary	Vocational	Average	Higher
Number of people in the family	5,20	4,43	4,617	3,897
Number of people employed in a farm	1,80	2,19	2,28	1,95
Number of people employed outsider farm	1,0	0,13	0,469	0,64
Retirees	0,20	0,00	0,08	0,15
Pensioners	0,60	0,25	0,42	0,33
Children	0,80	1,19	1,46	0,77
Age	51	51	41	39
The percentage of male owners	100,0	100,0	90,12	94,87

Source: Own survey

The area covered by the surveys of households depends on the level of education. As the level of education increased the area of farms increased, and the largest farms were run by owners with higher education (165.01 ha).

Farms run by farmers with basic education were smallest in area, had the smallest area of arable land, but the most pastures. This may indicate the likelihood of milk production in the farms or in more extensive activities (Tab. 2).

Table 2. **Education and the area of farms engaged in the cultivation of rapeseed**

Farm area	Education			
	Primary	Vocational	Average	Higher
Farmland, including:	57,18	75,55	117,22	165,01
Arable land	50,45	73,08	107,50	152,80
Meadows	6,75	1,03	7,36	10,29
Pasteruland	2,75	1,44	2,36	1,92

Source: Own survey

The means of production on the farm are divided into fixed and current assets. Fixed assets are used on the farm for more than a year and their value is at least 3500 zł. These assets included land, residential buildings, farm buildings, tractors and machines and the basic livestock herd[13].

The value of fixed assets increased with increasing education of the surveyed households and the highest value was recorded in the group of farms run by farmers with highest level of education (Tab. 3). The value of the land increased with increasing levels of education and the result can attest to the fact that the owners of farms with higher education more often modernize their farms, carry out investments, and rebuild assets on the farm. Research conducted by R. Michalek and A. Peszek found that farmers are responsible for achieving progress, including modernization, thus leading to the achievement of tangible benefits for households[14].

[13] *Wyniki standardowe uzyskane przez gospodarstwa prowadzące rachunkowość rolną FADN, Instytut Ekonomiki Rolnictwa i Gospodarki Żywnościowej – PIB w Warszawie 2014.*

[14] R. Michałek, A Peszek [2012]: *Wykształcenie rolnika a wskaźnik postępu naukowo-technicznego i wskaźniki efektywności postępu [A farmer's education in comparison to an index of educational and technical development and an efficiency index of development]*. Inżynieria Rolnicza 2(136), t. 1, s. 241-248.

However, in the group of farms run by farmers with basic education it is noted that the value of livestock and tractors and machines was higher than on farms run by farmers with vocational and secondary education. This may indicate the development of these entities animal production or simply the farmer has had more time to make improvements.

Table 3. **Education and the value of fixed assets on farms cultivating rapeseed**

Value of fixed assets	Education			
	Primary	Vocational	Average	Higher
Land	1 789 734	2 432 188	4 172 989	5 810 706
Residential buildings	325 875	269 205	311 400,6	306 025,6
Farm buildings	276 300	201 518,8	417 269,9	687 487,2
Other buildings	75 000	49 062,5	19 405,3	30 384,62
Tractors and machinery	524 850	505 756,3	686 713,6	715 887,2
Basic herd	68 200	13 012,5	50 037,04	214 692,3
Total	3 059 959	3 421 680,6	5 657 815,4	7 765 182,9

Source: Own survey

The second group of assets are current assets. They are used in a single production cycle. On the farm they are most often animals production, stocks of agricultural products, as well as long and short-term loans. The value of current assets increased with increasing levels of education of farmers and was the highest in the group of farms run by farmers with higher education (Tab. 4). Farms run by farmers with basic education were, in turn, the most in debt, which had an impact on the deterioration of their economic situation.

Table 4. **Education and the value of current assets on farms cultivating rapeseed**

Value of current assets	Education			
	Primary	Vocational	Average	Higher
Productive animals	72 275	61 818,8	114 468	65 288,97
Inventories of agricultural products	62 957	32 752,2	92 885,4	134 062,3
Inventories of purchase	13 100	80 464,4	50 113,4	91 588,54
Long-term credits	75 000	71 562,5	54 024,4	34 388,7
Short-term credits	0,0	0,0	11 419,8	5 000
Total	223 332	247 597,9	319 911	330 328,51

Source: Own survey

Agriculture is a part of economy in which knowledge is extremely important. Farmers have to make decisions each day, many of which are very difficult and concern problems with land, plants and animals[15]. In the paper the authors presented results concerning the impact of education on a farm's economic results.

[15] B. Klepacki, B. Gołębiewska, [2004]: *Wykształcenie rolników jako forma różnicująca sytuację gospodarstw rolnych [w:] Kapitał ludzki i intelektualny jako czynnik wzrostu gospodarczego i ograniczenia nierówności społecznych. (Ed. Woźniak M. G.) [Farmer's Education Level as a Reason of Farm Economic Differentiation [in:] Human and intellectual capital as a factor of economic growth and reduce inequality. Wydawnictwo Mittel, Reszów, pp. 457-465.*

Economic results calculated on the total farm grew with the increase of the level of education of farmers. However, the economic results calculated per 1 ha farmland present other dependencies (Tab. 5). The value of income calculated per 1 ha farmland was the lowest in the farms run by farmers with higher education.

Table 5. **Education and economic results of holdings engaged in the cultivation of rapeseed**

Economic results	Education			
	Primary	Vocational	Average	Higher
Total production	599 161	502 959,9	920 302,8	1 097 992,0
Total production per 1 ha farmland	4 605,3	6 657,31	7 851,07	6 654,09
Total production per 1 fully employed	332 867,2	229 662,05	403 641,57	563 072,82
Gross value added	300 164,3	306 222,3	566 588,4	579 383,0
Gross value addend per 1 ha farmland	5 249,47	4 053,24	4 833,55	3 511,20
Gross value addend per 1 fully employed	166 757,9	139 827,53	248 503,68	297 119,48
Net value added	228 339,3	265 022,0	502 598,7	519 855,0
Net value addend per 1 ha farmland	3 993,3	3 507,90	4 287,65	3 150,45
Net value addend per 1 fully employed	126 855,16	121 014,61	220 438,02	266 592,55
Agricultural income	178 062,3	242 740,7	476 243,70	479 667,8
Agricultural income per 1 ha farmland	3 114,07	3 212,98	4 062,82	2 906,90
Agricultural income per 1 fully employed	98 923,5	110 840,5	208 878,81	245 983,48

Source: Own survey

The development of farms includes plans. Holdings with development plans are adapting to changes in the environment, taking action and introducing new innovations. The research shows that the highest percentage of households with higher education planned changes to the farm. This may indicate a greater openness to change by the owners of these farms (Fig. 2).

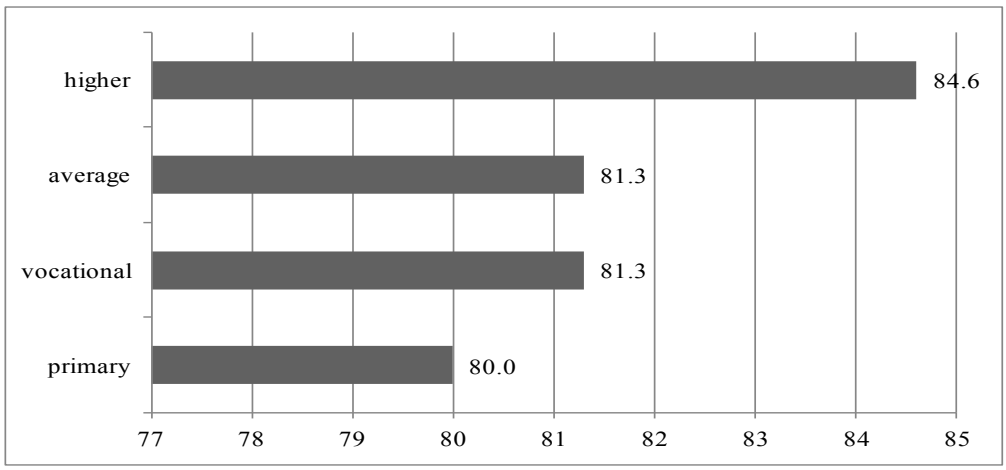

Figure 2. **The percentage of farmers considering changes in households depending on the level of education of farmers (%)**

Source: Own survey

It was important to know the types of planned changes to the farm, depending on the level of education in a study (Fig. 3). Farmers in the largest number of cases planned purchase of additional land. Especially farms operated by owners with higher education (84.6%) and education (63.8%) indicated plans to purchase land. This may indicate the desire of additional development of crop production, including the cultivation of rapeseed and cereals. Further in the farms run by farmers with higher education (32.8%) and education (21.3%) indicated plans for the future procurement of breeding animals.

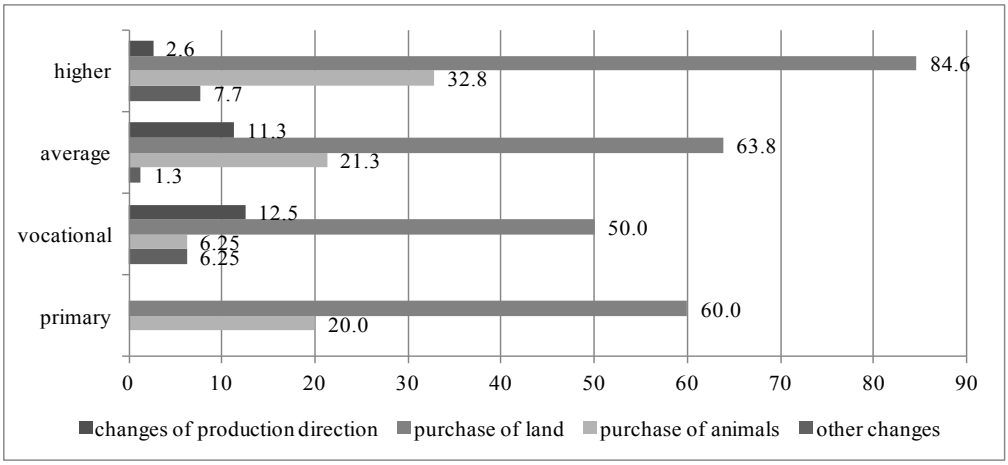

Figure 3**. Types of planned changes in farms depending on the level of education of farmers (%)**
Source: Own survey

Among other changes the owners of the surveyed households indicated was the purchase of machines, modernization of buildings, the purchase of equipment.

10.5. Conclusions

Farms run by farmers with basic education reached the lowest level of social and economic development and were the most indebted.

The research shows that education is a decisive factor for the development of farms and their modernization. The value of fixed and current assets was the highest in the group of farms run by farmers with higher education. This means that these households most often invest in the operation and restore the property. Both the area of farms and the economic results were the highest in the group of farms run by farmers with higher education. This proves a better use of resources by this group of farmers, which will be an indication of future positive changes in rural areas.

The research shows that the surveyed farms planned changes to the farm, most especially the owners with higher education and secondary education. In the largest number of cases these were larger farms and planned procurement of breeding animals and to change the direction of production.

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11

FARM ADJUSTMENT AND SUSTAINABILITY: THE ROLE OF EXTENSION

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Abstract: The focus of this study is on adjustment and adaptation in agriculture to ensure economic sustainability and the role of farm-level information. We examine the Farm Accountancy Data Network (FADN) in the European Union (EU) and the way this system operates in Poland. The Polish system is interesting in that it combines data collection with the provision of extension advice. This combination is likely to result in the collection of more accurate data and to the effective use of such data through the provision of extension advice to farmers. However, the system is relatively expensive and its cost-effectiveness in terms of improved decision making at the farm level has not been evaluated. Examples from other EU Member States indicate that there are methodological challenges to be overcome in performing a benefit-cost assessment of the Polish system. It would be worth conducting such an assessment to determine if the Polish system could serve as a model for the collection and use of farm-level data in other parts of the EU.

Key words: adjustment extension FADN Poland

11.1. Introduction

Agriculture is at the centre of the debate on the sustainable use of the earth's natural resources. Faced with growing demand due to an expanding global population with higher incomes, agriculture will face the challenge of producing substantially more food and agricultural raw materials. At the same time it will need to safeguard the productivity and quality of the natural resources upon which it depends, particularly land and water. The impact of climate change on global temperatures and precipitation patterns will create opportunities for increasing productivity in some areas, but will place stress on production systems in others. As a significant source of greenhouse gas (GHG) emissions as well as a potential agent in carbon sequestration, agriculture may well face increasing pressure to contribute to a reduction in the concentration of GHGs. Overall, farmers and others involved in the food and agricultural system will face increasing challenges to adapt to the changing physical and economic environment in which they operate. It may prove

difficult to meet the more exacting requirements of that environment while at the same time maintaining economically sustainable farming operations.

The focus of this chapter is on adjustment and adaptation in agriculture and the role of information in the process. As an example, we examine the Farm Accountancy Data Network (FADN) in the European Union (EU) and the way this system applies to Poland.

11.2. Adaption and Adjustment in Agriculture

Agriculture operates in a dynamic economic, technical, institutional and political environment. Farmers and farm households face continuing pressure to adapt their activities as a result of changes in this environment. Some of the pressure is the product of well-established long-term trends. The cost-price squeeze, created by technological advance and low price and income elasticities of demand for agricultural products, has long been a major part of the explanation for the decline in farm numbers, increase in farm size, and out-migration of labour from agriculture[1]. Superimposed on these trends are the effects of short-term shocks, such as animal disease outbreaks, extreme weather events, human health scares, and political events, such as wars and regime change. In addition to these external factors, there are internal life-cycle pressures for change, such as those that often accompany the aging of farm operators and the desire to pass the farm business to successors. Thus agriculture is in a more-or-less constant state of flux.

Adjustment is a process undertaken by individual farm household-firms. Response to changes in the business environment may take a variety of forms over various time horizons. Among the most common are changes in the following:

- The balance between enterprises on the farm and the intensity of production (use of variable inputs)
- Production methods (particularly through innovation and the adoption of new technology)
- Contracting for some or all of the production and marketing functions
- Business structure or institutional form
- The allocation of farm household factors (particularly labour) between on-farm and off-farm activities
- The area of land farmed, through enlargement or contraction and through purchase/sale or leasing
- The operator(s) of the farm through inter-generational transfers of assets and entry/exit decisions.

Decisions made at the farm household level are reflected in changes at the sector level – in the number and sizes of farms, in factor quantities and quality (especially the number of people working in agriculture and their socio-economic characteristics, such as age and education), in the degree of specialization among farms, and in productivity patterns. However, sector-level statistics are only snapshots based on censuses and surveys. Apparent stability in structure can conceal numerous individual adjustments, many of

[1] W. W., Cochrane, [1965]: *The City Man's Guide to the Farm Problem. Minneapolis, MN: University of Minnesota Press.*

which cancel each other out[2]. It is easy to underestimate the degree of adjustment that occurs at the farm household level in agriculture on a continuing basis.

Firms in all industries are subject to economic pressures for change, but there are some factors that are particularly important for adjustment in agriculture:

Factor immobility. In many countries the age structure of farmers, their specific skills, lack of experience in other occupations and relatively low levels of formal education are often cited as reasons why farmers find it difficult to adapt to change and to transfer to other activities. Many of these characteristics are highly correlated. Remoteness from alternative economic opportunities and the costs of relocation add to immobility. Constraints can be overstated, as there are often younger and more adaptable individuals within farm households, improved communications erode remoteness, and a substantial proportion of farmers (or their spouses) in most industrialized countries are now pluriactive (engaged in multiple economic activities), implying that there is some non-agricultural work experience in many farm households.

Dominance of the household-firm. In terms of numbers, most farms in higher income countries (e.g., members of the Organisation for Economic Cooperation and Development, OECD) are operated as unincorporated businesses in which the farmer and other members of the household supply the dominant share of the labour used. In such a situation, responsiveness to the price and cost signals that put pressure on income from farming may be muted. The reaction of the farm household may be "belt tightening", i.e., to continue to operate the farm business at a lower income level. By contrast, a firm that is mainly dependent on hired labour and owned by non-operator shareholders is likely to be more responsive to adjustment pressures.

Stickiness of economic change. While adjustments are made by the existing cohort of farmers, major shifts tend to occur when there is a change in the principal operator. In an industry in which, in many countries, there is a history of passing the business down the generations within families, substantial changes often accompany intergenerational transfers of farm property. These include changes in size, major enterprise and, perhaps most important, the decision to operate the farm as a full-time or part-time activity. Such responses may be delayed for a considerable time if the principal operator is not yet of an age at which the transfer of responsibility of managing the farm is not imminent. On larger farms, with more complex management structures involving several generations, stickiness may be less of an issue.

None of these factors is exclusively confined to agriculture. Some are characteristics of other sectors in which small family-run businesses are common (such as sectors of the retail trade, especially those in rural areas). What makes agriculture unique is the combination of these factors with the political and social weight that is often given to the sector, and its importance for environmental sustainability and the sustainability of rural communities.

The growing realization about the impact of agriculture on environmental quality (water, land, biodiversity), its potential contribution to climate change through emissions

[2] *This is illustrated in a study for the United States by Ahearn et al. [2005].The authors show that over two-thirds of US farms that continued to exist over the period 1992-97 changed their size. Furthermore, there was a substantial turnover of operators, with annual rates of entry (10 percent) slightly exceeding the rate of exit (9 percent); figures that exceed historical labor turnover in US manufacturing industry.*

of greenhouse gases, as well as growing public concern in some countries about how food is produced (e.g. use of new technologies) and the characteristics of food (e.g., food safety, diet and health aspects) add to the adjustment pressures on agriculture. The prospect of significant climatic change will further add to pressure on agriculture in the future.

Despite these challenges, it is important to stress that the ability of farmers to adapt to pressures for change is often underestimated. Previous studies covering a range of countries have shown that projections of the impact of substantial changes in the economic environment faced by farmers have tended to ignore their ability to adapt over time[3]. Static assessments, particularly of the impact of economic pressures on farmers, due to reductions in output prices, increases in input prices, or performance requirements due to environmental or other standards (e.g., food safety or animal welfare) tend to underestimate the ability of farmers to alter the composition of output, the use of inputs, production practices and the ability of farmers to innovate.

Studies also show that the quality of human capital in agriculture, particularly the skills of farmers and their ability to apply advances in knowledge are extremely important for adaptation. The general educational level of farm operators and their business and managerial skills, has been shown to be critical in their ability to adapt to economic change. Previous studies lend support to the importance of the level of educational attainment with the suggestion that this applies irrespective of the subjects studied[4]. Higher levels of formal education among farmers are associated with a greater take up of training opportunities in skills that are directly relevant to their business.

Management skills and the supply of good quality information on which to make business decisions are critical in the performance of agricultural enterprises. Empirical research shows a strong link between differences in the quality of management and the economic and financial performance of farms. Poorly performing farmers have difficulty in balancing workload on the farm and in making long-term strategic decisions. Farmers with the best financial performance tend to be innovators and early adopters of new technology (but not necessarily risky technology). They are typically well-informed about changes affecting their business, are well-networked into sources of information (which will include advisors and consultants), and plan ahead. In the United Kingdom, for example, there is evidence that higher levels of vocational training are associated with greater on-farm innovation and higher technology transfer[5]. Research on the performance of farms in the United States indicates that success depends on the control of variable costs of production and machinery costs, and on farm tenure arrangements[6].

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[3] D. Blandford and B. Hill, [2006]: *Policy Reform and Adjustment in the Agricultural Sectors of Developed Countries. CAB International, Wallingford, Oxfordshire, 2006.*

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[5] R. Gasson and B. Hill [1996]: *Socio-Economic Determinants of the Level and Rate of On-Farm Innovation. Wye College, University of London.*

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Risk management strategies, such as forward contracting of inputs, spreading sales over the year, participating in government programs, and farm diversification contribute to success. Using new technology, especially after someone in the same area has already adopted it, plays an important role. The use of extension services increases the likelihood of a farm being successful. The keeping of books and records on income and expenditures increase operator efficiency. Returns to labour and management are higher for operators with higher educational attainment, those employing consulting services, and those who use forward contracting or other risk management strategies.

The ability to adapt to a changing economic, technical and policy environment is greatly facilitated if farmers can compare their performance with that of others. Benchmarking against other farm operators is a recognized and valuable management tool. This, and accurate knowledge of the farm's costs of production, have been identified as of importance in providing resilience to price volatility and (especially) the ability of farm businesses to survive sustained periods of low prices that seem to characterize EU agriculture now that the CAP has moved away from market intervention and farmers are more exposed to international markets[7]. The availability of accurate data on production costs and incomes is fundamental for informed farmers to make good decisions to ensure the economic sustainability of their farms.

11.3. The Farm Accounts Survey as a Source of Information for Decision Making

In the EU an important source of information on the economic performance of farms that can be used by farmers and their advisors comes from the results published by the Farm Accountancy Data Network (FADN). This comprises an annual survey covering the accounts of some 80,000 holdings across the EU-28. Data are supplied from national farm accounts surveys through the completion of the required numbers of 'Farm Returns' that are set out in the Regulations that govern FADN. Poland's contribution is the largest, with 12,100 cases. The Farm Return, in effect, determines the range of information that has to be sent to the European Commission and the variables it contains are set in legislation, a characteristic that has in the past limited the ability to add questions as policy has shifted to new areas (e.g., environmental issues)[8]. Currently the data are quite narrowly restricted to what happens in agricultural production with, for example, no questions included on income that the farm household receives from other gainful activities off the farm.

Sets of Standard Results are published by the European Commission for the EU and individual Member States, and are included in a public database. They are also incorporated in various Commission publications. The Commission uses the data in evaluations and assessments of policies, and they are also used in research projects, and private evaluations and studies. In Poland there has been a long history of interest in farm-level income and performance. A national farm survey was established in 1926 with

[7] House of Lords, [2016]: *Responding to Price Volatility: Creating a More Resilient Agricultural Sector. European Union Committee, Energy and Environment Sub-Committee. House of Lords, London.*

[8] N. Robson, [1996]: *Practical and legal challenges of developing pluriactivity and non-farm incomes data using the EU's Farm Accountancy Data Network, in Income Statistics for the Agricultural Households Sector, (B. Hill, ed.), pp. 69–77, Eurostat, Luxembourg.*

a sample of 500 farms. In 1956 the system was remodelled in terms of the data collected and the methodology used. The present survey that supplies data to EU-FADN was set up in 2004 following a period of debate around how to balance sample size and the depth of coverage. A substantial amount of information about the movement and use of material on the farm that was formerly collected (in line with the approach to planning that dominated then) was dropped as this did not form part of the Farm Return. Poland, like many other Member States, complements publication by the Commission by issuing its own national version of the results, and also makes them available on a regional basis and for types of special interest, such as organic farms and family farms. There is also an on-line data base for Poland.

A recent study of FADN across all EU-28 Member States found that national farm accounts surveys often cover a broader range of variables than is required to complete the Farm Return sent to the Commission, or have a larger number of cases[9]. Both enable Member States to gather information and analyse factors that are of particular relevance to them; for example, they may be interested in the way that income earned from off the farm enables the household to remain viable and to adjust in time of lower incomes from agricultural activity. Or there may be concern in how farms on different regions within the country compare in terms of performance, and this may require more cases. Poland is not one of the users of an expanded survey (household income is no longer covered as part of the survey serving FADN but it is the subject of a separate survey that is distributed alongside), though the national survey does collect some further details that bring advantages when the validity of the data is checked.

The characteristic of the national accounts survey in Poland that is of particular interest here is the method of data collection. Though the responsibility for managing the FADN (including selecting the sample, meeting the required number of completed Farm Returns and data quality) rests with the Institute of Agricultural and Food Economics – National Research Institute (IAFE-NRI) which is designated as the Liaison Agency in Poland, data collection from family (unincorporated) farms is undertaken by staff from the public sector Agricultural Advisory Centres (AACs). Poland's family farms do not pay income tax on an accounting basis, so there is no opportunity to access records already held by accounting firms, as is the case for many Member States, Germany for example. Instead, primary data collection has to be undertaken by visits to farms by AAC staff who, in effect, construct accounts from whatever information is available and the logbooks that participating farmers are required to maintain. Some farms are VAT registered, and these will have more readily available information on sales and purchases.

AACs have contact with more than half of the total number of farms in the Farm Structure Survey for Poland through their advisory role. Some other Member States also use advisory services to collect FADN data (Lithuania and Latvia are examples) but what marks out Poland is the combination of data gathering and the provision of advice on the same farm, providing the possibility of direct impact on management behaviour (including adjustment) and economic performance. The recommendation is that the data collectors also provide extension services, and this seems to be the case for staff who

[9] D. Bradley and B. Hill, [2015]: *Costs of and Good Practice for FADN Data Collection. European Commission, Directorate-General for Agriculture and Rural Development, Brussels. EUR 2015.4546 EN.*

are employees of the AACs, though there are examples where collectors are dedicated to FADN, where they are part-time and self-employed. However, all are required to visit the farm on a minimum of occasions (at least four per year). Combining the knowledge held by the extension officers about individual farms with the collection of data is considered to be an example of good practice, as this allows the AAC advisor to identify data values which seem incorrect, reducing the possibility of error and the need for subsequent data validation.

There are other benefits in the Polish system. Viewed from the extension perspective, the information obtained for FADN is also a useful input into the advice provided by the AAC officers. Where farmers value this advice they will understand the importance of providing accurate data. Combining the data collection and extension functions therefore increases data quality. AAC staff discuss the accounts for the farm they are visiting to collect FADN data and can make available comparative figures for other businesses to provide a benchmark. Insights gained when visiting cooperating farmers supplying FADN data can often be beneficial to other clients of the AACs.

The combination of data collection and provision of advice helps all participants – both collectors and suppliers – to see the value of what they are doing. This means that higher quality data are generated and this should ultimately result in more informed policy decisions. But the key issue in terms of adjustment is that it encourages a flow back of useful information to the farmer and thus better farm-level management decisions, in pursuit of change and development at the farm level.

The combined role of providing advice and collecting data to be supplied to FADN comes at a cost. According to the recent study covering the period 2012-2014, this is due to the amount of time consumed by the data collection process. Poland uses more labour time per completed Farm Return than most other Member States, about 60 hours per case and more than twice the EU-28 average (only Belgium and Luxembourg use more). In contrast, Germany uses less than 10 hours. This greater resource use is also reflected in the monetary cost per FADN case. For Poland over the period 2012-2014 the average was €732 per completed Farm Return compared with €678 for the EU-28 as a whole. Member States that gather data from existing accounts drawn up for tax purposes by professional bookkeepers (accountants) have much lower costs to the public budget (Germany, for example, averaged €558) as much of the expense of assembling the accounts is paid for by farmers.

The higher costs for Poland reflect a number of factors, including the need to assemble data, the lack of experience of farmers in drawing up accounts, and the fact that data collectors do not usually specialise in that single activity. Taking a broader view, it may not matter that costs are higher if the system generates a bigger impact at the farm level by allowing the information gathered from a specific farm to be set alongside data available from other farms covered in the survey of accounts. Benchmarking is a well-established management tool, and the presence of an experienced advisor to assess what is being shown by the accounts for the farm being surveyed, and to advise as to how management should respond and adjust, can be a powerful influence on productivity, performance and income. The additional benefits could well outweigh the additional costs.

For the cost/benefit balance to be conducted there must not only be a system to measure costs (which largely already exists in Poland and other Member States) but also one to measure benefits. Issues associated with the latter form the final part of this chapter.

11.4. Valuing the Impact of Advice on Farm Performance

The provision of advice to farmers by public extension services funded by government budgets can be expected to facilitate adjustment at the farm level. However, obtaining reliable estimates of how much change has occurred as a direct result of this advice and the economic benefit flowing from it so that these can be compared to the public costs is far from simple and presents methodological problems. This can be demonstrated using the example of the evaluation of Farming Connect in Wales; the part of the United Kingdom where responsibility for agricultural policy is devolved to the (regional) Welsh Government. Farming Connect delivers a wide range of knowledge transfer and advisory activities, ranging from demonstrations to large groups of farmers, smaller discussion groups, and one-to-one advice and consultation. Most of the services are provided free to farmers, though for some (such as the development of farm plans) a small financial contribution from the farmer is expected. The evaluation of Farming Connect for the period 2012-14, reported in Hill *et al.* (2015), may hold some lessons for researchers wishing to assess the impact of the combined FADN data-gathering and advice providing activities in Poland[10]. It is known that farms that have remained in the Polish FADN for more than ten years achieved income results in 2014 that were some 10-20% higher than those who had been involved for shorter periods, but it is not clear how much of this was attributable to access to advice and how much to other factors[11].

An inherent difficulty in determining the net impact of advisory services is that any particular involvement of farmers and advisors in planning and implementing business decisions is almost always accompanied by other factors that could influence the outcome, so that observed changes in, for example, farm profits cannot be attributed solely to the interaction under examination. Establishing the 'counterfactual' (what would have happened in the absence of the provision of the advice) is a critical step in assessing the net impact of an intervention (its additionality). In times of economic pressure, it is quite feasible that the counterfactual may be one of generally declining incomes, so that even maintaining a given level of farm profit through adjustment and adaptation may be regarded as a success.

A common approach seen in the literature, and one used in the evaluation of Farming Connect, has been first to ask a sample of farmers (or all if resources allow) who have used the advisory service how much key performance variables (such as FADN's Family Farm Income) have changed since they received input from the extension staff (such as help in drawing up a farm development plan or receiving advice on a specific management issue such as how to meet cross-compliance conditions to receive the Basic Farm Payment). This establishes the gross impact. Second, each farmer is asked about the extent to which, in their view, these changes were attributable to the advice they were given. This enables the net impact of the advice to be assessed as a percent of farm income. No doubt some farmers will report large net impacts and others will report none (or even negative effects), so a weighted average has to be calculated. For Farming Connect in Wales the average gross

[10] B. Hill, D. Bradley and E. Williams, [2015]: *Has Farming Connect made an economic impact on the Welsh agricultural sector? Paper presented at the 89th Annual Conference of the Agricultural Economics Society, University of Warwick, England, 13 – 15 April 2015.*

[11] *IAFE-NRI personal communication.*

impact over the 2012-14 study period was a 2.4% rise in farm income per intervention, and a net income impact of 1.2%. With this information, and data on absolute farm incomes (in this case at the sector level) and the total number of interactions between advisors and farmers, it is possible to calculate the overall increase in income attributable to the provision of advice by Farming Connect. For the Wales evaluation this turned out to be £424 per farm (roughly €545 at recent exchange rates), or £8.2m (€10.5m) for the sector as a whole, slightly larger than the £8m (€10.3m) that the advisory service cost the public budget over the period studied.

However, it must be recognised that this approach to assessing additionality passes the responsibility to farmers who, while being closest to the decisions made and their impacts, may for a variety of reasons provide answers that overestimate impact ('optimism bias'). For example, farmers may wish to justify their use of time in participating in the activities, or they may wish to please the staff delivering the advice. On the other hand, professional staff often regard Welsh farmers as tending to be pessimistic about change and therefore may potentially underestimate positive effects.

This approach to valuation can, with some justification, be labelled as 'naive'. A more sophisticated method is to adopt a 'quasi-experimental' design, in which participants in the advisory scheme are compared with a matched sample of farmers who have not had these interactions. In the case of Farming Connect, both approaches were applied in parallel. However, when using matched samples of farmers who had and who had not received advice from Farming Connect, no significant differences were detected between changes over time seen in the two groups, suggesting that there was no impact on farm incomes, at least within the time period covered by the research. This picture is, of course, far less encouraging to proponents of extension who then have to search for justifications for activities other than impact on farm incomes viewed at the sector level. Such a case might be made if the farmers who receive advice are different from those who reject it (a form of 'selection bias'), and who might have problems with economic sustainability without advice. In reality, this did not appear to be a realistic claim for recipients in Wales though it has formed part of the explanation elsewhere, for example, in Ireland[12].

Any attempt to evaluate the combination of FADN data collection and provision of advice in Poland would face all these problems. In addition, when establishing whether value for money was being achieved, it would be necessary to split the resource costs of AACs between the two operations or at least to compare costs of delivering advice combined with data collection with advisory activities where data were not collected.

11.5. Conclusions

In order to ensure the sustainability of their farms, farmers face a continuing need to adapt to changing economic and other conditions. Society is demanding that farmers adjust their activities to provide a range of services, such as environmental services, that go beyond the production of agricultural commodities. There will be additional adjustment pressures due to climate change. To ensure sustainability, farmers need access to accurate

[12] P. Bogue, [2013]: *Impact of Participation in Teagasc Dairy Discussion Groups. Broadmore Research, Teagasc, Ireland.*

and high quality information that they can use to make decisions on how to manage their farms. They also need good business advice, which is dependent on knowing what is happening on the individual farm (how it being managed) and the ability to benchmark the performance of the farm using data from other farm businesses.

Poland has an interesting combination of data collection, to meet the requirements of the EU's Farm Accountancy Data Network, and the provision of advice to farmers. This has the potential to provide both good quality data for use by public agencies and to achieve a positive impact on adaptation from the on-farm use of information. An evaluation of the effectiveness of this unique combination faces some methodological problems, but is worthy of further exploration in order to determine whether the Polish model of data collection and use at the farm level is one that other EU countries might usefully copy.

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12

CHANGING GRAVITY FROM ECOLOGICAL EVALUATION TO SOCIAL APPROACH IN THE SITE REMEDIATION ASSESSMENT

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Abstract: The paper seeks to assess the applicability of different methodologies used to evaluate soil remediation technologies and projects. Remediation technologies are used to clean up contaminated soil (sites). It argues that while current literature and projects target internal ecological aspects of remediation, it is already possible to foster the transition from traditional ecological evaluation to include also measuring social impacts of site contamination and remediation. Such evolution in the approach frames a more cohesive foundation for assessing and implementing remediation technologies based on an array of socially relevant data, as opposed to narrow quantification of ecological properties of a remediated site.

Key words: site remediation, contaminated sites, ecological evaluation, cost-benefit analysis, risk-based assessment, sustainable remediation, social dimension.

12.1. Introduction

As a result of technogenesis, more soils are becoming disturbed and contaminated, subsequently, soil contamination pose risk to public health and environment. Land mismanagement has a negative influence on the soil ecosystems with unsustainable development contributing to soil contamination. In order to clean up contaminated soils and make them suitable for further use, various remediation methods are applied to remove contaminants from soils[1].

Soil remediation is a complex process that involves not only some contaminant removal procedure but also selection of remediation technology, effectiveness assessment and introduction of innovations. The algorithms for selecting site remediation technologies were established more than 40 years ago[2]. Since then, a large number of successful projects were carried out and a great amount of research has been conducted on developing

[1] A. S. Goudie, [2009]: *The Human Impact on the Natural Environment*: *Past, Present, and Future. Science. 2/2009.*

[2] U.S. Sustainable Remediation Forum., [2009]: *Sustainable remediation white paper—Integrating sustainable principles, practices, and metrics into remediation projects. Remediation, no. 19, pp. 5–114. doi: 10.1002/rem.20210.*

new remediation technologies and improving policy – and decision-making systems, with appropriate legislation adopted in the spheres of environmental protection and remediation (e.g., Cauwenbergh[3]).

Yet, there are fewer studies on summarizing and generalizing the results of the remediation practices as a whole[4]. Methods of selecting remediation technologies rely mainly on most evident indicators of the technology performance, i.e. the percentage of contaminant removed or otherwise treated contaminants and enhancement of soil physical, chemical and biological properties. This approach to evaluating remediation projects was omnipresent when the remediation industry originated, but over time more comprehensive quantitative and qualitative tools which evaluate remediation technologies were created.

The Environmental Agency of the United Kingdom was among the first to develop an extensive guideline for cost-benefit analysis in site remediation[5]. The cost-benefit analysis compares possible choice of remediation technology by monetizing the damage avoided. Another tool for measuring remediation effectiveness is risk-based assessment which is used around the globe as a methodology to evaluate the exposure for people's health and environment caused by site contamination[6]. A more integral tool for evaluation is life-cycle assessment (LCA), a method used to benchmark the current remediation systems, compare remediation options and identify ways to diminish possible impacts[7].

In recent years, however, practitioners and policy-makers have commenced to embody principles of sustainability into remediation projects and policies. The interest towards sustainable remediation resulted in numerous methodologies for sustainability assessment methodologies and projects that successfully implement sustainable remediation technologies[8].. Furthermore, while the idea of sustainable remediation has been already commonly accepted and became a part of governments remediation programs (i.e. US EPA[9]), various types of assessing the social dimension in sustainable remediation are coming forward as an instrument for evaluating remediation programs and technologies[10]. This should be considered as a meaningful manifestation of the shift in the evaluation paradigm from quantitative ecological measurements to a broader approach, which defines remediation from the perspective of its impact on local communities and society in general.

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3 L. Cauwenbergh Van, [1997]: *Technology Overview Report. Ground-Water Remediation Technologies Analysis Center, Leiden.*

4 E. Khan, T. H. Hejazi, [2004]: *An overview and analysis of site remediation technologies Journal of Environmental Management, no. 71, pp. 95-122.*

5 M. Postle, T. Fenn, A. Grosso, J. Steeds,[1999]: *Cost-Benefit Analysis for Remediation of Land Contamination. R&D Technical Report. Risk and Policy Analysis Limited, Environmental Agency.*

6 A. Fujinaga, M. Yoneda, M. Ikegami, [2012]: *Methodology for Setting Risk-Based Concentrations of Contaminants in Soil and Groundwater and Application to a Model Contaminated Site. Risk Analysis, no. 32: pp. 122–137. doi:10.1111/j.1539-6924.2011.01677.x*

7 P. Suer, S. Nilsson-Paledal, J. Norrman, [2004]: *LCA for site remediation: A literature review. Soil & Sediment Contamination, no. 13, pp. 415–425.*

8 P. B. Butler, L. Larsen-Hallock, R. Lewis, C. Glenn, R. Armstead, [2011]: *Metrics for integrating sustainability evaluations into remediation projects. Remediation, 21(3), pp. 81–87.*

9 US. EPA., [2008]: *Green remediation: Incorporating sustainable environmental practices into remediation of contaminated sites. Office of Solid Waste and Emergency Response, EPA 542-R-08-002. Retrieved from http://www.brownfieldstsc.org/pdfs/ green-remediation-primer.pdf. Access: 12.02.2016*

10 M. A. Harclerode, P. Lal, M. E. Miller, [2015]: *Quantifying global impacts to society from the consumption of natural resources during environmental remediation activities. Journal of Industrial Ecology, Special Issue: Linking Local Consumption to Global Impacts.*

Alongside with the seemingly evidential transmission from ecological evaluation to social approach, many scholars still use ecological evaluation as the only method to measure the results of a remediation technology. There is no doubt that ecological evaluation is the primary mechanism to quantitatively assess remediation effectiveness; in addition to that, different site-specific properties amplified by various external factors (e.g., regional and national remediation policies, stakeholder collaboration) encumber remediation evaluation. Nevertheless, it is necessary to evaluate remediation not as segregated procedure, but as an element of a multifaceted system, which implies using more extensive evaluation tools. Remediation scholars and practitioners should take into consideration sustainability principles and practices with a particular attention to the social dimension as a pivotal component in implementing advanced and sustainable remediation technologies.

The social shift is also justified in the policy re-orientation, that to a larger extent involves society, not only as a beneficiary of programmed actions, but also a co-creator of the innovation based development. This approach is observed in the network models of mutual influence of various socio-economic spheres in the economic system, ie. helix models, especially the triple and quadruple helix[11]. In 1995 Etzkowitz and Leydesdorff introduced the triple helix model for determining the dynamics of the relationship between science, industry and administration[12]. These three dynamics are considered stable. Such institutional configuration in the knowledge innovation system can also be considered as an expression of three functionally linked sub-dynamics of competing systems: the dynamics of economic wealth generation through the exchange, based on knowledge and innovation dynamics of reconstruction and political and managerial need and concern for normative control over the links. The success of these three functions should not be treated as individual relationships between industry, science and administration. According to Leydesdorff and Etzkowitz, the triple helix is a model of innovation in which the potential of cooperation determines the relationship between the three parties, and the lack of these ties significantly impedes the flow of knowledge[13] In the opinion of Carayannis, Barth and Campbell, the concept of the triple helix is associated with the concept of knowledge-based economy due to the emphasis on knowledge and innovation[14]. The triple helix model takes into account the paradigm of innovation, which as a condition sine qua non, determines the size of the pro-innovation relationship formed at the interface of science, business and administration. It is essential that such a policy orientation of cooperation creates demand among consumers, and is simply not limited to the organization of supply of already developed innovative solutions[15]. Eriksson et al. also argue that the innovation-oriented user's role is as important as the role of research institutions, support organizations and

[11] M. Maciejczak, [2012]: *Zastosowanie modelu potrójnej heliksy w rozwoju innowacyjności polskiego rolnictwa i obszarów wiejskich. Wieś Jutra, no 11–12, pp. 24-27.*

[12] H. Etzkowitz, L. Leydesdorff, [1995]: *The Triple Helix – University – Industry – Government Relations: A Laboratory for Knowledge Based Economic Development, EASST Review no. 14, pp. 78-97.*

[13] L. Leydesdorff, H. Etzkowitz, [2001]: *The Transformation Of University-industry-government Relations, Electronic-Journal of Sociology. Retrived from http://www.sociology.org/archive.html. Access: 12.02.2016.*

[14] E. Carayannis, T. Barth, D. Campbell, [2012]: *The Quintuple Helix innovation model: global warming as a challenge and driver for innovation. Journal of Innovation and Entrepreneurship 1/2012, doi:10.1186/2192-5372-1-2.*

[15] M. Maciejczak, [2015]: *How to analyze bioeconomy?, Annals of Polish Association of Agricultural Economists and Agribusiness, vol. XVI, issue 6.*

government companies[16]. Thus the quadruple helix model describes the new economic environment and observes how society is involved in continuous innovation, which is the result of co-creation between the four helices connected through networks, partnerships and symbiotic relationships.

Without including extensive evaluation tools, the effectiveness of the remediation technology becomes disputable, as the absence of data about the social-economic impacts holds up technology implementation. Moreover, the introduction of innovation occurs due to inconsistent information about the performance of existing technologies. One of the barriers in including advanced evaluation tools is "resistance to change", which leaves practitioners with approaches that are "well worn…over the last 30 years"[17]. This can be caused by three main group of factors: technological, social, and market.

12.2.Methods and Objectives

In this study, the authors seek to provide remediation scholars and practitioners with an overview of methods used to evaluate remediation technologies and projects. A significant part of the site remediation literature utilizes an ecological evaluation and to a much lesser extent includes long-term socio-economic assessment. The US Interstate Technology & Regulatory Council revealed the issue, noting that "remedial activities often focus on site-specific risks that were not developed in consideration of external social and economic impacts beyond identified environmental impacts, in order to protect human health and the environment"[18].

The objectives of the paper, besides to indicate the current predilection towards omitting comprehensive evaluation tools, are to examine the most widespread evaluation methodologies and their variations and to illustrate the importance of transition from ecological evaluation to social dimension methodologies. Such evolution in approach frames a more cohesive foundation for assessing and implementing remediation technologies based on an array of socially relevant data, as opposed to narrow quantification of ecological properties of a remediated site.

The information presented in the article is based on an extensive and critical literature review.

12.3. Ecological Evaluation

As it was noted by Yeung, it is a formidable task to give an overview of so many proven and emerging remediation technologies[19]. In effect, many technologies and their variations have been field-tested and are used by practitioners around the world. Since most remediation technologies are site-specific, the selection of appropriate technologies

[16] M. Eriksson, V-P. Niitamo, S. Kulkki, K. A. Hribernik, [2006]: *Living labs as a multi-contextual R&D methodology. Proceedings of 12th International Conference on Current Enterprising, ICE 2006, Milan, Italy, June 26-28, 2006.*

[17] SURF., [2009]: *Sustainable remediation white paper—Integrating sustainable principles, practices, and metrics into remediation projects. London.*

[18] ITRC, Interstate Technology & Regulatory Council., [2011a]: *Technical/regulatory guidance—Green and sustainable remediation: A practical framework. Green and Sustainable Remediation Team. Washington DC.*

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is often a difficult step for the successful remediation of a contaminated sit. Therefore, the successful treatment of a contaminated site depends on proper selection, design, and adjustment of the remediation technology's operations based on the properties of the contaminants and soils and on the performance of the system.

Table 1. **Description of selected remediation technologies**

Remediation technology	Description
Encapsulation	Physical disconnection of contaminated components from unpolluted outer medium
Biological remediation	Using biological agents such as bacteria to process or immobilize contaminants
Phytoremediation	Using plants to immobilize, process or remove contaminants
Vitrification	Using extreme temperatures to immobilize inorganic and destroy organic pollutants
Nanoremediation	Using nanopartictles to accelerate remediation process
Bioventing	Injecting air to maximize biodegradation and minimize the off-gassing of volatilized contaminants to the atmosphere
Biopiles	Piling petroleum-contaminated soils into heaps and then simulating aerobic microbial activity by aeration and the addition of minerals, nutrients, and moisture
Soil washing	Using liquids (usually water, occasionally combined with solvents) to mechanically processes to scrub soils.
Aeration	Evaporating the volatile contaminants of from the soil into the air

Source: own elaboration based on Khan and Hejazi, 2004

All of the technologies mentioned in table 1, as well as many of those that were not included into the list, have proved to be effective and efficient. The most straightforward procedure for remediation technology selection consists of the following parameters:

1. Type of soil;
2. Type of contaminants;
3. Sources of contamination;
4. Time required to remediate.

Since the algorithm is contamination-oriented, the simplest way to measure remediation effectiveness is to calculate the percentage of removed (immobilized, processed, etc.) contaminants over time[20]. Aside from the percentage of treated contaminants over time, a number of soil properties, known as Soil Quality Indicators, are included in soil evaluation. In a recent study, as many as forty-eight Soil Quality Indicators from soil structure to root elongation are recommended for a comprehensive ecological evaluation [21].

[20] O. K. Merkx, J. P. G. Loch, A. T. Lima, [2013]: *The Effectiveness of Electro-Remediation of Aged, Metal-Contaminated Sediment in Relation to Sequential Extraction of Metals. Water, Air, & Soil Pollution, , Volume 224, Number 9, p. 11-19.*

[21] Y. Volchko, J. Norrman, L. Rosén, [2014]: *A minimum data set for evaluating the ecological soil functions in remediation projects (2014) , no. 14, pp. 1850–1860. DOI 10.1007/s11368-014-0939-8.*

This approach, commonly known as *ecological evaluation* or *environmental risk-assessment,* does facilitate assessment of the results, although it marginalizes impact on the environment as the effectiveness measurement from a number of factors affecting remediation process as a whole. Nonetheless, ecological evaluation is the milestone and the first step in soil remediation assessment[2223].

12.4. Risk-Based Assessment

Risk-based assessment is a method to evaluate not merely the presence of contamination, but the risks this contamination pose to public health and environment[24,25]. Different types of risk exposure are taken into consideration while conducting risk-based assessment. For example, if a remediated site is planned to be used as a residential area, the risks for contaminant transmission via evaporation or drinking water need to be assessed. A different scenario occurs if the remediated site is designed for further agricultural use, hence contaminants can permeate into food chains and contaminated products could reach consumers.

For conducting a risk-based assessment of a remediation site, according to Catney et al. a receptor exposed to a contaminant source by means of a pathway" should be confirmed[26]. Measuring concentration of contaminants is not sufficient to evaluate the risks that contamination poses to people and the environment. It is necessary to examine availability of contaminants in soil environment. Thus, the risk-assessment methodology comprises the routes by which people and the environment are affected and the availability and transportation potential of soil contaminants[27].[28] [29].

A reverse risk assessment tool specific to a contaminated site is known as remediation risk management. This tool is a risk-based decision-support system that focuses on the risks posed *to* a remediation project, not *by* it. The elements of remediation risk management are risk identification, evaluation, mitigation, monitoring and reporting.

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22 A. Beames, S. Broekx, R. Heijungs, R. Lookman, K. Boonen, Y. Geert van, K. Dendoncker, P. Seuntjes, [2015]: *Accounting for land-use efficiency and temporal variations between brown field remediation alternatives in life-cycle assessment, Journal of Cleaner Production, 1/2015, pp. 101-109.*

23 D. E. Ellis, P. W. Hadley, [2009]: *Sustainable remediation white paper—Integrating sustainable principles, practices, and metrics into remediation projects. Remediat J no. 19, pp. 5–114.*

24 T. O'Berg, B. Bergback, [2005]: *A review of probabilistic risk assessment of contaminated land. J Soils Sediments, no. 5, pp. 213–224.*

25 R. Naidu, [2008]: *Bioavailability: the underlying basis for risk based land management. Chemical bioavailability in terrestrial environment. Elsevier, Amsterdam, pp 53–72.*

26 P. Catney, J. Henneberry, J. Meadowcroft, J. R. Eiser, [2006]: *Dealing with contaminated land in the UK through 'Developmental Managerialism'. J Environ Policy Plan 8/2006, pp. 331–356.*

27 C. P. Nathanail, N. Earl, [2001]: *Human health risk assessment: guideline values and magic numbers. Issues Environ Sci Technol., no. 16, pp. 85–102.*

28 H. Rothstein, P. Irving,T. Walden, R. Yearsley, [2006]: *The risks of risk-based regulation: insights from the Environmental Policy Domain. Environ Int., no. 32, pp. 1056–1065.*

29 H. Rothstein, P. Irving, T. Walden, R. Yearsley, [2006]: *The risks of risk-based regulation: insights from the Environmental Policy Domain. Environ Int., no. 32, pp. 1056–1065.*

Table 2. **Project risk input for remediation decisions**

Risk categories	Risk description
Technology performance	Selected inappropriate remedy, Inappropriate objectives, System failure
Human health	Changes to human health risk assessment, Accidents
Economic	Value of land after remediation, Environmental insurance, Cost avoidance, Public costs
Project management	Scope, Schedule, Communications
Regulatory	Changing conditions, Emerging contaminants
Environmental	Energy consumption, GHG consumption, Harm to ecosystems, Endangered species
Other	Political conditions, Social conditions

Source: *own elaboration ITRC 2011*

Scholars have been using risk-based assessment extensively during last decades[30][31][32]. However, in many cases the assessment was either carried out for short-periods of time or included only numerical models. Incorporation of more parameters such as potential site use and planning periods would provide, according to Maqsood et al.[33] a support for decisions related to pollution prevention and mitigation prioritization in terms of effective site management", or, as Huang et al.[34] argue outliers of these parameters prevent a comprehensive risk-assessment

12.5. Cost-Benefit Analysis

Cost-benefit analysis (CBA) has been used in recent years as a practical approach to evaluate soil remediation by estimating, quantifying and comparing its total costs and benefits[35]. CBA is recommended for estimating the net benefits of environmental projects, as it provides a quantitative estimation of changes in social well-being[36].. The key advantage of CBA is that it takes into account both direct and indirect benefits of remediation projects, and determines whether the benefits of soil remediation justify its costs[37].

30 R. Andricevic, V. Cvetkovic, [1996]: *Evaluation of risk from contaminants migrating by groundwater. Water Resour Res 32/1996, pp. 611–622.*

31 R. Schnatter, [2000]: *Petroleum worker studies and benzene risk assessment. J Toxicol Environ Health Part A 61:433–437.*

32 B. L. Morris, [2001]: *Practical implications of the use of groundwater protection tools in water-supply risk assessment. Water Environ Manage., no. 15, pp. 265–270.*

33 I. Maqsood, L. Janbing, G. Huang, Y. Huang, [2005]: *Simulation-based risk assessment of contaminated sites under remediation scenarios, planning periods, and land-use patterns—a Canadian case study. Stoch Environ Res Risk Assess, no. 19, pp. 146–157, DOI 10.1007/s00477-004-0222-4.*

34 B. Huang, D. Xiong, H. Li, [2004]: *An integrated approach to realtime environmental simulation and visualization. J Env Informatics no.3, pp. 42–50.*

35 D. Lavee, T. Ash, G. Baniad, [2012]: *Cost-benefit analysis of soil remediation in Israeli industrial zones. Natural Resources Forum, no. 36, pp. 285–299.*

36 US. EPA, [2011]: *Handbook on the Benefits, Costs and Impacts of Land Cleanup and Reuse. EPA-240-R-11-001. USEPA, Washington, DC.*

37 A. M. Wezel van, R. Franken, E. Drissen; K. Versluijs, R. Berg vand der, [2008]: *Societal cost-benefit analysis for soil remediation in the Netherlands. Integrated Environmental Assessment and Management, no. 4(1), pp. 61–74*

Estimating soil remediation costs is a relatively simple task compared to estimating soil remediation benefits, since soil remediation leads to both direct and indirect benefits[38]. Direct marketable benefits are, for instance, the increase in the site's land value due to soil remediation. Indirect non-marketable benefits may include the prevention of adverse health effects, improving water quality and influence on area's future economic performance[39].. In some scenarios, benefits from site remediation are higher than the costs, while in many other cases, the benefits do not exceed the costs[40]. The common framework is to find the optimal cost-benefit balance from zero alternatives, which usually means terminating or not starting site remediation, to the alternatives which include the estimated number of confirmed and potentially contaminated site. A discount rate is added to calculate the prospective costs and benefits at the present-day equivalent. Table 3 shows an example of CBA for soil remediation in the Netherlands with a time-span of one hundred years and a discount rate of 4%.

Table 3. **Costs, benefits and balance per alternative, at a discount rate of 4% and 70,000 euro valued for each year of life lost (net present value in millions of euros, period 2007-2107**

	Zero alternative	Alternative 1	Alternative 2	Alternative 3
		Current policy	Emergency Locations	All locations
Costs				
Remediation Costs	1,400 (530-1,600)	4,500 (1,700-4,900)	3,800 (1,400-4,200)	8,500 (3,200-9,400)
Benefits				
Health inc. lung cancer cadmium	210-1,000 0-630	870-2,800 0-1,500	790-2,300 0-1,200	1,400-5,800 0-3,500
Inc. other cancers	100	600	570	780
Inc. IQ loss	110-280	270-680	210-540	620-1,550
Drinking water	1-40	2-100	2-80	6-220
Real estate	270 (-10 – +540)	950 (-30 – +1,900)	830 (-30 – +1,700)	1,700 (-50 – +3,400)
Other benefits (ecology, dissemination, more efficient spatial use)	pm	pm	pm	pm
Net balance	-90 + pm (-1,400 – +1,100)	-600 + pm (-4,100 – +3,200)	-580 + pm (-3,500 – +2,700)	-750 + pm (-8,000 – +6,300)

Source: own elaboration based on Van Wezel et al. 2007

[38] F. Bonnieux, A. Carpentier, R. Weaver, [1998]: *Reducing soil contamination: Economic incentives and potential benefits. Agriculture, Ecosystems & Environment, 67 (2–3), pp. 275–288.*

[39] The World Bank, [1998]: *Handbook on Economic Analysis of Investment Operations. Washington, DC.*

[40] D. Lavee, G. Beniad, [2012]: *Estimating the value of non-marketable land in Israel. The geographical network, no. 5(1), pp. 1–10.*

The estimation of indirect costs and benefits is not yet based on a universal methodology, thus numerous CBA approaches may contain different input data, which results in a wide range of cost-benefit balance estimates. Another issue is uncertainty levels of some of indicators, such as a number of residents on a remediated site that would be exposed to contamination, health risks to the residents, cost and benefits of solutions other than remediation (conservation, relocating the residents), risks of recoil contamination, various impacts of the remediation project itself, etc. Uncertainty levels have an influence on the accuracy of the cost-benefit balance to such an extent that some authors suggest CBA being inapplicable to large-scale projects (Kornhauser 2000), although other scholars argue that CBA may be a productive mechanism for measuring effectiveness if the input information is regularly updated[41][42].

12.6.Evaluation of Innovation

Depending on the perspective, there are many ways to assess performance of a remediation project. Governments and policy-makers identify introduction of innovation as a criterion for evaluating results of technology deployment, as noticed by Spira[43]. While introduction of innovation is unequivocally a catalyzing challenge for innovation managers, for scholars and practitioners imbedding more than two evaluation methods in one project embrangles the laborious enough process of soil remediation.

Innovations in soil and groundwater remediation were estimated critically low in a 1997 research publication. Comparing traditional pump-and-treat technology against innovative technologies, it was found out that the barriers for implementing innovative remediation technology range from the site environmental conditions to regulatory obstacles and lack of trustworthy data on technology performance[44]. However, a more recent study on technology diffusion reveals that in-situ bioremediation has higher maximum technology adoption rate that in-situ chemical remediation and that social-economic and regulatory factors affect the adoption of remediation technologies[45]. In a guidebook "Evaluation of Innovation Activities. Guidance on Methods and Practices" innovation was qualified as "a complex phenomenon, difficult to quantify and with often long time lags before an impact can be measured"[46].

The need for introduction of innovative technologies was recognized by the European Commission (EC), which resulted in launching the European Co-ordination Action for Demonstration of Efficient Soil and Groundwater Remediation (EURODEMO) in 2006, one of the initiatives aimed to increase the availability of innovative technologies for

41 P. Misuraca, [2014]: *The Effectiveness of a Costs and Benefits Analysis in Making Federal Government Decisions: A Literature Review, The MITRE Corporation.*

42 L. A. Kornhauser, [2000]: *Cost-Benefit Analysis: Legal, Economic, and Philosophical Perspective The Journal of Legal Studies, no. 29(1), p. 1037.*

43 Y. Spira, J. Henstock, P. Nathanail, D. Müller, D. Edwards, [2006]: *A European approach to increase innovative soil and groundwater remediation technology applications. Remediation, no. 16, pp. 81–96. doi: 10.1002/rem.20103.*

44 M. Cadotte, L. Deschênes, R. Samson, [2007]: *Selection of a remediation scenario for a diesel-contaminated site using LCA. Int J Life Cycle Assess 12(4), pp. 239–251.*

45 D. Hou, D. O'Connor, A. Al-Tabbaa, [2014b]: *Modeling the Diffusion of Contaminated Site Remediation Technologies. Water, Air, & Soil Pollution, September 2014, pp. 225:232.*

46 Technopolis Group and MIOIR, [2012]: *Evaluation of Innovation Activities. Guidance on methods and practices. Study funded by the European Commission, Directorate for Regional Policy. Brussels.*

effectuating sustainable development in Europe[47]. Another environmental innovation project partially funded by the EC is Eco-Innovation, which has developed SmartStripping® technology. The main benefit of SmartStripping® is a reduction of water consumption and gas emissions during soil and groundwater remediation on contaminated sites[48]. The German-Polish cooperative Terra-, Aqua – & Site Remediation Competence Centre Leipzig – TASK initiative sets its aim to promote and support innovation, technology and know-how transfer within the field of soil and groundwater investigation, remediation, and land revitalization[49].

Also The Institute of Natural Fibres and Medicinal Plants in Poznań, Poland is implementing the project Remediation Method of Degraded Land by Cultivation of Industrial Hemp in The Region of Liglife_logonite Mine Konin. This project seeks the methods of remediation of degraded areas as a result of application of new crop rotation systems and use of crops produced on post-mining areas as valuable, renewable raw material for cellulose and energy production. The project will create a model of soil remediation system and environmentally sound use of raw materials produced by cultivation of industrial crops, esp. industrial hemp[50].

With many policy-makers prioritizing innovation introduction and proliferation, the actual contour for innovations in remediation technology leaves much to be desired. To start with, innovative soil remediation is still widely perceived as any technology different from "dig and dump". Secondly, according to Hou, O'Connor and Al-Tabbaa even in the US, one of the leaders in environmental remediation industry, traditional methods of soil remediation (such as soil vapor extraction) prevail[51]. Third, some sites require up to 300 years, as reported by Cadotte, Deschênes and Samson, for a complete remediation cycle, which, on the one hand, creates some potential for midline introduction of innovative remediation technologies into current projects, but it also reduces the chances for full-scale technology approbation within the foreseeable future[52].

Evaluation of innovative technologies is commonly conducted by the researches themselves, who focus on quantitative output, i.e. higher performance level and lower costs as compared to the outdated technology. An exemplary case may be found in a 2009 work, in which the authors not only developed "an innovative stabilization/solidification (S/S) process using high-performance additivated concrete technology", but also conducted a brief cost evaluation and presented some long-term performance scenarios[53].

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47 Y. Spira, J. Henstock, P. Nathanail, D. Müller, D. Edwards, [2006]: *A European approach to increase innovative soil and groundwater remediation technology applications. Remediation, no. 16, pp. 81–96. doi: 10.1002/rem.20103.*

48 *Smartstripping. Emission-free Groundwater and Soil Remediation Retrived from http://ec.europa.eu/environment/eco-innovation/projects/en/projects/smartstripping.*

49 J. Krupanek, [2009]: *Innovative Soil Remediation Technologies, Perspectives of Polish – German Cooperation. Paper presented at the first TASK workshop on Monitored Natural Attenuation (MNA), Poland, Cracow, October 27-28.*

50 J. Mańkowski, A. Kubacki, J. Kołodziej, I. Pieniewska, P. Baraniewski, [2013]: *New remediation metod for degraded land by cultivating industrial hemp. The lignite mine "Konin" case study. [in] Malina G. (ed) 2013. Reclamation and revitalization of demoted areas. The Institute of Natural Fibres and Medicinal Plants in Poznań, pp. 85-91.*

51 D. Hou, D. O'Connor, A. Al-Tabbaa, [2014a]: *Comparing the Adoption of Contaminated Land Remediation Technologies in the United States, United Kingdom, and China. Remediation, no. 25, pp. 33–51. doi: 10.1002/rem.21413.*

52 M. Cadotte, L. Deschênes, R. Samson, [2007]: *Selection of a remediation scenario for a diesel-contaminated site using LCA. Int J Life Cycle Assess 12(4), pp. 239–251.*

53 P. Scanferla, G. Ferrari, R. Pellay, V. A. Ghirardini, G. Zanetto, G. Libralato, [2009]: *Remediation and Management of Contaminated or Degraded Lands Research. Journal of Soils and Sediments June 2009, Volume 9, Issue 3, pp 229-236.*

In the presented example the evaluation of innovation does not exceed the standard environmental risk assessment. This case, along with many others, spotlights a range of issues general to innovation in many spheres: the relevance of the research results to social and economic welfare of the country/region, opportunities for investment into and commercializing of the technology, finally, channels to transfer the technology from scholars to the industrial-scale practitioners. The importance of knowledge transfer was emphasized by Wozniak[54]. Such transfer is further disclosed in the "sticky information" theory, which connects the issues of cost, acquisition and transmission of information to impact on technology innovation and diffusion and specialization of firms.

12.7. Social Dimension of Site Remediation

The idea of sustainable remediation emerged from the necessity to project the principles of sustainable development on remediation practices. Mechanisms for sustainability evaluation in environmental remediation have been developed and implemented by a number of scholars. Despite variations in approaches, researchers and policy-makers recognize the significance of tools and mechanisms for thorough assessment of remediation sustainability with a special emphasis on the social dimension. The social dimension is one of the triple bottom line dimensions along with the economic and environmental, but only recently it gained attention in connection to remediation practices as being a vital component of sustainability assessment.

The social dimension of a remediation project is too complex for any single tool to evaluate the overall remediation effectiveness in a manner that would allow obtaining holistic quantitative results. Furthermore, it is argued that a simple qualitative assessment of all possible social indicators is better than quantitative evaluation of a few, as indicated Harclerode et al.[55]. Various qualitative and quantitative tools for evaluating social impacts used by practitioners are presented in Table 4.

Measuring social impact encounters limitations and knowledge gaps. To start with, social impact is not always included into evaluation[56]. According to Favara et al. risk assessment tends to be the only method used to evaluate human risks during site remediation[57]. As the social dimension is one part of the triple bottom line, evaluating social impacts is conducted within three separate assessments with different methodologies, which inherently leads to inconsistent overall evaluation and further unequal trade-offs[58]. Stakeholder collaboration is largely regarded as the key pillar in sustainable remediation projects, thus integrating divergent stakeholder perception enables adopting sustainable

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54 G. D. Wozniak, [1987]: *Human capital, information, and the early adoption of new technology. Journal of Human Resources, no. 22(1), pp. 101–112.*

55 M. Harclerode, D. R. Ridsdale, D. Darmendrail, P. Bardos, F. Alexandrescu, P. Nathanail, L. Pizzol, E. Rizzo, [2015]: *Integrating the Social Dimension in Remediation Decision-Making: State of the Practice and Way Forward. Remediation, no. 26, pp. 11–42, doi: 10.1002/rem.21447.*

56 A. G. Lee, O. Baldock, J. Lamble, [2009]: *Remediation or problem translocation: An ethical discussion as to the sustainability of the remediation market and carbon calculating. Environmental Claims Journal, no. 3, pp. 234-256.*

57 P. J. Favara, T. M. Krieger, B. Boughton, A. S. Fisher, M. Bhargava, [2011]: *Guidance for performing footprint analyses and life-cycle assessments for the remediation industry. Remediation Journal, no. 213, pp. 39–79.*

58 N. Lee, [2002]: *Integrated approaches to impact assessment: Substances or make-believe? Environmental assessment yearbook 2002. Manchester, U.K.: Institute of Environmental Management and Assessment, Lincoln and the EIA Centre, University of Manchester.*

remediation practices, although incorrect identification or disengagement of stakeholders may induce project failure[59],[60].

Table 4. **Tools for Evaluating Social Impact (various sources)**

Tools for Evaluating Social Impact	Description	Reference
Rating and Scoring System Evaluations	A rating metric that combines separate ratings into an overall score, which enables decision-makers to draw conclusions based on the results of the scoring. This tool's function is to eliminate the gap between quantitative and qualitative information.	Bargagliotti and Lingfang 2013; Petelina et al. 2014; Ridsdale 2015
Social Sustainability Evaluation Matrix (SSEM)	An Excel-based tool that measures impacts in four social dimensions: social-individual, socio-institutional, social-economic and social-environmental. The socio-individual and socio-institutional dimensions have 18 measures that refer to impacts on standard of living, education, population growth, justice and equality, community involvement, and fostering local heritage. The socio-economic dimension has 11 measures that refer to business ethics, fair trade, and worker's rights. The socio-environmental dimension has 13 measures that refer to natural resource consumption, environmental management, and contamination prevention.	Reddy et al. 2014
Social Science Methodologies	Application of social science methodologies within a particular remediation project. The most commonly used methodologies are snowball sampling, interest-influence matrices and actor-linkage matrices.	Reed et al. 2009, Hart & Sharma, 2004
Social Network Analysis	Social network analysis assesses and quantifies stakeholder involvement in a remediation projects by calculating centrality of the stakeholders and cohesiveness of the whole network.	Bodin et al., 2011
Multicriteria Decision Analysis (MCDA)	Multicriteria models help evaluate conflicting criteria in order to make sustainable remediation decisions. Four major types of MCDA exist: linear additive models, single synthesizing criterion approaches, outranking approaches to synthesizing process, analytical hierarchy process (AHP). AHP is considered to be most widely implemented method in evolution social impact in environmental remediation.	Kain and Söderberg 2008; Harclerode et al. 2015
Enhanced Life-Cycle Assessment	A life-cycle assessment that is extended to social impacts and comprises land use assessment, toxicity exposure, carbon footprint and global warming potential.	Page et al. 1999, Diamond and Campbell 1999

Source: *own elaboration based on literature review.*

[59] D. Hou, D. O'Connor, A. Al-Tabbaa, [2014b]: *Modeling the Diffusion of Contaminated Site Remediation Technologies. Water, Air, & Soil Pollution, September 2014, pp. 225:232.*

[60] M. Delmas, M. W. Toffel, [2004]: *Stakeholders and environmental management practices: an institutional framework. Bus Strateg Environ no. 13, pp. 209–222.*

12.8.Conclusions

This paper presented a variety of tools for remediation evaluation. Conducting extensive evaluation of the technology efficiency and effectiveness is not a simple task, which is further antagonized by the fact that each evaluation takes place on a site with unique characteristics. Consideration of various factors is the core part of an integrated assessment that helps identify the most sustainable and efficient procedure for site remediation.

Uncertainty about remediation technology performance might push practitioners to opt in favor of technologies that are already evaluated as ecologically effective, regardless of the unknown long-term social-economic impacts. Including (parallel with ecological evaluation) risk-based assessment or cost-benefit analysis should assist to determine which technology is more effective for a particular remediation project. Integrating tools to evaluate social impacts within the triple-bottom line of sustainability will provide positive insights on the remediation strategies.

The social dimension of site remediation is not only one of the most comprehensive tools to evaluate remediation, it addresses the contamination impact on the receptors within the exposed communities, incorporates stakeholder collaboration, promotes social and environmental justice, and contributes to local, regional and global sustainability polices. While many current literature and projects target internal aspects of remediation, it is already possible to foster the transition from traditional ecological evaluation to social approach. Support from policy-makers is required in order to formalize methodologies of measuring social impacts in remediation frameworks, whereas scholars should include evaluation of social impacts into development of new sustainable remediation technologies.

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PART IV
ENVIRONMENTAL AND LEGAL DEVELOPMENT OF RURAL AREAS

13

RENEWABLE ENERGY IN THE WARMIA AND MAZURY REGION IN POLAND

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Abstract

The Warmia and Mazury region is an area of special and unique natural values. It is situated in the north-east of Poland and occupies 7.7% of the national area. In recent years, the consumption of energy produced from fossil fuels has been decreasing, with a simultaneous increase in the production and consumption of energy from renewable energy sources (RES). The aim of this study is to characterise the level of consumption of energy produced from renewable sources and from fossil fuels in the region of Warmia and Mazury and to determine the potential for future development of energy consumption from renewable sources. It seems that it is natural for the region to make the most effective use of biomass of various origins, as the potential for acquisition of such materials in the region is significant. Moreover, using biomass for energy production may provide continuous stimulation for infrastructure development in rural areas as well as for implementation of modern technologies of biomass conversion to useful and diverse bioproducts.

Key words: renewable energy; biomass; wind; geothermal; Warmia and Mazury region; Poland

13.1. Introduction

Energy security, along with food safety and environmental protection, is one of the key factors which influence the existence and development of human civilisation. Currently, energy is produced mainly from fossil fuels. As the output of such fuels increases, their deposits gradually decrease; new ones may be discovered, but their exploitation is increasingly difficult and costly. For example, the average price of oil from the OPEC

countries in the period between 2001 and 2008 increased from nearly 23 to almost 95 USD/barrel. During the economic crisis of 2009 the prices dropped to approx. 61 USD/barrel. They then increased rapidly to exceed 105 USD/barrel at the beginning of 2013[1]. It is noteworthy that the EU countries, including Poland, are becoming increasingly reliant on fuels delivered from outside the EU. Such deliveries in the years 2006-2010 accounted for 53.7% and 52.7% of their energy consumption, respectively. Such values for Poland were 20.0% and 31.5%[2]. Owing to its own resources, Poland is potentially self-sufficient in terms of its hard coal consumption. However, in 2010 it imported about 69% of its natural gas and about 97% of its oil. Therefore, it is very important to reduce the dependence on such imports at the EU level, in Poland, and on a local scale. It is all the more important that no fossil fuels are excavated in the Warmia and Mazury region. Despite this, drilling in search of shale gas has been carried out near Braniewo in the northern part of the region, bordering on the Russian Federation. Initial search results have been promising, which may mean that in several years fuel could be obtained in this way, but there is still a long way to go before it is accomplished.

Consequently, there has been growing interest in renewable energy sources, which could reduce the dependence on imported fossil fuels and diversify the energy sources. Directive 2009/28/EC of the European Parliament and the Council[3] set out new goals with regard to using renewable energy sources, energy saving and greenhouse gas emissions. Consumption of energy from renewable sources in Poland is to reach 15% by 2020. In the Warmia and Mazury region, there should be no problem with achieving the goal set for Poland; what is more, the region has potential to become one of the national leaders in producing energy from renewable sources and RES could become one of the main factors to boost the economic development of the region.

Producing energy from renewable sources is also very important from a socio-economic point of view. This is because there were 113,2 thousand registered unemployed people at the end of December 2012 in the Warmia and Mazury region; therefore, the unemployment rate was very high – 21.2% – whereas the value for the entire country was 13.4%[4,5]. On the other hand, RES can help to increase the number of jobs and to stimulate the economic development of the region. In 2009, the renewable energy production sector in the 27 EU countries employed, directly and indirectly, over 912 thousand people[6]. Of them, over 283.7 thousand were employed in energy production from solid biomass, 243.6 thousand in energy production from wind and 121.8 thousand were employed with photovoltaic cells. Those numbers for Poland were 7.0 thousand, 3.0 thousand and 100 people, respectively. Altogether, there were about 19.1 thousand people employed in the

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1 *Organization of the Petroleum Exporting Countries, OPEC basket price, http://www.opec.org/opec_web/en/data_graphs/40.htm?selectedTab=annually (accessed on July 16, 2013).*

2 *Eurostat, Energy, transport and environment indicators, Pocketbooks, Eurostat, 2012 Luxembourg p. 247.*

3 *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.*

4 *Główny Urząd Statystyczny. Mały Rocznik Statystyczny Polski 2013 [Concise Statistical Yearbook of Poland 2013]. GUS, 2013, Warsaw, p. 745 [in Polish].*

5 *Urząd Statystyczny w Olsztynie. Biuletyn statystyczny województwa warmińsko-mazurskiego [Statistical bulletin of warminsko –mazurskie voivodship]. Urząd Statystyczny w Olsztynie, 2013, Olsztyn [in Polish], http://olsztyn.stat.gov.pl/dane-wojewodztwa---2013-1079/, (accessed on July 16, 2013).*

6 EurObserv'ER, *The state of renewable energies in Europe, 10th EurObserv'ER Report, EurObserv'ER. 2010, Paris, p. 248.*

renewable energy sector in Poland in 2009, whereas the number for Germany was 333 thousand people.

Moreover, the economic output of the renewable energy sector in the EU countries was estimated at 120,185 million € (M€) in 2009. The highest turnover was recorded for Germany (36,650 M€), with 1,410 M€ recorded for Poland. These data confirm that RES bring both social and economic benefits. Producing energy from renewable sources rather than from fossil fuels is also more beneficial to the environment[7,8].

Therefore, RES have been playing an increasingly important role in producing primary energy in Poland and in the EU. The amount of primary energy produced from renewable sources has been growing since 2002[9]. Energy production from renewable sources in Poland increased from 5.2% to 10.2% between 2002 and 2010. The share of energy production from RES in the EU-27 increased in the same period from 10.4% to 20.1%. Rapid development of energy production from RES has also been observed on the global scale[10]. The share of renewable energy in global final energy consumption in 2009 was equal to 16%. In this, biomass consumption accounted for the largest part, followed by hydropower, wind, solar, geothermal energy, modern biomass and biofuels. Of all the countries of the world, the highest level of investment in RES is in China (wind power, solar hot water/heat), Germany (solar PV, biodiesel production) and the USA (ethanol production).

13.2. Aim and Methodology

The aim of the study was to characterise the level of consumption of energy produced from renewable sources and from fossil fuels in the region of Warmia and Mazury and to determine the potential for the development of energy consumption from renewable sources. Research was based mainly on surveys, database and a literature review.

13.3. Results

13.3.1. A description of Warmia and Mazury

Warmia and Mazury is situated in the north-east of Poland (Fig. 1) and the capital city is Olsztyn.

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7 B. Igliński, A. Iglińska, W. Kujawski, R. Buczkowski, M. Cichosz, [2011]: *Bioenergy in Poland. Renewable and Sustainable Energy Review 15, 2999-3007.*

8 K. McCormick, T. Key Kaberger, [2007]: *Barriers for bioenergy in Europe: economic conditions, know-how and institutional capacity, and supply chain co-ordination. Biomass and Bioenergy 31, 443-452.*

9 *Główny Urząd Statystyczny. Energia ze źródeł odnawialnych w 2011 roku [Energy from renewable sources in 2011]. GUS, 2012, Warsaw, p. 83 [in Polish].*

10 REN21, Renewables 2011, *Global Status Report, 2011, http://www.ren21.net/Portals/97/documents/GSR/REN21_GSR2011.pdf (accessed February 15, 2012).*

Figure 1. **The location of Warmia and Mazury in Poland (grey colour)**
Source: own elaboration

The region occupies an area of 2,417.3 thousand ha, which is 7.7% of the national area (Table 1). The population size is 1,450.7 thousand people and it accounts for 3.8% of the national population. The average population density in the region is half of the national average. Warmia and Mazury stands out among other regions of Poland and Europe in terms of its biodiversity, which includes a diverse landscape, dense forest complexes, clean air, and numerous lakes. There are about 3 thousand lakes in the region, with about 2 thousand of them exceeding 1 ha. The lakes occupy about 5% of the region's area[11]. This is the reason why the region is sometimes called "the land of a thousand lakes" and is also situated within the "Green Lungs of Poland" area. The air is clean, which is the result of the low level of industrial pollution emissions, both dust and gases. Another characteristic of the region is the high share of areas which are legally protected because of their particularly high natural value, which now account for an area of 1,129.4 thousand ha (46.7% of the province) (Table 1). Therefore, the area of nature value per inhabitant is 7,775 m^2, which is three times the national average. Forests and forest land account for 32.5% of the region, while the national average equals 30.7%.

On the other hand, Warmia and Mazury is a typical agricultural region. Land used for agriculture occupies an area of 1,319 thousand ha. The area used for crop cultivation in 2012 was 885.3 thousand ha, more than 50% of which were used to produce basic cereals. Livestock per 100 ha of agricultural land was 32.9 cattle and 40.9 pigs[4,5,11]. The period of vegetation in the north-east of Poland (including Warmia and Mazury) is shorter than in other regions and ranges from 199 to 208 days, with an average of 205 days[12].

Annual precipitation ranges from 550 to 650 mm, with 418.3 mm on average during the vegetation period (April-October). The average number of days with precipitation exceeding 0.1 mm is 173 days, with the highest rainfall usually occurring in June and July (75-77 mm a month, on average). The average annual temperature is equal to 7.2°C, and 12.9°C during the vegetation period (April-October). The highest temperatures are

[11] *Główny Urząd Statystyczny. Ochrona środowiska 2012 [Environmental protection 2012]. GUS, 2012, Warsaw, p. 599 [in Polish with English summary].*

[12] Z. Szwejkowski, A. Nowicka, B. Banaszkiewicz, [2002]: *Klimat Pojezierza Mazurskiego cz.3 [Climate of the Mazurian Lakeland Part 3]. Fragmenta Agronomica, 2, 307-316 [in Polish with English Summary].*

recorded in July-August, sometimes exceeding 35°C[13]. Soils in the region vary, because of the diversity of the bedrock, terrain relief, weather and hydrographic conditions. The diversity of these factors results in zonal variability of the soil cover from north to south. Soils in the north of the region are fertile, usually brown or black. Those in the medium part are varied, with brown, grey-brown, rusty, deluvial and gley soils. Soils in the southern part of the region are poor, with low fertility and are usually rusty and podsolic. The average soil quality in the region is resembles that of the entire country. Brown soils dominate in the region (accounting for about 70% of its area) followed by hydrogenic soils (approx. 14% of the area)[14].

Table 1. **Comparison of Warmia and Mazury and Poland**

Characteristic	Warmia and Mazury	Poland
Total area, thousand ha	2,417.3	31,268
Population, thousand people	1,450.7	38,512
Population per 1 km^2 of total area	60	123
Total gross domestic product, million euro	10,078	363,154
Gross domestic product per capita, euro	7,100	9,500
Atmospheric emission of industrial particulates, thousand tonnes	1.2	62.5
Emission of gaseous pollutants, thousand tonnes	9.6	1,703.9
Objects and area of special nature value protected by law, thousand hectares	1,129.4	10,148.7
Objects and area of special nature value protected by law, per capita, m^2	7,775	2,633
Agricultural land, total, thousand ha	1,319	18,825
Forests and forest land, thousand ha	785.6	9,600
Crop cultivation area, total, thousand ha	885.3	13,981
Cattle, thousand	435	5,777
Cattle per 100 ha of agricultural land	32.9	38
Pigs, thousand	539.3	11,581
Pigs per 100 ha of agricultural land	40.9	77

Source: Główny Urząd Statystyczny. Mały Rocznik Statystyczny Polski 2013 [Concise Statistical Yearbook of Poland 2013]. GUS, 2013, Warsaw, p. 745 [in Polish].

Urząd Statystyczny w Olsztynie. Biuletyn statystyczny województwa warmińsko-mazurskiego [Statistical bulletin of warminsko –mazurskie voivodship]. Urząd Statystyczny w Olsztynie, 2013, Olsztyn [in Polish], http://olsztyn.stat.gov.pl/dane-wojewodztwa---2013-1079/, (accessed on July 16, 2013).

Główny Urząd Statystyczny. Ochrona środowiska 2012 [Environmental protection 2012]. GUS, 2012, Warsaw, p. 599 [in Polish with English summary].

[13] S. Suchecki, Z. Szwejkowski, E. Dragańska, E. Olba-Zięty, [2011]: *Thermal and pluviometric characteristics of north-eastern Poland in 1966-2005. in: Z. Szwejkowski (Eds.). Climate and agroclimate of north-eastern Poland. Wydawnictwo UWM, Olsztyn, pp. 6-66.*

[14] Urząd Marszałkowski Województwa Warmińsko-Mazurskiego, *Program ochrony środowiska województwa warmińsko-mazurskiego na lata 2007-2010 z uwzględnieniem perspektywy na lata 2011-2014 [The Environmental Protection Programme for the Province of Warmia and Mazury for 2007-2010 including the perspectives for 2007-2010], Urząd Marszałkowski Województwa Warmińsko Mazurskiego, Departament Ochrony Środowiska, Olsztyn, 2007 [in Polish], http://bip.warmia.mazury.pl/urzad_marszalkowski/505/547/Program_ochrony_srodowiska_Wojewodztwa_Warminsko_-_Mazurskiego_na_lata_2007_-_2010_z_uwzglednieniem_perspektywy_na_lata_2011_-_2014 (accessed August 1, 2012).*

13.3.2. The Balance of Consumption of RES and Fossil Fuels

The share of energy from renewable sources in the total energy consumed in Warmia and Mazury has been growing since 2003 (Table 2, Fig. 2). In 2003, 4169.02 TJ of energy from renewable sources was consumed, and by 2007 this amount had increased by 23.7%. Energy from renewable sources consumed during the period in question accounted for 5.2% and 7.6% of the total energy consumed in the region[15]. On the other hand, the greatest increase in renewable energy consumption took place in 2009: it was higher by 59.5% as compared to 2007. The share of renewable energy in total energy consumption in 2010 was close to that of the previous year.

Table 2. **Balance of consumption of renewable energy sources and fossil fuels in Warmia and Mazury (TJ)**

Item	Year			
	2003	2007	2009	2010
Renewable energy				
Solar energy	0.98	3.07	6.17	12.86
Wind energy	0.00	170.42	319.57	301.86
Hydro power	222.00	173.16	167.54	177.04
Biomass	3,946.00	4,811.06	7,735.00	7,743.50
Heat pumps	0.04	0.05	0.10	0.20
Photovoltaic cells	0.00	0.00	0.00	0.30
Total renewable energy	4,169.02	5,157.76	8,228.38	8,235.76
Non-renewable energy				
Hard coal	40,144.00	22,471.00	22,701.00	23,368.00
Pipeline gas	6,626.00	6,077.00	6,469.00	6,421.00
Liquefied gas	1,660.60	1,410.00	1,805.00	1,662.50
Heavy and light heating oil	2,270.60	1,849.00	2,368.00	2,226.00
Vehicle fuels (petrol and diesel oil)	16,313.00	20,568.00	23,015.00	22,879.47
Conventional electricity	9,166.40	10,119.00	11,905.00	11,739.60
Total non-renewable energy sources	76,180.60	62,494.00	68,263.00	68,296.57
Total	80,349.62	67,651.76	76,491.38	76,532.33

Source: Koniecko A, Sprawozdanie z realizacji programu ekoenergetycznego województwa warmińsko – mazurskiego na lata 2005 – 2010 [Progress report on the ecoenergy program realisation in the Province of Warmia and Mazury for 2005-2010], 2008 [in Polish], http://www.wrota.warmia.mazury.pl/images/stories/srodowisko/zrodla_energi/spr_programu_ekoenergetycznego.pdf (accessed on February 15, 2012).
Warmińsko-Mazurska Agencja Energetyczna. Program ekoenergetyczny województwa warmińsko-mazurskiego na lata 2005–2010 [The Energy Regulatory Authority of the Province of Warmia-Mazury 2011. Ecoenergy program in the Province of Warmia and Mazury for 2005-2010 – in Polish], http://www.wmae.pl/userfiles/file/Do%20pobrania/koncowe_sprawozdanie_z_realizacji_programu_ekoenergetycznego_2010_-_2011.pdf (accessed May 22, 2012).

[15] A. Koniecko, [2008]: *Sprawozdanie z realizacji programu ekoenergetycznego województwa warmińsko – mazurskiego na lata 2005 – 2010 [Progress report on the ecoenergy program realisation in the Province of Warmia and Mazury for 2005-2010], [in Polish], http://www.wrota.warmia.mazury.pl/images/stories/srodowisko/zrodla_energi/spr_programu_ekoenergetycznego.pdf (accessed on February 15, 2012).*

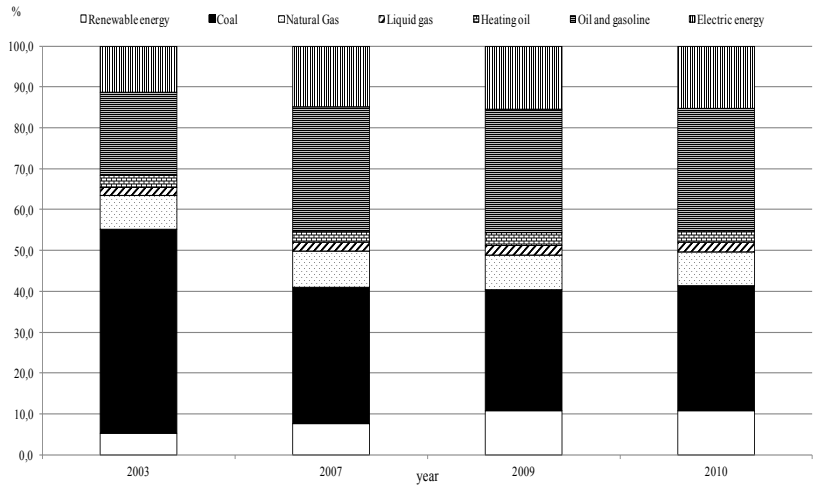

Figure 2. **Structure of consumption of energy sources in Warmia and Mazury**

Source: Warmińsko-Mazurska Agencja Energetyczna. Program ekoenergetyczny województwa warmińsko-mazurskiego na lata 2005–2010 [The Energy Regulatory Authority of the Province of Warmia-Mazury 2011. Ecoenergy program in the Province of Warmia and Mazury for 2005-2010 – in Polish], http://www.wmae.pl/userfiles/file/Do%20pobrania/koncowe_sprawozdanie_z_realizacji_programu_ekoenergetycznego_2010_-_2011.pdf (accessed May 22, 2012).

It is noteworthy that the consumption of fossil fuels in 2007 decreased by approx. 18% as compared to 2003 (Table 2, Fig. 2). This includes a decrease in hard coal consumption by 44%, fuel oil by nearly 19%, liquefied gas by 15%, and natural gas by 8%. On the other hand, consumption of oil-derived vehicle fuels increased by over 26% and that of conventional energy by 10%. The consumption of all fossil fuels in successive years increased by 9% as compared to 2007, but it was still lower by approx. 10% than in 2003. In 2010, 68,296.57 TJ of energy from fossil fuels were consumed, whereas the total consumption of energy from renewable sources and from fossil fuels amounted to 76,532.33 TJ. Hard coal accounted for 30.5%, vehicle fuels (petrol and fuel oil) 29.9%, total gas 10.6% and heating oil nearly 3%. The consumption of energy from renewable sources in Warmia and Mazury (10.8%) was higher than the average value for Poland (7%). The gross consumption of energy in Poland is dominated by hard coal 41%, lignite 13%, oil 26% and natural gas 13%. The respective values for EU countries are 10%, 5%, 37%, 24%, with an additional 14% for nuclear energy, while renewable energy sources account for 9%[2].

13.4. Characterisation and Structure of Consumption of Energy from Renewable Sources

13.4.1. Biomass

Currently, biomass dominates among RES consumed in Warmia and Mazury; its consumption is close to 94% (Fig. 3). Solid biomass is also the main source of renewable energy on the national scale (85.6%); while the value for the EU countries is equal to 48.5%[9].

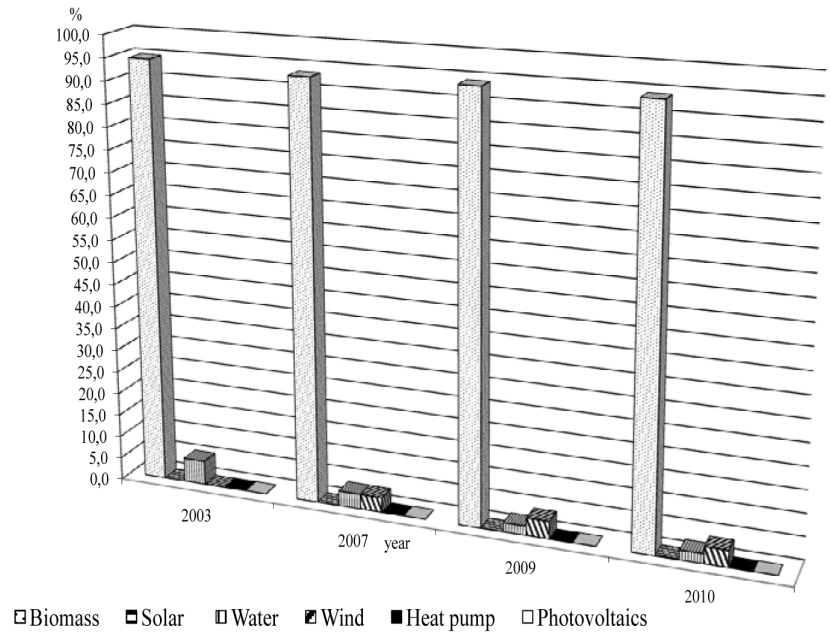

Figure 3. **Structure of the consumption of energy from renewable sources in Warmia and Mazury**

Source: Warmińsko-Mazurska Agencja Energetyczna. Program ekoenergetyczny województwa warmińsko-mazurskiego na lata 2005–2010 [The Energy Regulatory Authority of the Province of Warmia-Mazury 2011. Ecoenergy program in the Province of Warmia and Mazury for 2005-2010 – in Polish], http://www.wmae.pl/userfiles/file/Do%20pobrania/koncowe_sprawozdanie_z_realizacji_programu_ekoenergetycznego_2010_-_2011.pdf (accessed May 22, 2012).

Biomass as a material for energy production is obtained mainly as forest production waste, from wood processing plants as chips and bales. In 2009, 3,313.8 thousand of cubic metres of wood was acquired, 98.9% of which was acquired in public forests. Compared to 2000, the amount of acquired wood increased by 18.2%. Timber accounted for 96.3% of all the wood acquired. The amount of timber acquired per 100 ha of the forest area was equal to 433.8 m³, with 359.8 m³ acquired per 100 ha in the entire country, placing Warmia and Mazury fifth among all provinces[16]. According to the quality and quantity classification, of the 33,769.1 thousand m³ of wood acquired in 2010, 3,814.87 thousand m³ was acquired for fuel. This included fuel wood of coniferous trees (class S4) – 1,188.6 thousand m³, hardwood for fuel (S4) – 1,228.7 thousand m³, small-size wood (M2) 1,397.5 thousand m³ and underground parts of trees used as fuel – 0.070 thousand cubic meters[15]. It is estimated that as much as 1,526.2 thousand m³ of wood for use in energy production could be acquired in the Warmia and Mazury region[17].

Other commonly-used sources of energy include cereal and rape straw as a by-product in the production of cereals and rapeseed. The total output of straw in Poland

[16] *Główny Urząd Statystyczny. Leśnictwo 2011 [Forestry 2011]. GUS, 2011. Warsaw, p. 335 [in Polish with English summary].*

[17] M. Pigan, [2009]: *Dostępność biomasy z Lasów Państwowych dla energetyki zawodowej w perspektywie 20 lat. In: Materiały konferencyjne Odnawialne* źródła *energii – ocena zasobów paliw do produkcji OZE [Availability of biomass from the State Forests for professional energy purposes in a 20-year perspective. In: Proceedings of Renewable Energy Sources – assessment of fuel resources for production of energy from renewable resources]. Kielce [in Polish].*

(from cereals, rape and maize) varies from year to year and ranges from 25 to 30 million tonnes. The consumption of straw for litter, fodder, ploughed-in and used for substrate for mushroom production is estimated to be about 19.2 million tonnes. Surplus straw amounts to about 9 million tonnes, at least 30-40% of which can be used for other purposes (e.g. energy production). Therefore, it is estimated that about 3-4 million tonnes of straw a year can be used for energy production[18]. Large amounts of straw can be acquired mainly in the areas where large farms dominate, where cereals and rape cultivation area account for over 90% of all the arable land, and where animal production output is low. About 50% of straw on such farms is ploughed in to ensure a proper balance of organic matter in soil, and the remaining material can be used for energy production. It should also be stressed that the amount of such surplus varies from region to region. The average area of agricultural land per farm in Warmia and Mazury is among the largest in Poland and it amounts to 22.88 ha in 2012, with the value for the entire country equal to 10.38 ha[19].

Therefore, there is potential for acquiring straw for energy production in the region. It is estimated that the total annual straw output in the region is 1,463 thousand tonnes, 330 thousand tonnes of which can be used for energy production[20,21]. It is estimated that the highest surplus of straw in Poland exists in the Lublin and Wielkopolska provinces – 1,480 and 1,110 thousand tonnes, respectively.

Recently, the production of compact fuels has been developing, such as biomass briquettes and pellets produced from forest and agricultural production as well as the food industry. There are several pellets production plants situated in Warmia and Mazury – in Orneta, Pisz, Wielbark, Mrągowo, Elbląg, Niechłonin and their output ranges from 1 to 3 tonnes per hour (Fig. 4). Meanwhile, there are about 30 pellet production plants of considerable size in the country. Pellet production in Poland is growing very rapidly. It amounted to about 20 thousand tonnes in 2003, to reach 410 thousand tonnes in 2009 and about 595 thousand tonnes in 2010. Pellet consumption for energy production is also growing in the EU; it amounted to 1.3 million tonnes in 2002, about 10 million tonnes in 2009 and it is estimated to exceed 11 million tonnes in 2010[22,23,24].

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18 J. Kuś, A. Faber, [2009]: *Produkcja roślinna na cele energetyczne a racjonalne wykorzystanie rolniczej przestrzeni produkcyjnej Polski. I Kongres Nauk Rolniczych. Przyszłość sektora rolno-spożywczego i obszarów wiejskich [Crop production for energy purposes and national utilization of Polish agricultural lands. Proceedings of First Congress of Agricultural Sciences. The future of agricultural and food production sector and rural areas]. IUNG-PIB, Puławy, p. 63-75 [in Polish with English summary].*

19 Agencja Restrukturyzacji i Modernizacji Rolnictwa. *Ogłoszenie Prezesa Agencji Restrukturyzacji i Modernizacji Rolnictwa z dnia 17 września 2012 r. w sprawie wielkości średniej powierzchni gruntów rolnych w gospodarstwie rolnym w poszczególnych województwach oraz średniej powierzchni gruntów rolnych w gospodarstwie rolnym w kraju w 2012 roku [Average farm size. Announcement of the president of the Agency for Restructuring and Modernisation of Agriculture of 17 September 2012 – in Polish], http://www.arimr.gov.pl/dla-beneficjenta/srednia-powierzchnia-gospodarstwa.html (accessed June 20, 2013).*

20 A. Faber, J. Kuś, M. Matyka, [2009]: *Uprawa roślin na potrzeby energetyki [Plant production for energy purposes]. Konfederacja Pracodawców Prywatnych, Warsaw [in Polish].*

21 J. Kuś, A. Madej, J. Kopiński, [2006]: *Bilans słomy w ujęciu regionalnym. Regionalne zróżnicowanie produkcji rolniczej w Polsce [Straw balance in regions. Regional Diversity of Agricultural Production in Poland]. Raporty IUNG-PIB 3, 211-226 [in Polish with English summary].*

22 Pelletsatlas. *Pelets market database, http://www.pelletsatlas.info/cms/site.aspx?p=9138 (accessed March 06, 2012).*

23 E. Tromborg, B. Solberg, T. Ranta, J. Schweinie, D.G. Tiffany, [2011]: *Costs and policy means for production of wood pellets–a comparative study between Finland, Germany, Norway and the US. In: Proceedings of 19th European Biomass Conference and Exhibition, Berlin, Germany.*

24 E. Wach, [2011]: *Aktualności rynku pelet na koniec 2010 roku [Latest developments on the pellets market at the end of 2010]. Czysta Energia, 6, 42-44 [in Polish].*

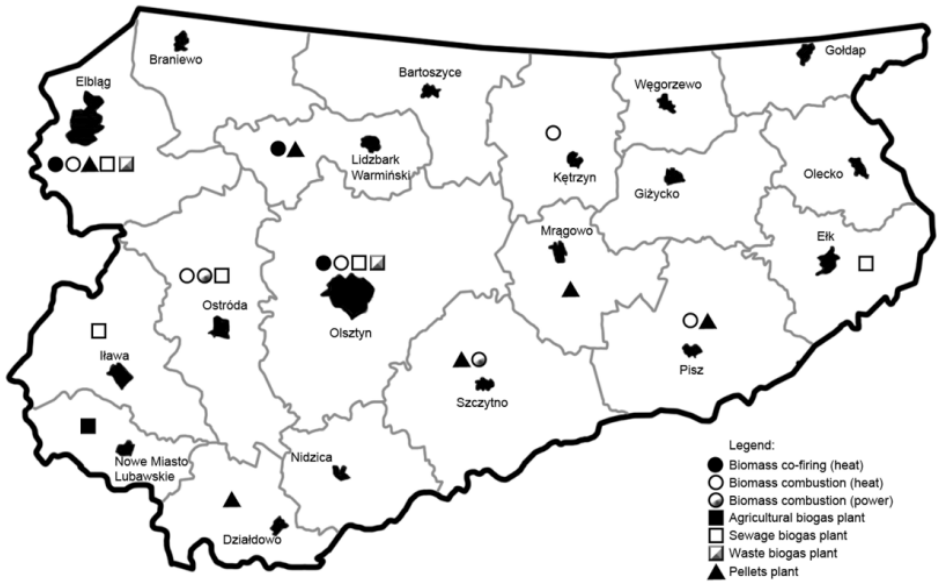

Figure 4. **Pellet production, heat producing plants, CHP plants and biogas plants in the counties of Warmia and Mazury**

Source: E. Wach. Aktualności rynku pelet na koniec 2010 roku [Latest developments on the pellets market at the end of 2010]. Czysta Energia, 6 (2011), 42-44 [in Polish].

There are also briquette production plants with an annual output ranging from 2 to 5 thousand tonnes. For example, according to the data provided by the Wektor company, there are four lines of briquette production from straw and three lines for briquette production from sawdust[25]. The company is also reported to have sold about 300 briquette production machines in Poland since 2005. Briquette production lines are also produced in the Warmia and Mazury region[26]. A typical LTBS process line includes a grinding unit and a briquetting unit. Productivity of a complete line ranges from 1.0 t/h to 1.6 t/h. The total power installed of the devices which comprise a complete process line for briquette production is about 250 kW, with a power demand of about 175 kW.

The area of cultivation of perennial energy plants in the Warmia and Mazury region was 898 ha in 2008 (Table 3). The largest area was recorded in the county of Elbląg. This trend in biomass acquisition is still poorly developed because the area of cultivation of perennial plants was 1,244 ha in 2010, with the cultivation of willow (580 ha) dominating. However, the cultivation of *Miscanthus* x *gigantheus* (540 ha) has been growing rapidly recently, mainly due to an easier production technology.

[25] Wektor Toruń. *Mapa sprzedaży brykieciarek [A list of purchased briquetting machines – in Polish], http://www.wektortorun.com/?n=b_mapa&l=pl (accessed April 24, 2012).*

[26] URSUS. *Briquettes production line, http://ursus.com.pl/Produkcja-biomasy/Linia-do-brykietowania-slomy#LTBS (accessed July 3, 2013).*

Table 3. **The area of cultivation of willow and other perennial energy plants in Warmia and Mazury (ha)**

County	Year	
	2008	2010
Bartoszyce	-	1.1 (incl. 0,6 willow, 0.5 *Miscanthus*)
Braniewo	164.3 (incl. 100.5 of willow, 41.0 *Miscanthus*, 22.8 Virginia fanpetals)	466.0 (incl. 70.0 willow, 339.0 *Miscanthus*, 17.0 Virginia fanpetals, 40.0 reed canarygrass)
Działdowo	12.0	8.7
Ełk	8.1	-
Elbląg	372.5	334.6 (incl. 134.6 willow, 200.0 *Miscanthus*)
Giżycko	53.2	53.5
Gołdap	-	3.3 (incl. 1.0 willow, 1.0 *Miscanthus*, 0.3 Virginia fanpetals, 1.0 poplar)
Iława	31.1	60.3
Kętrzyn	4.0	3.19
Lidzbark Warmiński	10.0	11.6
Mrągowo	6.5	3.5 (incl. 1.5 willow, 2.0 Virginia fanpetals)
Nidzica	37.5	38.5
Nowe Miasto	18.3	23.1
Olecko	-	-
Olsztyn	28.5	58.08
Ostróda	136.1	168.3
Pisz	4.0	-
Szczytno	-	10 reed canarygrass
Węgorzewo	12.3	-
Total	898.4	1243.77

Source: Warmińsko-Mazurska Agencja Energetyczna. Program ekoenergetyczny województwa warmińsko-mazurskiego na lata 2005–2010 [The Energy Regulatory Authority of the Province of Warmia-Mazury 2011. Ecoenergy program in the Province of Warmia and Mazury for 2005-2010 – in Polish], http://www.wmae.pl/userfiles/file/Do%20pobrania/koncowe_sprawozdanie_z_realizacji_programu_ekoenergetycznego_2010_-_2011.pdf (accessed May 22, 2012).

The plant is grown mainly in the county of Braniewo (339 ha) and the county of Elbląg (200 ha). The area of cultivation of perennial energy plants in the region accounted for approx. 12.2% of the total production in Poland, where about 10.2 thousand ha of perennial plants are cultivated[27]. Willow cultivated on 6.2 thousand ha clearly dominates among all the plants grown for biomass in Poland. Plantations of *Miscanthus* x *gigantheus* occupy an area of 1.8 thousand ha, and those of other grasses – 1.4 thousand ha. Meanwhile, poplar trees are cultivated on 0.6 thousand ha, and Virginia fanpetals on 0.1 thousand ha. This data indicates that cultivation of perennial plants in Poland is at an initial stage. The target area of such plants in Poland should reach approx. 500 thousand ha by 2020[19,28]. This is

[27] R. Gajewski, [2010]: *Potencjał rynkowy produkcji BIOB z przeznaczeniem na cele energetyczne, in: P. Bocian, T. Golec, J. Rakowski (Eds.). Nowoczesne technologie pozyskiwania i energetycznego wykorzystania biomasy. [Market potential of BIOB production for energy purposes. Modern technologies of production and application of biomass for energy purposes]. Instytut Energetyki, Warsaw, pp. 414-418 [in Polish].*

[28] W. Budzyński, S. Szczukowski, J. Tworkowski, [2009]: *Wybrane problemy z zakresu produkcji roślinnej na cele*

possible to achieve because the area of land suitable for plantations of perennial energy plants has been estimated to be near 954 thousand ha nationally, and to be 42.6 thousand ha in Warmia and Mazury–[29]. Perennial plants can provide considerable amounts of biomass owing to their high production potential[30,31]. In addition, plantations of energy plants can be fertilised with sewage sludge[32].

According to the data provided by the Agricultural Market Agency, as of 6 November 2011, there were 9 entities buying biomass produced from annual plants in Warmia and Mazury as well as 20 approved processing facilities which process and use biomass for energy production from annual (17 units) and perennial plants (3 units). Moreover, the register of liquid biofuel producers in Warmia and Mazury includes the fuel terminal in Gutkowo (County of Olsztyn), where methyl esters are stored and released for sale. The facility in Lenarty (County of Olecko) produces and stores bioethanol[33].

Currently, there are only two agricultural biogas plants with a power output of 3.2 MW in the region of the village of Boleszyn (2.0 MW), the commune of Grodziczno, the county of Nowe Miasto Lubawskie and in village of Brzydowo (1.2 MW), the commune of Świątki and the county of Olsztyn (Fig. 4). Moreover, there are five biogas plants at wastewater treatment plants and three at landfill sites. However, it can be supposed that several new agricultural biogas plants will be launched within the next few years because such investment projects are being prepared in the communes of: Świętajno (0.5 MW), Dźwierzuty (14 MW), Kisielice (2 MW), Giżycko, Ełk, Korsze and Olecko. Such investment projects can be subsidised by the Agency for Restructuring and Modernisation of Agriculture after farmers have filed relevant applications[34]. Within such programs, several applications for construction of farm biogas plants have been filed in Warmia and Mazury. Around the entire country, there are 28 agricultural biogas plants with power outputs ranging from several dozen kWe to over 2 MWe[34,35]. It is expected that biogas production in Poland will develop rapidly due to Poland's potential in this respect. Moreover, this type of renewable energy production is supported by government policies

energetyczne. In: Pierwszy Kongres Nauk Rolniczych. Przyszłość sektora rolno-spożywczego i obszarów wiejskich [Selected problems from the scope of crop production for energy generation. In: Proceedings of First Congress of Agricultural Sciences. The future of agricultural and food production sector and rural areas], IUNG-PIB,, Puławy, pp. 76-89 [in Polish with English summary].

[29] J. Jadczyszyn, A. Faber, A. Zalewski, [2008]: *Wyznaczanie obszarów potencjalnie przydatnych do uprawy wierzby i ślazowca pensylwańskiego na cele energetyczne w Polsce [Determination of areas potentially usefull for the production of willow and Virginia mallow for energy purposes in Poland]. Studia i Raporty IUNG-PIB 11, 55-65 [in Polish with English summary].*

[30] M. Stolarski, S. Szczukowski, J. Tworkowski, A. Klasa, [2008]: *Productivity of seven clones of willow coppice in annual and quadrennial cutting cycles. Biomass and Bioenergy 32, 1227-1234.*

[31] M. Stolarski, S. Szczukowski, J. Tworkowski, H. Wróblewska, M. Krzyżaniak, [2011]: *Short rotation willow coppice biomass as an industrial and energy feedstock. Industrial Crops and Products 33, 217-223.*

[32] I. Dimitriou, H. Rosenqvis,t [2011]: *Sewage sludge and wastewater fertilisation of Short Rotation Coppice (SRC) for increased bioenergy production – Biological and economic potential. Biomass and Bioenergy 35, 835-842.*

[33] Agencja Rynku Rolnego, *Lista zatwierdzonych podmiotów skupujących i zatwierdzonych pierwszych jednostek przetwórczych, rejestr wytwórców; rejestr przedsiębiorstw energetycznych zajmujących się wytwarzaniem biogazu rolniczego [A list of the approved purchasing entities and the first approved processing entities, a producers' list, a list of energy entities producing agricultural biogas – in Polish], http://www.arr.gov.pl (accessed February 24, 2012).*

[34] ARMiR. *Różnicowanie kierunku działalności nierolniczej [Diversification of non-agricultural activities – in Polish], http://www.arimr.gov.pl/fileadmin/pliki/Publikacje-biblioteka/B_311_09_2011.doc (accessed July 28, 2013).*

[35] W.M. Budzianowski, I. Chasiak, [2011]:*The expansion of biogas fuelled power plants in Germany during the 2001-2010 decade: Main sustainable conclusions for Poland. Journal Power Technologies 91, 102-113.*

and grants[36]. It is estimated that raw material potential for biogas production, using available agricultural by-products and agri-food industry waste, is approx. 1.7 billion m^3 of biogas a year. After being purified, such an amount of biogas could satisfy approx. 10% of the national demand for gas or fully satisfy the demand from consumers in rural areas and additionally supply 125 thousand MWh of electrical power and 200 thousand MWh of thermal energy.

There are two installations in Warmia and Mazury which produce electricity from solid biomass. Meanwhile, solid biomass is used in the province mainly to produce heat as domestic hot water and hot water for space heating. The largest installation where wood chips are combusted is operated by the Przedsiębiorstwo Energetyki Cieplnej Sp. z o.o. in Pisz – the Municipal Heat Producing Plant, with a total power output of 21 MW (Fig. 4). It was constructed in 2003 and has three VFR 6000 water boilers with a thermal power output of 6.0 MW each and one VFR 3000 boiler with a net thermal power output of 3.0 MW. The boilers are intended for the combustion of a mixture of wood chips and bark. The energy efficiency of the boilers is close to 87.4%. The plant consumes about 88,000 m^3 of fuel, or about 26,000 t/year. The area from which biomass is supplied to the plant has a radius of approx. 120 km.

Another example of the local use of biomass as wood chips is the boiler house in the village of Łukta, operated by the Zakład Gospodarki Komunalnej in Łukta (Communal Management Company). There are two boilers fired with wood chips in the boiler house. One is a C150 DH boiler with a thermal power output of 1.5 MW, while the other is a C50 DH boiler with a thermal power output of 0.5 MW; the energy efficiency of the boilers is close to 82%. The boiler house was constructed in 2001 and it consumes about 1,950 t of wood chips, supplied from a distance of up to 45 km. Other boiler houses in the region, fired with wood chips, include that of the Residential Cooperative in Jonkowo and the boiler houses in Lidzbark Warmiński and in Reszel. On the other hand, the boiler house in Frombork, with a power output of 6.5 MW, is a model facility fired with straw. There are two automatic stoker-fired boilers with a rated power output of 2.5 MW each and one boiler with a power output of 1.5 MW. The energy efficiency of the boilers is equal to 85%. Moreover, apart from the local boiler houses, biomass (in the form of wood, straw, briquettes and pellets) is commonly used to heat detached houses.

Attempts have been made at the co-combustion of biomass (mainly wood chips) with coal. They have been carried out mainly at the municipal heat production plants in Olsztyn and in Elbląg (Fig. 4). However, it must be stressed that this should only be a temporary solution, which should be eliminated and replaced by energy production from biomass alone in modern energy production systems. Nevertheless, it must be emphasised that local boiler houses which produce heat from hard coal dominate in Warmia and Mazury. According to data from the Energy Regulatory Office, 93.9% of heat in the licensed heat producing plants in Warmia and Mazury is produced from hard coal[37]. The average price of heat (without the transmission service) produced from hard coal in the region was 8.44

[36] B. Sliz-Szkliniarz, J.A. Vogt, [2012]: *GIS-based approach for evaluating the potential of biogas production from livestock manure and crops on a regional scale: A case study for the Kujawsko-Pomorskie Voivodeship. Renewable and Sustainable Energy Reviews 16, 752-763.*

[37] Urząd Regulacji Energetyki. *Energetyka cieplna w liczbach – 2012 [Heat power in numbers – 2012]. Urząd Regulacji Energetyki, 2013, Warsaw, p. 110 [in Polish].*

€/GJ, and for energy produced from biomass, 10.08 €/GJ (Table 4). Energy from natural gas was much more expensive – over 15.31 €/GJ, and that from heating oil – approx. 21.20 €/GJ. Therefore, using biomass for heat production is economically more attractive than using natural gas or heating oil. However, energy from biomass is more expensive by 19.4% than that produced from coal.

Using solid biomass for heat production is also cost-effective in boilers operated in detached houses. It has been found by this author[38] that the annual cost of producing heat in an automated boiler for a well-insulated detached house during three heating seasons were the lowest when willow chips were used as fuel (average of 393 €/year). Using briquettes and pellets to produce heat increased the costs (three years' average) to 599 and 1,098 €/year. In regard to fossil fuels, heating a house with pea grade coal cost 692 €/year, whereas production of heat from natural gas was approximately twice as expensive as from briquettes. On the other hand, using heating oil for heating increased the cost of production of energy by a factor of 3 and 5 as compared to briquettes and wood chips, respectively. Other authors found that use of biomass wood instead of oil clearly showed its lower impact on the environment[39].

Table 4. **Characterisation of heat production from different types of fuels in 27 companies in Warmia and Mazury in 2012**

Item	Hard coal	Light heating oil	High-methane natural gas	Biomass
Fuel consumption	578,884.7 (t)	677.4 (t)	8723.6 (thousand m^3)	540,662.9 (GJ)
Cost of fuel (k€)	47,655.68	583.87	3574.41	2248.36
Average unit cost	82.32 (€/t)	861.98 (€/t)	0.41 (€/m^3)	4.16 (€/GJ)
Heat production output (GJ)	9,943,899.8	7908.8	277,001.0	352,055.1
Heat sales (GJ)	7,972,103.9	7108.1	238,015.2	309,840.9
Income from heat sale (k€)	67,324.47	150.70	3644.04	3126.48
Average heat price (without service) (€/GJ)	8.44	21.20	15.31	10.08

Source: Urząd Regulacji Energetyki. Energetyka cieplna w liczbach – 2012 [Heat power in numbers – 2012]. Urząd Regulacji Energetyki, 2013, Warsaw, p. 110 [in Polish].
(Polish zloty according to the average weighted exchange rate announced by the National Bank of Poland for the year 2012 (€/PLN = 1/4.1850)

13.4.2. Hydropower

There are various facilities in Warmia and Mazury which produce electricity from RES. According to data from the Energy Regulatory Office, there are 122 facilities in the province in which electricity is produced from RES, with a total power output of 233.29 MW (Table 5). In Poland, there are 1806 facilities which produce electricity from RES. In

[38] M. Stolarski, M. Krzyżaniak, Ł. Graban, [2011]: *Evaluation of energy-related and economic aspects of heating a family house with dendromass in the north-east of Poland. Energy and Buildings 43, 433-439.*

[39] B. Esteban, J-R. Riba, G. Baquero, R. Puig, A. Rius, [2014]: *Environmental assessment of small-scale production of wood chips as a fuel for residential heating boilers. Renewable Energy 62, 106-115.*

Warmia and Mazury there are 87 small hydropower plants, with a total power output of 15.9 MW (Fig. 5). The majority of them – 76 – are run-of-the-river hydropower plants with a power output below 0.3 MW. There are eight such facilities with a power output not exceeding 1 MW and three with a power output of up to 5 MW[40]. Despite apparent interest in such projects, there are no new initiatives to construct small hydropower plants due to lengthy administrative procedures. Currently, there are 746 hydropower plants around the country.

Table 5. **The number and power output of electrical power facilities in Warmia and Mazury and in Poland as of 30.06.2013**

Item	Warmia and Mazury		Poland	
	number of facilities	power output (MW)	number of facilities	power output (MW)
Biogas power plants	10	7.129	211	141,414
Biomass power plants	2	0.72	31	941.011
Photovoltaic power plants	1	0.05	12	1.688
Wind farms	23	209.475	765	2807.298
Hydropower plants	87	15.915	746	951.389
Co-combustion power plants	-	-	41	no data
Total	122	233.289	1806	4842.8

Source: Urząd Regulacji Energetyki. Mapa odnawialnych źródeł energii [Map of renewable energy sources – in Polish], http://www.ure.gov.pl/uremapoze/mapa.html (accessed July 24, 2013).

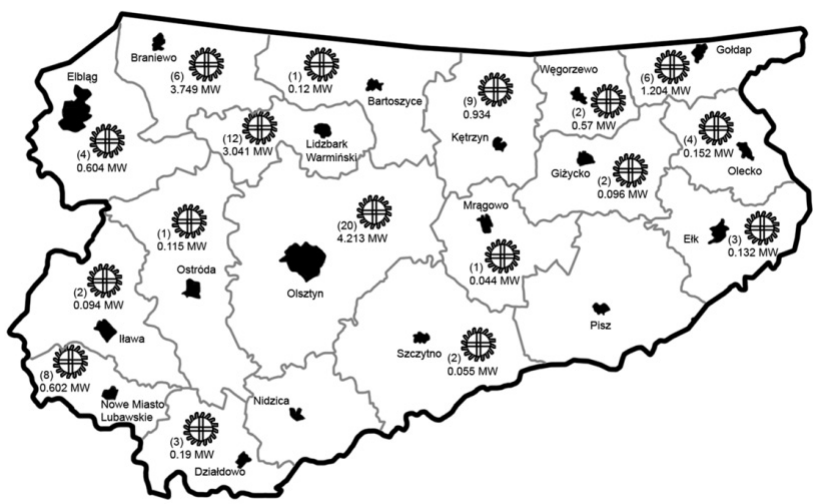

Figure 5. **The number of hydropower plants and their power output in counties of Warmia and Mazury**

Source: Urząd Regulacji Energetyki. Mapa odnawialnych źródeł energii [Map of renewable energy sources – in Polish], http://www.ure.gov.pl/uremapoze/mapa.html (accessed July 24, 2013).

[40] Urząd Regulacji Energetyki. *Mapa odnawialnych* źródeł *energii [Map of renewable energy sources – in Polish], http://www.ure.gov.pl/uremapoze/mapa.html (accessed July 24, 2013).*

13.4.3. Wind Energy

The share of wind energy in the total energy production in the region has been growing owing to the large wind farms that have been constructed. There are 23 wind farms now operating in Warmia and Mazury, with a total power output of 209.48 MW (Table 5, Fig. 6). Production output of energy from wind in the region in 2009 increased by nearly 100% as compared to 2007 and amounted to 88,000 MWh/year. It decreased in 2010 as compared to 2009, which resulted from the fact that wind farm in Łęgowo (commune of Kisielice) with the power output of 22 MW was started, but its operation did not begin until January 2011 because the investor did not have a licence to sell energy. Furthermore, the existing wind farm in Kisielice (power output 40.5 MW), produced less energy due to unfavourable weather conditions (weak winds).

Moreover, there was a failure between November and December 2010, which resulted in a month-long shutdown. During that time, approx. 8 thousand MWh of energy was not supplied to the power grid. In the nearest future, production output of wind energy is expected to increase considerably owing to the construction of new wind farms in the Commune of Kisielice (9 wind turbines with a total power output of 18 MW) and in Kętrzyn (12 turbines with a total power output of 24 MW). However, it should be stressed that the construction of large wind farms provokes protests in local communities. On the other hand, issues related to the installation of small wind power plants are enjoying considerable interest. Therefore, it is worth noting that in the last quarter of 2011, the production of complete small wind turbines was launched in Reszel, Kętrzyn county.

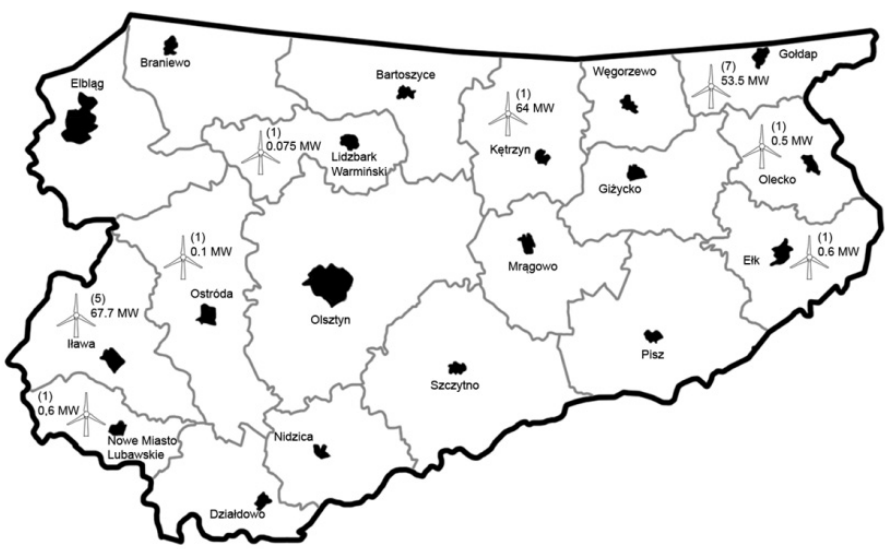

Figure 6. **The number of wind farms and their power output in the counties of Warmia and Mazury**

Source: Urząd Regulacji Energetyki. Mapa odnawialnych źródeł energii [Map of renewable energy sources – in Polish], http://www.ure.gov.pl/uremapoze/mapa.html (accessed July 24, 2013).

13.4.4. Solar Energy

There is growing number of installed solar thermal collectors and growing energy production output in Warmia and Mazury. Compared to 2009, the latter has doubled (Table 2). It can be expected that the amount of energy produced by this method will be increasing. Initiatives of subsidising this type of installation by the Environmental Protection and Water Management Fund in Olsztyn and by the National Environmental Protection and Water Management Fund have attracted a lot of attention. Such subsidies can be granted to individuals and housing cooperatives which are not connected to heat supply networks, to finance solar collectors used to produce domestic hot water and to support central heating[41]. Within the framework of this action, it is possible to receive a 45% subsidy for the purchase and installation of solar collectors to produce domestic hot water.

Examples of investments in solar energy production include:

- comprehensive modernisation of the heating system in the Primary and Junior High School in Ruciane-Nida (50 collectors, power output 45.5 kW),
- thermal efficiency improvement of public buildings in the County of Olecko (96 collectors, power output 136.8 kW),
- improvement of the heating system efficiency in the St. Leon parish church in Gołdap by using solar energy (5 collectors, power output 12.75 kW),
- two of the largest installations of solar thermal collectors in the region – approx. 1,500 m^2 – are operated by the Housing Cooperative in Gołdap, which continued the investment project in 2011 and installed more collectors in the County Hospital in Bartoszyce – over 1,000 m^2,
- further investment projects are being carried out in two hospitals in Olsztyn.

13.4.5. Other Sources of Energy

The geological profile of Warmia and Mazury makes the occurrence of geothermal waters very likely. Usable underground waters are present only in sedimentary rocks. The crystalline base, which is rather shallow (less than 1 km) in the south-eastern part of the region, is the lower limit of their occurrence and geothermal waters are not found there. The crystalline base in most parts of the region lies about 1-2 km below the ground level and this is where – usually low-temperature – geothermal waters are found. The temperature of such waters in the deepest deposits usually ranges from 20°C to 40°C. The most favourable conditions in which geothermal waters are found occur in the western part of the region. In that area, middle-temperature geothermal waters (40-70°C) (Fig. 7) that can be used directly for heating occur. Heat pumps have to be employed for such use of geothermal waters to be possible in the other parts of the region.

Due to the high investment construction costs of a geothermal installation, the use of such waters is limited to towns. Installations which use geothermal waters for heating are operated in the Podhale region, in Pyrzyce, in Mszczonów and Uniejów. The natural conditions present there are more favourable than in Warmia and Mazury[42]. Nevertheless,

[41] NFOŚiGW, *Kup kolektor z 45% dopłatą [Purchase a collector with 45% subsidy – in Polish] www.nfosigw.gov.pl/o-nfosigw/aktualnosci/art,186,kup-kolektor-z-45-doplata.html (accessed February15, 2012).*

[42] Z. Zaprzelski, S. Olech, [2006]: *Ocena zasobów energii geotermalnej i możliwości jej wykorzystania w województwie warmińsko-mazurskim [Evaluation of geothermal energy and possibilities of its use in the Province of Warmia and Mazury – in Polish], W-MBPP, Olsztyn, p. 17.*

a project has begun aimed at construction of a balneological facility in Lidzbark Warmiński to make use of geothermal waters.

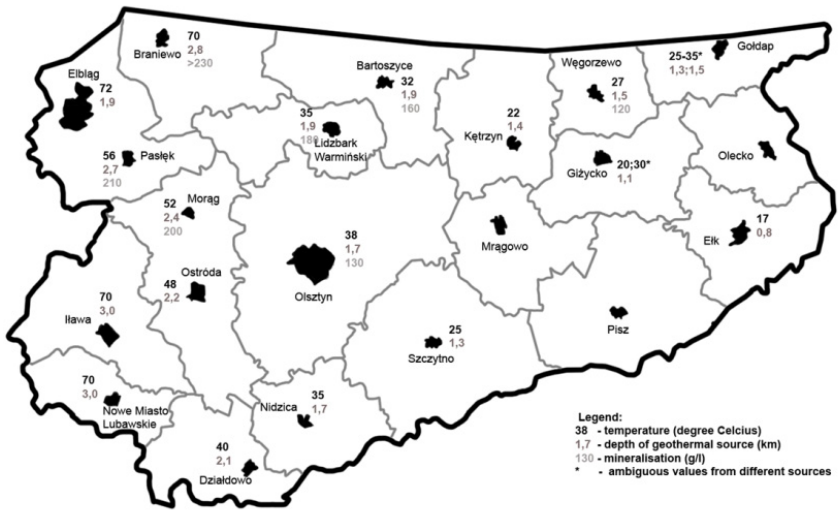

Figure 7. **Evaluation of geothermal water resources and usability in the region**

Source: Z. Zaprzelski, S. Olech, Ocena zasobów energii geotermalnej i możliwości jej wykorzystania w województwie warmińsko-mazurskim [Evaluation of geothermal energy and possibilities of its use in the Province of Warmia and Mazury – in Polish], W-MBPP, 2006, Olsztyn, p. 17.

Production of energy with the use of heat pumps has also been developing slowly. This is because of the high costs of such installations. It is also difficult to monitor the number of installed heat pumps because – especially in the case of heat pumps – private individuals and legal entities are the investors.

There has been rapid growth in the energy production output from photovoltaic cells (PV). However, the total energy output from that source is small. At the moment, there is only one small PV installation in the region. It is situated in city of Ełk. Its power output amounts to 50.16 kW. The installation provides power for a leisure centre – Water Park. Energy production from that source is likely to increase, which is indicated by growing interest in such installations, such as in the County of Ostróda where a photovoltaic installation is being planned.

13.5. Conclusions

Despite all the positive aspects of energy production from renewable sources, there are many controversies accompanying it. In the region of Warmia and Mazury, environmental aspects play a particularly important role as about half of the region's area is covered by different forms of legal protection. Therefore, the location of large wind farms is especially controversial because as much as 100-120 m-high wind turbines are becoming dominant features of the landscape of Warmia and Mazury, with a detrimental effect on it. It is also emphasised that such objects may be dangerous to birds. Less negative emotions are induced by the production of electricity in small hydropower plants, which are desirable

as they have a positive effect on local hydrographic relations. The production of heat or electricity with solar collectors, photovoltaic cells and geothermal waters is relatively neutral. The use of solid biomass in newly-constructed or existing heat or combined heat and power production plants does not raise any serious controversies. More protests are raised by plans for the construction of biogas plants. Nevertheless, it is noteworthy that using energy from renewable sources will be rational when all the economic, social, environmental and legal considerations, both for and against it, are taken into account. Only then can reasonable and compromise solutions be achieved. Favouring only one aspect – either positive or negative – usually results in distorting the whole picture and sense of energy production from renewable sources.

It seems that it is natural for the Warmia and Mazury region to make the most effective use of biomass of various origin, as the potential for acquisition of such materials in the region is significant. Moreover, using biomass for energy production may provide continuous stimulation for infrastructure development in rural areas as well as for implementation of modern technologies of biomass conversion to useful and diverse bioproducts. The issue is extremely important due to the fact that – being a material for energy production – biomass requires the involvement of many groups of people to ensure effective operation of the entire logistic chain from material acquisition through biomass production, its storage and transport, pre-processing to the process proper and ultimate use. Therefore, unlike wind as an energy-producing factor, biomass is a demanding fuel. However, paradoxically, this demanding material for energy production may stimulate regional development because it involves a considerable amount of work. Unlike this option of energy acquisition, large wind power plants do not provide such opportunities for the region of Warmia and Mazury. This is due to the fact that considerable income is generated by energy produced in large wind farms and it is then transferred outside the region. An analysis of different solutions and proposals for the development of a system of energy production from renewable sources shows that production of energy from biomass, small hydropower plants, solar radiation and geothermal waters should be of particular importance in Warmia and Mazury. On the other hand, the production of energy in large wind farms should be organised in such a way so as to respect the special and unique nature value of the region of Warmia and Mazury. Moreover, it should be added that it is necessary to modernise the existing energy transmission and supply lines and to increase energy production output in the region, which will directly improve energy security in the region.

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14

EU FUNDS IN THE ASPECT OF SUSTAINABLE DEVELOPMENT OF TOURISM IN POLAND

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Abstract: Agritourism is one of the tourist activities in rural areas, and its specificity very often fit in with the concept of the sustainable development. The development of this type of tourism can be affected by investments in improving the quality of services offered. Therefore, it is important to evaluate the use of aid funds under the Rural Development Program 2007-2013. The aim of the present study is to show how these funds were obtained for the action entitled *Differentiation towards non-agricultural activities* providing a possibility to implement projects related to agritourism activities. The authors have used source material from reports of the Headquarters of the Agency for Restructuring and Modernization of Agriculture from the years 2008-2014. Their analysis allowed to conclude that despite the fact that tourism is an additional activity for the farm, the owners are aware of the need to improve the quality of services offered, as evidenced by the numerous large and complex investments conducted. Such situation takes place especially in the provinces, where this type of activity is popular, and more frequently men reach for the EU funds, usually registered as farmers.

Key words: sustainable development of tourism, EU funds, investments, agritourism.

14.1. Introduction

The starting term for "sustainable tourism" is "responsible tourism", defined in 1965 by W. Hetzer as the one assuming "minimization of environmental interference, respect for cultural differences, maximization of participation of local population in the provision of tourism services and growth in satisfaction of tourists"[1]. On the other hand, the mere implementation of the principles of sustainable development in tourism activities can be noticed in the world literature, mainly in the US literature, starting from the 1980s.

A document important in the context of shaping and developing sustainable tourism was, first of all, the document *Agenda 21 for the Travel and Tourism Industry*, prepared in 1995 jointly by the World Tourism Organization (WTO) and the World Travel and Tourism Council (WTTC): the document contains basic principles concerning sustainable tourism [2].

[1] M. Kowalczyk, [2011]: *Indicators for sustainable development of tourism. Man and Environment 35 (3-4). Warsaw. pp. 38-39.*

[2] A. Hadzik, A. Hadzik, [2008]: *Selected aspects of sustainable tourism in rural areas of the spa areas. Infrastructure and Ecology of Rural Sciences. Commission of the Technical Rural Infrastructure. No 2/2008. Krakow. p. 291.*

Sustainable tourism is defined in many ways. Undoubtedly, it is worth quoting a term that assumes balance between its basic elements, namely: natural environment, tourists, local communities and tourism services providers. According to this assumption, sustainable tourism is "a phenomenon where actions undertaken by tourists do not result in losses or hardly reversible changes in the natural environment, and, at the same time, ensure benefits for tourists alone, communities inhabiting towns and areas visited by tourists, as well as individuals and institutions providing tourism services" [3].

On the other hand, the EUROPARC Federation assumes that this version of tourism is "every form of tourism development, management and tourism activities, which sustains ecological, social and economic integrity of the areas, and preserves natural and cultural resources of those areas in an unchanged condition for future generations"[4]. This perspective, alike the quoted above, assumes a harmonious coexistence of all elements of the market of tourism services, though, as U. Myga-Piątek claims, "on this background, however, a clear conflict appears, which results from disproportions in the social need to make available attractive areas for tourism leisure and sports purposes, and undisputed rights of the natural environment and natural protection needs"[5].

As a matter of fact, in the subject literature often the term "sustainable tourism" is identified with almost all forms being in opposition to mass tourism or it is used interchangeably with such terms as: "environmentally-friendly tourism", "green tourism", "mild tourism", "alternative tourism" or "ecotourism", however, W. Mirowski distinguishes specific criteria that make it possible to specify which tourism forms can be qualified to the category of sustainable tourism. In his opinion, there must be compliance with regard to:

— natural conditions, e.g. protection of the natural environment as a whole and its particular elements (water, greenery, flora and fauna),
— health needs, namely care for health of people and animals, distribution of ecological food or development of conditions for rest and leisure,
— economic requirements, e.g. financial support for small and medium-sized enterprises or diversity of tourism phenomena,
— material and technical conditions, which remains in strict association with planning development of tourism movement, to take into account" physical and spatial limitations of an area, which, when exceeded, pose a particular danger of conflicts between the free life of the visited community and tourism"[6].

M. Kazimierczak adds usually to the indicated dimensions of sustainable tourism (such as ecological, economic and social dimension) another dimension, and gives it tremendous importance, namely ethical and cultural aspect. He writes about sustainable tourism as "a synonym of ethically oriented tourism"[7], postulating the implementation of one of its key, in his opinion, goals, namely creation of conditions for the development of ethical tourism.

Owing to the need for monitoring sustainable development of tourism, it is worth considering various kinds of rations prepared for that purpose. One way to describe are

[3] M. Durydiwka, A. Kowalczyk, S. Kulczyk, [2010]: *Definitions and scope of the term "sustainable tourism". (In :) A. Kowalczyk (ed.) Sustainable Tourism. PWN. Warsaw. p. 33.*

[4] U. Myga-Piątek, [2011]: *The concept of sustainable development in tourism. Problems of Sustainable Development. vol. 6, no 1. Lublin. pp. 151.*

[5] Ibidem, p. 151

[6] A. Hadzik, A. Hadzik, [2008]: *Selected aspects of sustainable tourism in rural spa areas, pp. 292-293.*

[7] M. Kaźmierczak. M. Kaźmierczak, [2009]: *Sustainable tourism as a synonym of the ethically oriented tourism. Studies Periegetica: Scientific Papers No. 3 Theory and practice in tourism. Poznan. pp. 9-10.*

ratios proposed by WTO that can be divided into basic ratios, applicable to all tourism areas and specific (supplementary) ratios, to be used only in a specific type of area (for each ecosystem and separately for each place)[8]. On the other hand, compliant with the one recommended by WTO, however, a set of VISIT ratios, proposed for the purposes of European tourism is definitely more extensive and covers such thematic areas as: policy of implementation of the concept of sustainable development, implementation of obligations towards environment, social and cultural provisions and economic provisions[9].

Another way to measure and describe sustainable tourism, especially important from the point of view of local development, mostly in the perspective of local government units (for communes and counties), is the way suggested by R. Janikowski. Its importance is proved, for example, by the fact that an advantage of these accordingly selected ratios is that they are enrooted in statistical data published by the Local Data Bank of the Central Statistical Office[10].

One of the type of tourism activities in rural areas is agritourism whose form is very often compatible with the concept of sustainable development. A complex concept of sustainable development of rural development is an innovative idea, matching production goals with environmental requirements. It includes economic, ecological, ethical and social issues. The production of goods and the provision of services in rural areas are intended to use natural resources without – damaging their sources, and, at the same time, make it possible to fulfill basic needs of subsequent generations of producers and consumers. Economic aspects refer to the analysis of profitability and affect the standard of living of families who earn their living from work on a farm and affect the structure of expenses in their domestic budgets[11]. Ecological goals come down to the need to preserve the natural environment in good condition and, if possible, recover natural qualities in contaminated or degraded areas. The ethical aspect determines obligations of the natural environment users towards future generations. The social sphere is related to the specification of a position and functioning of rural families in the local community, which involves the need to reduce employment in the agricultural sector through evolving development of rural areas towards the multifunctional development, which consists in skillful incorporation in the rural space of non-agricultural directions of production and services, including development of agritourism.. The development of this type of tourism is often determined by investments with regard to enhancing quality of services offered.

This kind of investment might be supported by the state in order to obtain additional sources of income in rural areas. Especially where there is a high agrarian fragmentation and farmers are not able to keep up only with agricultural production. However it is important to assess how large is the need to use aid funds. Moreover, for what purpose they are used most often – in which directions the investments are carried out.

14.2. Research Goal and Method

The research goal was to evaluate the use of aid funds under the Rural Development Program for the years 2007-2013 for the action entitled *Differentiation towards non-agricultural activities*,

8 M. Kowalczyk, [2011]: Indicators for sustainable development of tourism. p. 41.
9 Ibid., pp. 44-47
10 Ibid. p. 43
11 P. Prus, [2002]: *The possibilities of applying the concept of sustainable development on family farms. Annals of Science SERiA. Volume IV. Paper 5. pp. 124-128.*

providing a possibility to implement projects related to agritourism activities. The authors wanted to present the scale of the use of EU funds for tourism in rural areas. Source material covered information from reports of the Headquarters of the Agency for Restructuring and Modernization of Agriculture from the years 2008-2014. It was a period featuring calls for proposals under aid funds for this action. The research findings are presented in the form of tables and descriptions.

14.3. Research Findings

Tourism is a part of the internal market of the European Community. The policy of the European Union indirectly affects the development of such activities, inter alia, through different supporting actions[12]. One of them are actions under the Common Agricultural Policy because tourism in rural areas is a significant component of local economy and has enjoyed a growing popularity for years. One of its forms is agritourism or eco-agritourism, which is characterized by using resources of a farm to run tourism activities[13]. M. Drzewiecki defines agritourism as "a form of rest, which is implemented in agricultural rural areas, based on accommodation base and leisure activities related to a farm or equivalent and its natural environment, production and service environment"[14].

In Europe, agritourism is considered to be a very important factor stimulating rural economy[15]. In the opinion of B. Sawicki, it perfectly matches the idea of sustainable and multifunctional development of rural areas[16]. It is consistent with this concept and presently it plays an important role in shaping the way of thinking about mutual relationships of the society, economy and the natural environment and functioning of economic systems[17]. The concept of sustainable development has its provisions in particular legal acts of the European Union. For more information, refer to Ł. Paluch in the paper *Genesis and essence of the concept of sustainable development* [18].

Development of agritourism is determined, on the one hand, by natural-landscape and cultural conditions as well as socio-environmental relations. On the other hand, given all these values, agritourism cannot develop well in regions with poor infrastructure. Many tourism regions are areas peripherally located in respect of large municipal centers. Lack of own resources makes them see tourism as a chance for development intensification. To be able to implement this scenario, they apply for financial support from EU funds and allocate obtained funds mainly for the expansion of infrastructure[19].

D. Knecht believes that capital expenditures are an important factor of development of tourism movement in the countryside. Without appropriate tourism infrastructure,

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12 A. Walasek, [2014]: *Tourism in the European Union. Ed. Difin. Warsaw. pp. 52-54.*

13 M. Roman, [2012]: *Leisure activities of tourist farms in Podlaskie Province. Annals of Science "SERiA". Volume XIV, Paper 1. pp. 412-413.*

14 M. Drzewiecki, [2002]: *Basics of tourism. Oficyna Wydawnicza Ośrodka Postępu Organizacyjnego. Bydgoszcz. p. 41.*

15 A. Niedziółka, M. Kowalska, [2006]: *Agritourism in the sustainable development of rural areas of Malopolska Province. (:In) Tourism economy in the twenty-first century. Global challenges and threats. Academy of Physical Education. Poznan. p. 319.*

16 B. Sawicki, [2007]: *Agritourism in the activation of rural areas. Publisher of the Agricultural University in Lublin. Lublin. pp. 47-48.*

17 Ł. Paluch, [2013]: *Origin and essence of the concept of sustainable development (SUSTAINABLE DEVELOPMENT). Ed. Episteme. 18, Volume 1. 2013. Krakow. pp. 389-403.*

18 Ibid., pp. 389-403.

19 Ł. Satoła, [2013]: *Differences in the use of EU funds in a center – periphery configuration., Scientific Papers of the University of Economics in Wroclaw, Gospodarka Przestrzenna, No. 320. Wroclaw. pp. 176-185.*

even the beauty of the landscape and the richness of the cultural heritage will not increase tourism movement[20].

The years of programming 2007-2013, also within the Common Agricultural Policy, featured actions supporting sustainable development under the Rural Development Program 2007-2013 (RDP 2007-2013). This program was the main instrument in Poland of support for structural, economic and social transformations in agriculture and in agricultural products processing in the subsequent programming period, financed with the use of EU funds[21]. In addition, environmental actions were firmly supported: among other things, the whole second axis, the so-called environmental axis, comprising activities with regard to ecology. The signs of the concept of sustainable development can be found also in the conduct of tourism activity, especially in rural areas where relations between tourists and the local community and development of tourism with the observance of the natural environment principles have played increasing role [22].

Within the framework of the axis 3 of RDP 2007-2013 – the so-called social axis, the action *Differentiation towards non-agricultural activities* was implemented, aimed at assisting in undertaking and developing non-agricultural activities or agriculture-related activities in the field of manufacturing or services. The implementation of the action was aimed to contribute to creating non-agricultural income sources, as well as promoting employment beyond agriculture in rural areas. The action was addressed to people whose basic professional activities are agricultural activities (farmers, spouses of farmers and other household members – as defined by the social insurance regulations). One of the possibilities was to support agritourism activities under the operations entitled *Tourism services and services related to sports, leisure and rest*[23]. Applications were submitted with Regional Branches of the Agency for Restructuring and Modernization of Agriculture in each Province.

On the basis of the data included in table 1A, it can be noted that men definitely more often than women applied for aid funds: mainly men aged below 40 and aged 25-40. It should be emphasized that agritourism activities are not popular among very young people and elderly people, even retired, definitely more often show interest in it. What is important, unfortunately, seniors cannot benefit from EU subsidies. Analyzing a number of research on agritourism, it can be noted that women are more willing to run these activities whereas men apply more often for EU funds.

It is worth noting that the number of implemented operations concerning tourism services to total operations is approx. 8% of total investments implemented under this action.

Considering beneficiary's type, it can be noted that farmers are a predominant group. On the contrary, spouses and other household members definitely less frequently benefit from such form of support (Table 1B). The situation may be connected with the fact that beneficiaries use also other forms of EU support under RDP 2007-2013, which used to apply only to farmers[24].

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20 D. Knecht, [2009]: *Agritourism in agribusiness. Wydawnictwo C. H. Beck. 2009. Warszawa. p. 133.*

21 *The Agency for Restructuring and Modernization of Agriculture 2015.: PROW 2007-2013*. http://www.arimr.gov.pl/pomoc-unijna/prow-2007-2013.html. Access from: 11.12.2015.

22 P. Dziekanski, [2014]: *Touristic competitiveness of the Świętokrzyskie Province (selected issues). MODERN MANAGEMENT REVIEW 2014 MMR, vol. XIX, 21 (2/2014). April-June ISSN 1234-3706. s. 17-26.*

23 Ibid. 2015.

24 *Farmer* – an adult natural person residing and running on Polish territory, in person and self-employed an agricultural activity in remaining in the possession of the farm, including within the group of agricultural producers, as well as the person who allocated land for afforestation. The law on social insurance for farmers. The Act of 20th December 1990. Social insurance of farmers [Dz. U. z 2008 r. Nr 50, poz. 291 ze zm.]

Table 1. **Number of investments carried out within tourism services and related to sports, leisure and rest – axis 3 Differentiation towards non-agricultural activities of RDP 2007-2013 in Poland**

A. Number of investments implemented by beneficiary's sex and age							
Scope of aid	**Number of investments implemented – natural persons**						
	Women			**Men**			**Total**
	<25	25-40	>40	<25	25-40	>40	
Tourism services and services related to sports, leisure and rest	20	220	296	35	240	356	1167
Total investments implemented	119	1935	1875	741	6038	5079	15787

B. Number of investments implemented by beneficiary's type				
Scope of aid	**Number of investments implemented – beneficiary's type**			
	Farmer	**Farmer's spouse**	**Household member**	**Total**
Tourism services and services related to sports, leisure and rest	908	212	47	1167
Total investments implemented	12969	2309	509	15787

Source: prepared by the author on the basis of ARiMR data, as of 31.12. 2014.

Another interesting aspect can be also territorial diversity with regard to implemented operations concerning broadly understood tourism services under the action *Differentiation towards non-agricultural activities* (Table 2). Definitely, the most investments in agritourism were implemented in the Voivodeships: Wielkopolskie (165) and Lubelskie (162), whereas the least in the province: Opolskie (16), Kujawsko-Pomorskie (22) and Łódzkie (24). Analyzing data referring to different provinces, it can be stated that the most investments were implemented in the areas with better developing agritourism activities[25].

In 2009-2011 research was conducted on a sample of 236 tourist farms in the area of the Polish Carpathians[26]. The themes of the research were, among others, investment directions and sources of financing. Based on the results, it was found that investments in all surveyed households were covered from various sources. Prevailed own savings and aid funds from the EU, especially those intended for agritourism. During the interviews conducted, farmers usually listed in the frame of the development of agritourism activity the following investments: retrofitting of rooms, renovation of premises, land adaptation for business or adaptation of different buildings for rural tourism. These actions were aimed to raise the standard of services provided.

[25] M. Bogusz, A. Brelik, I. Żuchowski, [2014]: *Ambient impact of institutional development of agrotourism farms. Ed. Bórawski P. Rural Development in Poland: the Role of Policy, Tourism and Human Capital. High Economic-Social School in Ostrołęka. pp. 31-43.*

[26] M. Bogusz, [2013]: *The income situation of agricultural holdings engaged in agritourism in the Polish Carpathians. Doctoral thesis. Poznań. pp. 187-195.*

Table 2. **The number of implemented operations concerning tourism services under Differentiation towards non-agricultural activities of RDP 2007-2013 in Poland by the scope of aid with breakdown into provinces**

Province	Tourism services and services related to sports, leisure and rest	Total – all operations
Dolnośląskie	43	559
Kujawsko-Pomorskie	22	801
Lubelskie	162	1555
Lubuskie	14	323
Łódzkie	24	938
Małopolskie	89	782
Mazowieckie	52	2366
Opolskie	16	474
Podkarpackie	89	729
Podlaskie	90	1178
Pomorskie	91	520
Śląskie	45	527
Świętokrzyskie	35	729
Warmińsko-Mazurskie	91	782
Wielkopolskie	165	3072
Zachodniopomorskie	44	452

Source: prepared by the author on the basis of ARiMR data, as of 31.12. 2014.

14.4. Conclusions

For a dozen of years, agritourism has enjoyed a great interest in Poland: both among owners of apartments, being for them an additional source of income, and among tourists who more and more often opt for this form of rest. In addition, it be should noted that more and more often owners of agritourism farms who run activities match the concept of sustainable development, preserving balance both in social relations and between business activities and environmental protection.

The research goal was to evaluate the use of aid funds under the Rural Development Program for the years 2007-2013 for the action entitled *Differentiation towards non-agricultural activities*, providing a possibility to implement projects related to agritourism activities. Based on the conducted research it can be stated that certainly, the use of aid funds has a positive side. For agritourism farms owners suitable tourism infrastructure is important since it is a way of attracting potential tourists, and aid funds are the possibility of adjusting the tourism base to relevant standards.

On the basis of data from the Agency for Restructuring and Modernization of Agriculture used in this research, it can be stated that men, usually registered as farmers, apply more often for EU funds. It is worth paying attention also to the fact that although agritourism is additional activities for a farm, its owners are aware of the need to enhance quality of the services offered, the proof of which is a great number of applied for and implemented operations. This situation is noted especially in provinces where this type of activities enjoys popularity.

Appropriate use of aid in agritourism activity translates into the quality of tourist services and products, which contributes to an increase in the number of tourists and consequently to the raise of the income level and multi-functional development of rural areas with the principles of sustainable development.

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15

BIOFUEL DEVELOPMENT AND POLICY IN THE UNITED STATES

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Abstract: The role of biofuel in the United States is examined and how its development has matured and what the industry did as conditions changed in the last decade. The largest biodiesel feedstock is soybean oil, by corn oil and rapeseed oil. Another important feedstock is yellow grease. Soybean oil is readily available, but soybean meal is an important animal feed, which is the largest determinant of soybean prices. Only about 25% of soybean oil goes to produce biodiesel. Biodiesel leaves more residual value from the feedstock than ethanol from corn. Biodiesel has not been the controversial issue that ethanol from corn has been. The big biodiesel users are truckers, rather than consumers. The economics of biofuel changes with world economic conditions. The U.S. dollar has been very strong in recent years, and importing ethanol from Brazil has been more economical than buying domestic ethanol made from corn.

Key words: biofuel, ethanol, biodiesel, manure digesters.

15.1. Introduction

After the formation of the Organization of Petroleum Exporting Countries (OPEC) in the early 1960s, oil prices were very stable and low until the embargo OPEC imposed in October 1973. Gasoline prices rose in the United States by about 50% and the sizeable dependence that the United States had on imported oil became an issue. Big gas-guzzling automobiles passed out of favor and smaller fuel-efficient cars became more popular. In the Midwestern United States ethanol blended with gasoline was available and was in rural communities, since corn prices were exceptionally low and the product was seen as helping the local economy. This politically important region also lobbied Congress to require that all gasoline for automobile fuel contain at least ten percent ethanol. Although it took several year, ultimately this rule was imposed.

15.2. Renewable Fuel Standard

In the Energy Policy Act of 2005, a minimum content of renewable fuel was required for motor fuel, heating oil, and jet aviation fuel. Later the Energy Independence and Security Act of 2007 expanded some of these requirements. This act defined renewable fuel in four categories: biomass-based diesel, cellulosic biofuel, advanced biofuel, and total

renewable fuel. One challenge is that each of these policies was passed with an expiration date. The original theory was that once the industry was established that it would be competitive and that the auto and general transportation fleet would adjust and be more adaptable to biofuels relatively quickly. In fact, the second part of this (the evolution of the transportation fleet) has not evolved quickly, if at all. Consumers have generally not wanted to buy automobiles that can use a high portion of ethanol for fuel because the fuel economy is worse and, while biodiesel is more readily consumed in trucks and buses, the physical limitations of producing enough biodiesel for the diesel fleet have slowed biodiesel's growth as a fuel[1].

Many studies have examined these issues recently, for example Byrge, and Kliesen, Hofstrand, and Kane and Reilly

15.3. Biodiesel

Although most Americans think only of ethanol when they hear biofuels, actually biodiesel was more easily adopted and has a better net-energy gain than ethanol produced from corn. In the early stages of the biofuel movement, many urban transportation systems switched to biodiesel, including the bus system in my community. There is also a substantial small-scale biodiesel refining industry that collects waste cooking oils from restaurants and adapts it to home heating and diesel transportation uses. As a practical matter, the U.S. production of vegetable oils would not satisfy the domestic demand for diesel fuels for transportation and heating even if all waste oils were refined. By far the largest biodiesel feedstock is soybean oil, followed by corn oil and canola (rapeseed) oil. Another important feedstock is yellow grease. Soybean oil is readily available, but soybean meal is an important animal feed which is the largest determinant of soybean prices. Only about 25% of soybean oil goes to produce biodiesel. Instead most of the soybean oil is used for food and as a cooking oil. Also soybeans and corn are substitute crops in the American Corn Belt, and the most common rotation puts a limit on how many acres of soybeans will be grown, and thus soybean acreage is unlikely to grow dramatically[2].

Corn oil could also be an important source of biodiesel, but since the main use of corn oil is also as a food ingredient, this use bids corn oil away from fuel usage. Much of the canola oil is produced in Canada and imported into the United States, especially since much of the canola production is in central Canada and much closer to U.S. population concentrations than the major Canadian cities, which are closer to the Atlantic or Pacific Oceans.

In general, this explains a major challenge for biodiesel. Vegetable oils are more valuable as food than as fuel, especially because vegetable oil is often an essential, but minor ingredient in food products, and the food manufacturer can afford to pay a higher price that the fuel market if necessary, while the fuel market has petroleum options that are more economical, making the biofuel market less competitive with petroleum.

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1 J. H. Stock, [2015]: *The Renewable Fuel Standard: A Path Forward. Columbia University. April.*

2 W. Brorsen, [2015]: *Projections of U.S. Production of Biodiesel Feedstock. Report prepared for the Union of Concerned Scientists and The International Council on Clean Transportation. July.*

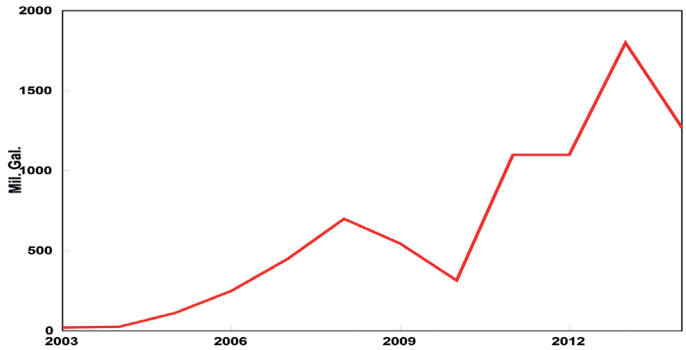

Figure. 1. **U.S. BioDiesel Production 2003-15**
Source: National Biodiesel Board

15.4. Ethanol

Ethanol is an ancient grain product for drinking. In the early days of the United States, farmers in western Pennsylvania rebelled about a whiskey tax that was a major source of revenue for the fledgling U.S. government. The farmers found whiskey yielded more revenue than the grain feedstock and they were further processing their crop into whiskey. To quell the rebellion George Washington led the army to the region. Before Washington arrived the rebels gave up and the rebellion was over. Nevertheless, home whiskey production is a traditional activity in many regions, but for drinking, not for fuel[3].

When petroleum prices rose in the early 1970s and corn prices dropped, Midwestern grain producers wanted the government to require ethanol as a minor component of gasoline. These laws took many years to be enacted. Finally, in 2005, Congress passed the Renewable Fuel Standard, with minor revisions in 2007. This required gasoline to contain 10% renewable fuel, with the goal that this percentage would increase over time as the automobile fleet changed and newer cars were able to burn fuel with a higher percentage of ethanol without causing engine damage. The belief was that cellulosic ethanol would be economically viable in a short time and would replace corn-based ethanol, lowering the greenhouse gas emissions for motor fuels. However, the viability of cellulosic ethanol has yet to be established. At this time there are 214 operating ethanol plants in the United States and only one is producing cellulosic ethanol. Four other cellulosic plants exist, but are not currently producing, no doubt because at current petroleum prices cellulosic ethanol is unprofitable[4]. Of the operating ethanol plants, 95% use corn as their feedstocks. Except for the one cellulosic plant, the others use whey or waste beer. The Environmental Protection Agency has the ability to waive the cellulosic requirement if the industry isn't operating under what is known as the "cellulosic waiver authority."[5]. Figure 2: shows the growth in ethanol production in recent decades. As you can see ethanol production has leveled off. In some recent years the economics of importing ethanol produced from

[3] J. A., Byrge, K., L., Klisen, [2008]: *Ethanol: Economic Gain or Drain? The Regional Economist July.*
[4] *Renewable Fuels Association, http://www.ethanolrfa.org/resources/biorefinery-locations/, access 13.04.2016*
[5] Kane, J. Reilly, [2015]: Economics of Ethanol *Production in the United States. Agricultural* Economic *Report No. (AER-607) USDA March.*

sugar cane in Brazil that is has been more economical for the fuel companies than buying domestically produced ethanol made from corn.

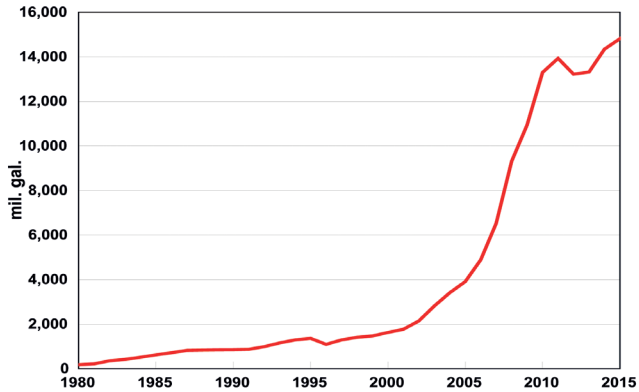

Figure. 2. **U.S. Annual Ethanol Production**
Source: Renewable Fuels Association

15.5. Manure Digesters

Manure digesters take the waste products from large animal operations, especially dairy farms, and produces electricity from the methane. There are about 260 digesters operating in the United States, and most were built in the last decade. In the last year, interest in this technology has waned. Usually these projects depend on receiving large government grants. Also manure digesters require a lot of management and maintenance. The bigger issue is that the electricity generated does not receive a premium price from the electric companies and so the digesters are not economically feasible under current prices[6]. Understandably, the electric companies have built expensive generating capacity and want to maximize the revenue received from those factories rather than subsidize the investment of some farmer in a methane digester. Other green electricity sources such as wind mills and solar panels have expanded greatly and so the power companies can get adequate green electricity from these sources. Given the current economics, the government's goal of having 1300 digesters by 2020 seems very unlikely, although the economics of digesters could change if the world's economy should improve and energy prices rise. Another caveat is that these digesters are usually on very large dairy farms and the digester requires considerable management time and expertise, so only the biggest farms ordinarily have the personnel to run one.

15.6. Other Economic Issues

Green energy does not exist in a vacuum and its economics changes with general economic conditions. Some examples or these are below. This list is not exhaustive and many factors can affect the profitability of producing green energy.

The economics of biofuel changes with world economic conditions, especially agricultural and petroleum prices. The U.S. dollar has been very strong in recent years,

[6] *Manure isn't cheap energy [2016] Hoard's Dairyman, April 4.*

reducing U.S. exports and inducing imports, and lowering U.S. agricultural prices in general. As mentioned earlier, with the strong dollar, importing ethanol from Brazil has been more economical than buying domestic ethanol made from corn. The strong dollar hurts exports of all agricultural products, keeping U.S. farm prices lower than they would be with a cheaper dollar and thus making U.S. producers of biofuels more competitive with more affordable feedstocks.

World oil prices have fallen with the collapse of the world's economy, and as a result, biofuels face much lower prices for their competing energy sources, whether of international or domestic origin. For those types of biofuels that are not very competitive anyway, especially ethanol, this has hurt the industry badly. The economics of producing ethanol from corn is usually border-line, but in years when traditional fuel prices are low, biofuels are especially noncompetitive. After the big boom in 2008, the industry struggled for several years because few automobiles that could use fuel with a high ethanol content. Sales of such autos did well initially, but over time consumer interest has lagged, and few consumers can or want to buy E85, the ethanol biofuel with an 85% ethanol mixture. The ethanol industry has lobbied Congress to raise the minimum ethanol requirement but Congress has refused to do so.

One reason that corn farmers were big supporters of the ethanol requirement in gasoline for automobiles was to keep the price of corn higher than it would be otherwise. This happened for a while, but as the genetically-modified seeds increased corn yields the share of the corn crop used to make ethanol has dropped. Furthermore, with lower corn prices the cattle producers who used a byproduct of ethanol production, dry-distillers grains, did not see the urgency of finding a cheaper feed source, further undermining the profitability of the ethanol distilleries. With the expansion of corn acreage in the southern hemisphere, world corn production has soared and world corn prices have fallen[7]. In the presidential primaries in 2016, ethanol was a much less significant issue in voter attitudes, even in the major ethanol-producing states, such as Iowa.

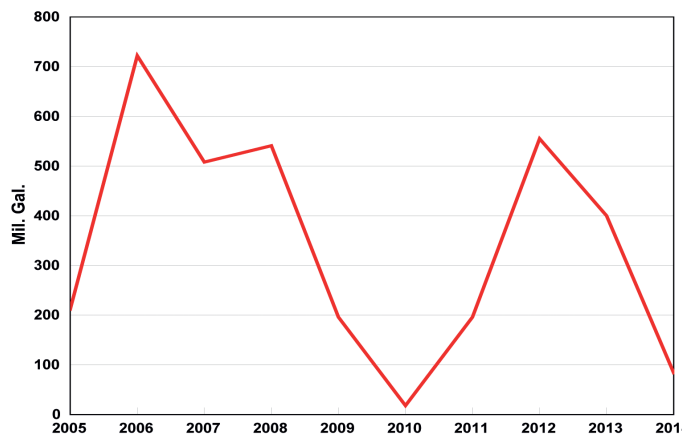

Figure. 3. Ethanol Imports

Source: Renewable Fuels Association

[7] D. Hofstrand, [2013]: *The Changing Economics of Corn Ethanol. Renewable Energy & Climate Change Newsletter May.*

As with corn, soybean markets are less driven by biofuels because of new seed varieties and increased soybean production in South America. Also biodiesel leaves more residual value from the feedstock than ethanol from corn, and so biofuel never had the large impact on soybean markets that it had on corn markets. As a result biodiesel has not been the controversial issue that ethanol from corn has been. The big biodiesel users are truckers, rather than consumers, so the political support for biodiesel is considerable less.

15.7. Conclusions

The biofuel industry has grown greatly since the adoption of the renewable fuel standards. Nevertheless, biofuel has not been greeted with enthusiasm by the average American, and as fuel prices have changed, the economic situation for biofuel producers has changed with them. It is difficult for biofuels to compete with the fossil fuel prices which currently prevail and the industry is struggling.

Since the industry is located only in a few less-populous states, the political power of the ethanol lobby is low, especially with low fuel prices generally.

In years when corn is expensive and therefore ethanol is costly to produce, ethanol has been imported from Brazil, where it is produced from sugar at a much lower cost. Since the Brazilian real is a weak currency, Brazilian ethanol is almost always reasonably priced for a U.S. buyer and imports have undermined the domestic ethanol industry.

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16

IMPORTANCE OF LEGAL AND ORGANIZATIONAL SOLUTIONS IN PREVENTING AGRO-TERRORISM IN POLAND

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Abstract: Agroterrorism, is an attempt to attack to destroy the agricultural and food sector through the use of pathogens to cause disease. An attack, towards an agricultural environment aims to damage food supply chains and distract national and international economy. The aim of this article is to analyse the phenomenon of agro-terrorism as a type of bioterrorism, carried out in the context of forecasts of state security authorities and applicable legal regulations referring to the fight against terrorism. Procedures related to maintaining food safety are a form of preventing health problems in the food production process. They are primarily used to ensure proper quality of food in typical manufacturing processes. Certainly, their efficiency will be lower in the case of purposeful food contamination. Raises concern that the process of preventing agroterrorist attacks involves several specialised agencies and institutions which could result in difficulties as regards the efficient, rapid coordination of activities to prevent a terrorist attack.

Keywords: Agroterrorism, Food Security, Agriterrorism, Food Supply Chains,

16.1. Introduction

The standard of living is defined by public opinion not only through the prism of the wealth possessed, but also with regard to the quality and availability of public goods. One of the most important tasks of government is to ensure general safety. Over the last twenty-five years, the social requirements that have been growing at the fastest rate are those concerning ecological safety and improvement of living conditions. This results from the increasing level of education and easy access to information, but also from direct experience of the effects of environmental pollution.

Ecological safety means protection, by each state, of the life and health of its citizens, as well as its natural resources against damage or threats caused by environmental pollution. The basic point of this type of safety is the right to live in a clean environment. In conditions that pose no threat to life or health in the short-term, as well as in the

long-term perspective. An additional, no less important element of ecological safety is the right to use natural resources in the least restricted way, both in recreational purposes and for business operations. Those two elements making up a part of ecological safety must be supplemented with the right to demand that the desired environmental and life conditions are ensured, especially given the fact that in food production, like in few other areas, the condition of the environment is indirectly reflected in product quality.

The aim of this article is to analyse the phenomenon of agro-terrorism as a type of bioterrorism, carried out in the context of forecasts of state security authorities and applicable legal regulations referring to the fight against terrorism.

With regard to legal aspects, it should be emphasized that the analysis is carried out on the level of international law, EU legal regulations and Polish criminal law. Although terrorism threat in Poland, including its biological or chemical varieties, is considered very low, this risk cannot be neglected, for instance,in view of the fact that citizens of states in which the risk of terrorist attack is high are present in the territory of Poland[1].

Since the notion of agro-terrorism has a relatively short history – only a few dozen years, it can be assumed to be poorly recognized in society, unlike other forms of terror that may occur. Relatively little attention is also given to this notion in the literature of the subject, particularly in the field of public safety, agriculture or biology and it is entirely absent in legal literature – first of all, there is no legal definition of agro-terrorism or precisely described procedures and methods for organising a system to prevent this type of terrorism[2]. Attacks using agro-terrorism even occurred in antiquity, which means that the phenomenon itself is not new and has been accompanying society for ages. Since World War I, the risk of terrorist attacks on crops and farm animals was considered. However, in modern times, after the 11 September 2001 World Trade Centre attacks, particular attention has been given to anticipating terrorist threats and developing a strategy for preventing them. Since the beginnings of 21st century, among the potential threats of this type,the emphasis has been on the risk of attacks using biological agents (bacteria, viruses or poisons of biological origin),for example, in an area of agricultural production (attack on unprocessed food). The first entities to diagnose this type of risk were specialised United States authorities and services (including FBI, Department of Homeland Security, Department of Agriculture and the Food and Drug Administration). Over time, agro-terrorism has also become recognized as a potential threat by Europe (although it happened just a few years ago), the example being a project carried out by scientific units commissioned by the European Commission – PLANTFOODSEC, the aims of which include identification of the most dangerous pathogens that can be used in agro-terrorist attacks.

Procedures related to maintaining food safety are a form of preventing health problems in the food production process. They are primarily used to ensure proper quality of food in typical manufacturing processes. Certainly, their efficiency will be lower in the case of purposeful food contamination. Nevertheless, the regulations and practices developed in production plants and by institutions supervising food safety could provide the basis for

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1 *The current assessment of the Ministry of Foreign Affairs – www.msz.gov.pl (accessed on 05.04.2016).*

2 *The Polish literature of the subject usually recognizes bioterrorism, while the notion of agro-terrorism is rarely found and a broader depiction of this subject matter is missing. It should be mentioned that the first author to bring up this issue was* M. Żuber [2006]:, *Agroterroryzm – zagrożenie sektora rolniczego [Agroterrorism – threat to the agricultural sector] In: M. Żuber (ed.), Katastrofy naturalne i cywilizacyjne. Terroryzm współczesny. Aspekty polityczne, społeczne i ekonomiczne [Natural and civilizational disasters. Present terrorism. Political, social and economic aspects] (pp. 155-161), Wyd. WSOWL., Wrocław 2006, pp. 155-161.*

prevention of agro-terrorism threats. It is commonly assumed that crop pathogens or farm animal pathogens could be introduced to the environment in multiple ways (with the foot and – mouth disease virus identified as the most dangerous), but their detection by services and authorities specialised in the control of agricultural products would be difficult.

16.2. Definitions of the Term

The notion of terrorism originates from the Latin word *terrore,* and since the French Revolution it has been used to denote those in power ruling by threats, violence and physical force.

According to contemporary definitions, of which more than 200 can be found, the relation between terrorism and violence should still be stressed, although with the provision that violence, threat or even force can be used not only by the entity with power, but also by social groups, or even individuals[3]. All definitions construed and applied in the literature of the subject, even if they constitute an attempt to synthetically depict the issue presented, face criticism due to their partial character and lack of universalism[4].

Based onthe encyclopaedic definition published by PWN, terrorism means planned and organized acts of individual persons or groups, performed on various grounds, mostly ideological, that are undertaken with infringement of the existing law or in order to coerce state authorities and the society into specific behaviour and benefits, often harming third persons. Those acts are carried out with ruthlessness, using various means (psychological pressure, physical violence and the use of weapons and explosives), in conditions of deliberate publicity and fear purposefully evoked in society[5].

Likewise, many definitions have been developed in the search for the nature of agro-terrorism (Greek *agros* denoting soil and Latin *terror*meaning fear or dread) as a form of biological terrorism. However, it should be emphasized that this is a relatively new term, which came into use as late as at the beginning of the 21st century, and the gist of the notion is a purposeful attack with the use of pathogens on the agricultural production of a given state or its food resources. Of course, the phenomenon itself is not new, and has probably been accompanying man since the beginning of history. Even in antiquity, Phoenicians, Persians, Greeks and Romans applied measures such as destroying plants, crops or poisoning potable water intakes as methods of fighting against enemies. But similar methods were also used in modern times, during both world wars and after their end, e.g. during the Persian Gulf War. More than a dozen states are currently suspected of having biological weapons and developing strategies of attacking, among others, crops or farm animals. They do this, despite the fact that they are signatories of the Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction, (in short, the Biological Weapons Convention, or BWC) of 1972 which entered into force in 1975[6].

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3 Cf. e.g. definitions quoted by R. Zgorzały [2007]: *Przestępstwo o charakterze terrorystycznym w polskim prawie karnym, Prokuratura i Prawo, No. 7-8, p. 60.*

4 *Ibid.*, p. 61.

5 *http://encyklopedia.pwn.pl/haslo/terroryzm;3986796.html (accessed on 09.04.16).*

6 T. M. Wilson et al. [2000]: *Agroterrorism, Biological Crimes, and Biological Welfare Targeting Animal Agriculture, in: Emerging diseases of animals, C. Brown, C. Bolin (ed.), ASM Press 2000, Washington D. C., p. 23.*

16.3. International Regulations Concerning Terrorism and Agro-terrorism

The provision of Art. 2 of the International Convention for the Suppression of the Financing of Terrorism, adopted in New York on 9 December 1999[7], can be regarded as the first definition of terrorism in international law, aimed at grasping the universal element of this phenomenon. Pursuant to this Article, a crime of terrorism can be committed by any means, directly or indirectly, unlawfully and wilfully, and consists in carrying out:

a) an act which constitutes an offence within the scope of, and as defined in, one of the treaties listed in the annex;

b) any other act intended to cause death or serious bodily injury to a civilian, or to any other person not taking an active part in the hostilities in a situation of armed conflict, when the purpose of such act, by its nature or context, is to intimidate a population, or to compel a government or an international organization to do or to abstain from doing any act.

The above-mentioned Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction (BWC) should be considered the basic act concerning prohibition of using biological agents as a method of terror. Pursuant to Art. 1 of this Convention, each State Party to this Convention undertook to never,under any circumstances, develop, produce, stockpile or otherwise acquire or retain:

1) microbial or other biological agents, or toxins whatever their origin or method of production, of types and in quantities that have no justification for prophylactic, protective or other peaceful purposes;
2) weapons, equipment or means of delivery designed to use such agents or toxins for hostile purposes or in armed conflict.

In Europe, the following documents are of the greatest importance for the issues discussed in this study: the European Convention on the Suppression of Terrorism of 27 January 1977 with an amending protocol of 15 May 2003[8], Council of Europe Convention on the Prevention of Terrorism of 16 May 2005[9], and the Council of Europe Convention on Laundering, Search, Seizure and Confiscation of the Proceeds from Crime and on the Financing of Terrorism of 16 May 2005.[10] This list includes only the most important acts of international significance and is not exhaustive (as numerous declarations, recommendations or resolutions, i.e. the acts of the so-called *soft law* are also included within this field).

In the law of the European Union, the definition of terrorism is provided in Art 1 of Framework Decision of EU Council 2002/475/JHA of 13 June 2002 on combating terrorism[11] and it includes, among others:

a) attacks upon a person's life which may cause death,
b) attacks upon the physical integrity of a person;

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7 *In relation to Poland, it entered into force on 26 October 2003, Dz. U. of 2004, No. 263, item 2620.*

8 *In relation to Poland, it entered into force on 4 October 1996, and the amending protocol on 1 July 2004 (Dz. U. of 1996, No. 117, item 557 and Dz. U. of 2004, No. 172, item 1803).*

9 *In relation to Poland, it entered into force on 5 September 2003, Dz. U. of 2008, No. 161, item 998.*

10 *In relation to Poland, it entered into force on 1 May 2008, Dz. U. of 2008, No. 165, item 1028.*

11 *O.J. L. 2002, No. 164, p. 3 with amendments resulting from Council Framework Decision No. 2008/919/JHA of 28 November 2008 amending Framework Decision 2002/475/JHA on combating terrorism, O.J. L 2008, No. 330, p. 21.*

c) kidnaping or hostage-taking;
d) causing extensive destruction to a Government or public facility, a transport system, an infrastructure facility, including an information system, a fixed platform located on the continental shelf, a public place or private property likely to endanger human life or result in major economic loss;
e) seizure of aircraft, ships or other means of public or goods transport;
f) manufacture, possession, acquisition, transport, supply or use of weapons, explosives or nuclear, biological or chemical weapons, as well as research into, and development of, biological and chemical weapons;
g) release of dangerous substances, or causing fires, floods or explosions, the effect of which is to endanger human life;
h) interfering with or disrupting the supply of water, power or any other fundamental natural resource, the effect of which is to endanger human life;
i) threatening to commit any of the acts listed above.

Those acts are considered to be a terrorist offence if they are carried out by their perpetrator (perpetrators) in order to seriously damage a country or an international organisation with the aim of seriously intimidating a population, or unduly compelling a Government or international organisation to perform or abstain from performing any act, or seriously destabilising or destroying the fundamental political, constitutional, economic or social structures of a country or an international organisation.

An exhaustive description of all of the most important legal norms applicab

16.4. Polish Regulations and Procedures Concerning Terrorism and Agro-terrorism

According to Maslow's hierarchy of needs, the aspects of ecological safety can be classified into two basic groups. In the case of food, satisfaction of physiological needs concerning foodstuff is interwoven with the expectation that the food available in the market should provide appropriate nutrientsand, above all, it should be free from substances harmful to health. It should be emphasized that social, esteem and self-actualisation needs can also be assigned the content related to the care about the nature and the quality of life. This results in the expectation of the public that the authorities will ensure environmental resources of proper quality and quantity. In relation to the fact that supplying the population with food is an elementary, existential need, any disruptions in this regard may evoke not only social dissatisfaction, but could be the cause of dangerous diseases or even epidemics.

In the area of Polish legislation, the basic legal acts concerning counteracting terrorism should include the Act on counteracting money laundering and terrorism financing of 16 November 2000[12], regulating – apart from establishing legal definitions in Art. 2 –also such other aspects as principles of the functioning of the General Inspector of Financial Information, investigating the course of all transactions that raise suspicions as to their compliance with law, registration of transactions of a specific type transferred to

[12] *Dz. U. of 2016, No. 299, consolidated text.*

the General Inspector. This group of legal acts –apart from executive provisions[13]– should also include the Act on state border protection of 12 October 1990[14], the Act on maritime security of 4 September 2008[15], and additionally, e.g. the Act on crisis management of 26 April 2007[16]. At this point, it is worth noting that the National Anti-terrorist Programme for 2015 – 2019 functioning in Poland, the content of which identifies the threat of biological terrorism (although not agro-terrorism)[17].

However, none of the above-mentioned legal acts contains a definition of terrorism. Such a definition can be found in another act that is significant from the perspective of the subject matter discussed, namely in the Penal Code Act of 6 June 1997[18]. At this point,the significant tardiness of the legislator should be mentioned in an attempt to develop a legal structure concerning the crime of terrorism – a respective provision was introduced into the Penal Code only under the Act of 16 April 2004 on amending the Penal Code Act and some other acts[19], i.e. six years after the Penal Code entered into force. This delay was justified by the fact that terrorism acts generally did not occur in Poland, and they did were not an issue of court decisions[20]. The need to finally introduce a definition of an act of terrorism into the Penal Code resulted from Framework Decision No. 2002/JHA analysed above.

In the light of Art. 115 § 20 of the Penal Code, an act of a terrorist nature is an offence that carries a penalty of imprisonment with an upper limit of at least 5 years, committed with the purpose of:

- seriously intimidating many persons,
- compelling the public authority of the Republic of Poland or of another state or an international organization to undertake or abandon specific actions,
- causing serious disturbance to the system or the economy of the Republic of Poland, or of another state or an international organization, as well a threat to commit such an act.

Meeting two of these basic premises classifies a given act as an act of terrorism:

1/ the act is subject to imprisonment of at least 5 years or to a more severe penalty,

2/ the act iscommitted with one of the purposes(motives) listed in the quoted provision. The same applies the threat of committing such an act[21].

The above provision raises numerous issues and has become the basis to formulate critical opinions in the literature of the subject, with the main objection concerning the limit of the penal sanction specified by the legislator in a completely arbitrary manner (at least 5 years of imprisonment)above which a given offence may be classified as a terrorist act[22].

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13 *Cf. e.g. Regulation of the Council of Ministers of 2 November 2011 on establishing the authority commanding the air defence and the procedure for using defence measures in relation to alien aircraft not complying with calls of the state air traffic management authority, Dz.U. of 2015, No. 83, consolidated text.*

14 *Dz. U of 2015, No. 930, consolidated text.*

15 *Dz. U. of 2016, No. 49, consolidated text.*

16 *Dz. U. of 2011, item 1166, consolidated text as amended.*

17 *Resolution of the Council of Ministers No. 252 of 9 December 2014 on the "National Anti-Terrorist Programme for 2015–2019", M.P. of 2014, item 1218.*

18 *Dz. U. of 1997, No. 88, item 553 as amended.*

19 *Dz. U. of 2004, No. 93, item 889.*

20 J. Brzezińska [2008]: *Z rozważań o terrorystycznym charakterze przestępstwa [The consideration of the terrorist nature of the crime], Nowa Kodyfikacja Prawa Karnego, Vol. XXII, p.13.p.13.*

21 C. Sońta [2005]: *Przestępstwo o charakterze terrorystycznym w prawie polskim [Terrorist crime In Polish law] , Wojskowy Przegląd Prawniczy No. 4, thesis No. 2, Lex No. 50443/2.*

22 J. Brzezińska, *op.cit.,* p. 24, in a similar vein A. Rybak – Starczak [2004]: *Środek do osiągnięcia celu [Means to achieve the aims], Rzeczpospolita of 4 November 2004.*

Therefore, if the offence carries a penalty of the lower limit of a penal sanction of less than 5 years of imprisonment, it cannot be considered an act of terror under Polish criminal law.

At the same time, it should be explained that Polish law does not provide for separate sanction, a separate type of crime[23], for offences of a terrorist nature. Acts that may amount to acts of terrorism are therefore subject to the same penalty as those without the terrorist features. For instance,homicide under Art. 148 § 1 of the Penal Code carries a penalty of the deprivation of liberty between 8 years and life imprisonment, regardless of the fact of whether it was common murder (in connection with robbery, for revenge, jealousy, etc.) or murder as an act of intimidation, terror. However, as set out in Article 65 of the Penal Code, a perpetrator of a crime of a terrorist nature is subject to the same Code regulations as those concerning a so-called multi-repeater (Art. 64 § 2 of the Penal Code), which means the possibility of imposing an exceptionally enhanced penalty (i.e. more severe), as well as the application of other negative consequences, e.g. the need to serve not a half, but at least ¾ of the penalty involving deprivation of liberty to acquire the right to apply for early release on parole[24].

A further part of this study addresses the types of criminal acts that can be carried out by a person committing an agro-terrorist type offence, the following legal regulations should be noted (with the omission of the most obvious ones concerning the ban on financing terrorism – Art. 165a of the Penal Code, acting in an organized group or association – Art. 258 of the Penal Code, or dissemination or public presentation of the content that may facilitate the commission of an offence of a terrorist nature – Art. 255a of the Penal Code), provisions of Art. 165 § 1 of the Penal Code, concerning, among others,causing danger to the life or health of many persons or property of a considerable value by: causing an epidemiological hazard or spreading a contagious disease or livestock or plant epidemics (Point 1), producing or marketing substances or foodstuffs that are harmful for health (Point 2), causing damage to or preventing the operation of a public utility device, in particular, a device supplying water, light, heat, gas, energy or a device ensuring protection against the general risk or used for its reduction (Point 3). If the above-mentioned acts result in the death of a person or a serious detriment to the health of many persons, the perpetrator is subject to a penalty of imprisonment between 2 and 12 years (Art. 156 § 3 of the Penal Code). Destruction of crops or farm animals, when occurring on a large scale, also shows that features set out in Art. 181 § 1 of the Penal Code, which provides that the person committing such an offence is subject to the penalty of the deprivation of liberty for a term of between 3 months and 5 years. Finally, whoever

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[23] *In legal systems of other EU states, e.g. in the Penal Code of the Kingdom of Spain, the legislator decided to introduce a separate offence into the wording of Art. 573 – an act of terror (§ 1, which is defined as any act against human life or physical integrity of a person, his or her freedom, moral integrity, sexual freedom, heritage, natural environment or natural resources, public health, posing a risk of a disaster, fire, against the Spanish Crown, armed robbery, possession of and trading in weapons, ammunition or explosives, seizure of an aircraft or a ship or any other means of public or goods transport, if the act is committed in order to:*

a) overthrowing a constitutional order, or overthrowing or serious destabilization of operation of institutions and state authorities, creating distortions in social and economic life in order tocompel public authorities to undertake or to abandon a specific action,

b) serious disturbance of the public order,

c) causing serious disturbance in the operation of an international organization,

d) serious intimidation of all or a part of society

[24] It is obviously doubtful whether the person who committed an offence of a terrorist nature could be granted such a release at all.

pollutes water, air or ground with a substance in such quantities or in such a form that it can pose a risk to human health or life or result in serious reduction of the quality of water, air or ground or destruction in the plant or animal world on a significant scale, is subject to the penalty of the deprivation of liberty for a term of between 3 months and 5 years (Art. 182 § 1 of the Penal Code).

16.5. Conclusions

Protection of the legal order, the internal order and ensuring social security are the basic tasks of every state, therefore states aim at consolidating their attempts in this regard and coordinating activities of specialized services and authorities at the international level. With respect to anticipated risks, it is undoubtedly significant to draw attention to this variety of bioterrorism, which is known as agro-terrorism. In particular, it is important to strengthen security policies in laboratories where dangerous pathogens, e.g. viruses, bacteria or fungi are stored, to make institutions and governmental agencies aware of the risk of agro-terrorism and to carry out training activities aimed at immediate distinguishing a terrorist attack from an isolated event consisting in the occurrence of pathogenic phenomena among crops or farm animals. Another important issue is the need to undertake attempts to develop a strategy for preventing agro-terrorist attacks, including cooperation with authorities and institutions from other states (bearing in mind the possible cross-border nature of such an attack).

What raises the greatest concern is the fact that the process of preventing terrorist attacks involves – – in every state – several specialised agencies and institutions (courts, the prosecutor's office, police, border and customs authorities, intelligence agencies, competent ministries, for example, the Interior Ministry, Environment and Public Health, veterinary inspection and sanitary authorities, departments responsible for monitoring agriculture, authorities dealing with issues related with environmental pollution, local government institutions, etc.), which results in extreme difficulties as regards the efficient, rapid coordination of activities to prevent a terrorist attack.

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