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GREENING OF ECONOMY
Selected Issues

Scientific editors:
JÓZEFA FAMIELEC and MAŁGORZATA KOŻUCH

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Introduction

The present study consists of selected papers that originated from the monograph of the Department of Industrial and Environmental Policy at the Cracow University of Economics. They address the issues of economic development and in particular questions concerning the industry along with the paradigm of sustainable development[1].

Economy is subordinated to the environment, so it can be said that it is a subsidiary of the environment. Economy conditions social life, economic development and generally speaking civilization. At the same time, the man and the economy, while using the services of the environment are obliged to protect ecosystems and to maintain them for future generations. Thus the economic growth must be less raw materials absorbent and the effects of using raw materials should always be the subject of the calculation and the ecological and economic account. Such an approach to the philosophy of economy and management is the essence of the category of greening.

The study consists of six chapters. In the first chapter the essence and the scope of the concept of greening as a paradigm of the modern socio-economic development has been defined. The second chapter develops the category of greening from the perspective of the climate policy and the strategy of the most emissive sector, namely the energy sector. The third chapter uses the category of greening in the local public transport. The fourth chapter discusses the most important condition of greening the economy, namely the innovative processes. The fifth chapter discusses the importance of relationships in the greening of economy. It recognizes the significance of the thought of John Paul II, which sets the directions of any concern and the desire to improve the world[2]. In the sixth chapter the forms of public subsidies have been identified and their importance in the process of financing the environmental protection has been underlined. Public subsidies as instruments of the environmental policy are an important tool of greening the economy.

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[1] M. Kożuch (ed.), *Ekologizacja gospodarki*, Uniwersytet Ekonomiczny w Krakowie, Fundacja Uniwersytetu Ekonomicznego, Kraków 2015. This monograph is much more extensive and includes papers of other members of the team of the Department as well as its PhD students. The selection of papers for translation – with the consent of the authors – has been done by Józefa Famielec.

[2] *Any concern and desire to improve the world requires in-depth changes of life styles, modes of production and consumption, well established power structures on which the society is based today*. It is recalled in the encyclical of the Holy Father Francis devoted to the concern for the common home.

They motivate us to take actions that lead to the reduction of pressure of economic activity on the environment.

The category of greening of the economy is controversial and requires an integration of many fields of knowledge and science. Previous studies of the Department of Industrial and Environmental Policy at the Cracow University of Economics devoted to the development of this category represent a significant contribution. The authors of this study are convinced that it is the right way to make this contribution public for English speaking readers.

Prof. dr hab. Józefa Famielec

Józefa Famielec

CHAPTER I

GREENING AS THE PARADIGM OF SOCIAL AND ECONOMIC DEVELOPMENT

1. Introduction

Should the world be organized differently? This question is answered in the following way: "There is significant evidence that after 200 years the capitalist system leaves social, economic, environmental and ecological ruins, even in countries and on continents in which it used to have its largest achievements"[3]. The pursuit of quantitative growth that brings profit does not guarantee sustainable development preferred by science and the local and international communities. Such development enforces integration of economic values with social and environental ones. This orientation is called greening.

Greening means efforts for achieving structural changes in the whole economy and conversion of its respective branches in order to lower the usage of energy, raw materials and water, lower the amount of produced waste and its arduousness for the environment and the society. Greening has influence on all sectors and macro- and microeconomic phenomena.

In this chapter, the Authoress discusses selected aspects of the greening processes concerning economy that constitute the subject of own research and theoretical study.

2. Greening – from egoism to eco-humanism

The term of greening is an old category related to silviculture, as well as game management, fisheries economy, beekeeping economy and even agriculture since it includes the usage of natural mechanisms in order to enhance economic processes. As such, it is called primary greening. The current ecological movements apply the principles of greening that were already established in the past. Those principles were elaborated over 200 years ago

[3] M. Cesarski, *Kryzys istoty kapitalizmu*, "Przyszłość" 2013, No. 2.

and they were the reaction against the unprecedented plundering and wasteful exploitation of forests that could lead to the total eradication of contemporary forests, which already had been far from their natural state. Modern European forestry was, then, not an economic takeover of natural forests (which sometimes occurred), but rather a rational attempt to order (and protect) the principle itself – the sustainability of forests.

"If you cleared a forest and planted a new one in its place, it does not mean that you have kept the natural balance or that his balance will be restored when the young forest will grow. You will never restore the old forest. It is impossible to recreate, copy or repeat such an aged stand with its thicket, shade and scent, with its internal web, connections and relations. When you clear a forest, a part of this world dies out for ever"[4]. Some part of ourselves dies since, when we turn forests into "warehouses with wood, we not only lose rare beetles, moss, fungi or birds"[5].

The struggle with the plundering of forests, for the sake of return to the rational forest management, is the first stage of greening that is analogical to the actions of the "state" forestry 200 years ago. The same degree will be applied by all the methods of semi-culture of plants and semi-breeding of animals, modern agriculture, as well as the rational game management and fisheries economy. The increase in the variety of crops and tree stands and the usage of natural mechanisms of biological resistance against damages means a higher degree of greening[6].

The original greening of agriculture, which was an attempt to stop the degradation processes, concerned the discovery of crop rotation (that replaced natural succession). The so-called primary crop rotation in form of the three-field system (fallow land – winter cereal – spring cereal) was introduced in Poland in the late Middle Ages (about 15th century). At the end of the 18th century and at the beginning of the 19th century, the discovery of the four-field crop rotation: root crops (on manure) – spring cereal – legume plants – spring cereal, constituted another modification of the three-field system. This crop rotation, also called the Norfolk crop rotation, underwent many changes. Ecological agriculture uses even an 8-year crop rotation. In its basic form, it is still in effect today, after a significant simplification due to

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4 R. Kapuściński, *Lapidarium III*, 1997, pp. 174-175 quoted after M. Zaremba Bielawski, *Leśna mafia. Szwedzki thriller ekologiczny*, Wydawnictwo Agora SA, Warszawa 2014, p. 7.

5 M. Zaremba Bielawski, *Leśna mafia. Szwedzki thriller ekologiczny*, Wydawnictwo Agora SA, Warszawa 2014, p. 11.

6 The state of research and their results concerning the greening of silviculture and its economic outcome is included in i.a. the following study: S. Zając, A. Kaliszewski, *Ekonomiczne aspekty ekologizacji zagospodarowania lasu*, VI Sesja Zimowej Szkoły Leśnej, Instytut Badawczy Leśnictwa, Sękocin Stary 18-20 March 2014.

the naive trust in technology, i.e. great removal of legume plants and their replacement with synthetic fertilizers. This significant breach of the principle of crop rotation is greatly responsible for the negative effects of the modern agriculture disaster.

The crop rotation system has created a set of positive feedbacks[7]. The usage of manure on such a wide scale was possible only after the growth in breeding animals. This growth was possible only due to the fact that people could preserve more animals during winter thanks to the wide scale farming of root crops. Introduction of root crops and legume plants was started due to geographical discoveries as a result of a deliberate selection. Root crops and legume plants, that have been farmed till this day, are, to a large extent, a typical product of technology – the application of science research results and technology.

By the application of manure and usage of root crops and legume plants that "cultivate the soil", it was possible not only to stop their degradation for the first time, but, on the contrary, increase their lifetime. As a result, the production of cereal also increased significantly; this was the condition of successful culture (straw – manure) and the reason for the "small demographic explosion" in Europe and North America in the nineteenth century.

It is significant to establish greening of agriculture that refers to the universal laws present in nature, where every effect has its cause and where is an overall coherence, things are important or less important, while awareness decides on harmonized development[8].

Those references to forests and agriculture have been indicated only to illustrate the complex issue of greening that is developed, in particular, in fields of science connected with earth, that are beyond the competences of the Authoress and the framework for this study. They help to present the ambiguity and extent of the category of greening[9].

This category underwent its renaissance during the second half of the twentieth century. On a large scale, it was used to describe the strategy for social and economic development, very often called sustainable development[10] or, more

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[7] An interesting history of greening of agriculture was presented in a quite old, yet scientific and noteworthy study: A. Bieńkowski, *Rolnictwo ekologiczne szansą dla części małych gospodarstw rolnych Ziemi Kurpiowskiej*, "Zeszyty Naukowe Ostrołęckiego Towarzystwa Naukowego" 2002, No. 16.

[8] S. Kozłowski, *Droga do ekorozwoju*, Wydawnictwo Naukowe PWN, Warszawa 1997, pp. 55-64.

[9] Further reading: B. Smolorz, *Kierunki procesu ekologizacji na świecie*, "Ekologia i Technika" 2005, No. 1, pp. 27-31.

[10] See i.a. A. Skowroński, *Zrównoważony rozwój perspektywą dalszego postępu cywilizacyjnego*, "Problemy Ekorozwoju" 2006, No. 2, pp. 47-57.

correctly, permanent development. While defining it, one's attention is drawn by the domination of ecological (natural) circumstances in the determination of development goals, next to social and economic goals.

It has been assessed that greening of economy is an efficient method of implementing the principles of sustainable development. This may be achieved by means of application of administrative and legal instruments for environmental protection in the economic policy[11].

The properly understood greening does not only mean consideration of ecological limitations (the need to protect the environment), but also to consider any social aspects connected with human beings. A category of the so-called green economy is being shaped – a system that optimizes the flow of goods and services in order to maximally use the raw materials and lower the amount of waste to the minimum.

Green economy distinguishes biological resources and technological resources. Biological resources include food, vegetable waste, wood and textile fibres, which are consumed and then return to the environment as compost or organic to restore the nutrients in soil or/and are processed in order to produce energy from renewable sources. Technological resources are preserved, reused, restored or recycled multiple times in a closed circuit system. This system is energy saving and uses, to the maximum extent, renewable sources of energy, which results in lowering of greenhouse gases emission. Green economy requires withdrawal from production based on the "take-make-dispose" attempt. This creates new development challenges in all sectors. A demand for innovation appears within the scope of designing and production since people want to create a new generation of products with an extended service life, which people will be able to repeatedly use, repair and disassembly, while the components of such products can be reused or recycled. Public administration and entrepreneurs are encouraged to help their employees acquire new skills required to satisfy the conditions of green economy.

Activities related to green economy can be called greening. Greening of economy means efforts for achieving structural changes in the whole

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The Authoress agrees with the following statement: "The correct translation of the term 'sustainable development' is 'rozwój podtrzymywalny', but it is a neologism in Polish. That is why it is commonly agreed to use the translation 'rozwój zrównoważony' [balanced development], but this, on the other hand, is a self-contradictory translation (development may not be balanced) and does not resemble the main idea of G. Brundtland: to leave future generations with the same chances that we had". A. Pawłowski, L. Pawłowski, Warunki trwałego, zrównoważonego rozwoju ludzkości, "Przyszłość" 2013, No. 2.

[11] H. Żukowska, *Ekonomiczne aspekty ochrony środowiska naturalnego (Na przykładzie województwa lubelskiego)*, Wydawnictwo Uniwersytetu Marii Curie-Skłodowskiej, Lublin 1996, p. 201.

economy and conversion of its respective branches in order to lower the usage of energy, raw materials and water, lower the amount of waste and its arduousness. Greening of economy is mainly about changing the goals of economic policy, and in the second instance – about organizational and technical undertakings.

The category of greening is frequently used in terms of terminology "innovations"[12]. Among more uncommon references to greening one may recall: greening of administration, greening of work efficiency, greening of restructuring, greening of legislation, or even greening of subsidies.

Nowadays, greening constitutes a feature of market economy development. Greening of market economy means[13]:

- creation of markets,
- integration of actions with other policies,
- co-operation with other policies,
- observation of market formation,
- stimulation/support of pro-environmental conversion of the market,
- deliberate withdrawal from actions that are harmful to the environment.

The choices and market activities should always take into consideration the more advantageous alternatives, including the ecological ones. There is no sufficient research of the profitability of greening processes, while the issues related to that are beyond the scope of this study. However, it is worthwhile to mention that greening may cause higher efficiency of management processes thanks to the so-called *multiplication factor four*. It has been described in the report for the Club of Rome in 1999[14]. It is even referred to as the revolution of efficiency. According to this mechanism, the execution of ecological tasks allows doubling of well-being and double decrease of the usage of nature resources. 50 examples were described, as well as the paradoxes of civilization and economy were indicated. It also presented the projects of alternative ecological solutions.

Summing up, greening – that most often is associated with the circumstances of economic processes – is a much wider category. It constitutes the most important trait of the development of the civilization, while integrating the economic, social and nature factors that define it. In this perspective, the category of *eco-humanism* is defined. It means a partnership

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[12] http://www.linguee.pl/polski-angielski.

[13] A. Graczyk, *Instrumenty rynkowe polityki ekologicznej. Teoria i praktyka*, Wydawnictwo Uniwersytetu Ekonomicznego we Wrocławiu, Wrocław 2013, p. 376 and further.

[14] E.U. Weizsäcker, A.B. Lovins, L.H. Lovins, *Mnożnik cztery. Podwójny dobrobyt – dwukrotnie mniejsze zużycie zasobów naturalnych*, Report for the Roman Club, Wydawnictwo Rolewski, Toruń 1999.

cooperation for the benefit of all people, both the rich and the poor, the society of the highly-developed and the development of the delayed, their successors and natural environment, widely supported with science and high-tech, as well as information culture[15].

3. Greening versus economic growth

The theory of both the classical and neoclassical economy is interested in the boundaries of growth. Economic growth constitutes the basic paradigm of economy and the goal of activities of governments, sectors and societies. It is usually reduced to investment and consumption activity and is assessed with a controversial – there is no alternative so far – measure of gross domestic product or gross national income[16], but it rarely triggers consideration for its fundamental and civilizational factors.

In the growth theory its factors are simplified to physical capital (expenditures for fixed assets), intellectual capital (the employees and their skills) and the productivity of capital. R.M. Solow and T.W. Swan tried to define and quantify the sources of economic growth, in which they used the Cobb–Douglas production function[17]:

$$Y = A N^{\beta} K^{\alpha} \text{ where } \alpha + \beta = 1, \text{ for } 0 < \alpha < 1 \text{ thus } \beta = 1 - \alpha$$

The gross domestic product Y is determined by i.a. the capital resources K and work resources N at a degree set by the value of exponents α and β. They are interpreted as the production flexibility rates in comparison to the changes in the inputs of a particular factor that determines its contribution to every manufactured unit of the product. The variable A – in Solow model – is the measure of the contribution of technical development to the economic growth rate. The evolution of production inputs in Solow model results in the fact that the majority of capital per unit of efficient work is intended to reach a constant, leading the economy on the so-called balanced growth path (BGP), until it reaches the state in which each variable of the model increases at a constant rate. In the general Solow growth model, the only source of growth of product per worker on the BGP path is the technological

[15] L. Michnowski, *Nauka dla życia w stanie zmian i ryzyka*, "Przyszłość" 2014, No. 2.

[16] "Nowadays scientists struggle with two questions. Firstly, how can one enhance the measurement with GDP, which is the symbol of the race of multiplying products and services? and, secondly – and more important question – have we reached in this race the boundaries that require us to change the philosophical foundations of human existence and, thus, the change of this measurement?". Z. Madej, *Odwieczne kłopoty z pojmowaniem i pomiarem bogactwa narodów*, "Przyszłość" 2013, No. 2.

[17] M.G. Woźniak, *Wzrost gospodarczy. Podstawy teoretyczne*, Wydawnictwo Uniwersytetu Ekonomicznego w Krakowie, Kraków 2008, p. 179.

development – both the capital per worker, as well as product per worker grow at the rate of the technological development[18].

The question of the boundaries of growth is not only a matter of production factors, but also the size of population and consumption of resources. The team from the Institute for Technology in Massachusetts, led by professor Dennis Meadows, elaborated in 1972 the first report entitled *The Limits to Growth*. On the request of the international team of experts, the Roman Club, analysts used computers to create models to forecast the possible scenarios for the future of industrial civilization. The findings of the report were very pessimistic. By using the contemporary trends of growth of population and resource consumption, various levels of agricultural productivity, birth control and efforts within the scope of environmental protection, it was determined that due to consumption, which exceeded the environmental capacity of the planet (while such capacity is connected with technological development and aggressive market competition), we can expect an economic downturn and the beginning of reduction of population already before 2030.

Those catastrophic visions had been criticized. The scientists from the University of Melbourne repeated the analysis of the possible scenarios and the results were published in September 2014. However, they confirm the forecasts from 1972. Moreover, they document that the global ecological crisis is not only related to emission of pollutant gases and ecosystems losing their capacity to provide services for economy and the society[19]. The ecological crisis may also be connected with unemployment, financial and economic crisis. An unlimited physical growth is impossible on a planet with limited resources. The limits of growth may be shifted through changes in our deeds, or the planet will stop this growth by itself. In 13 scenarios prepared by the countries, the end of the physical growth of our civilization, meaning the growth of population, production of food and other consumption goods, will start in the first half of the twenty-first century.

At the same time, the turn of the twentieth and the twenty-first century is rich in political, economic, market and financial initiatives, which provide programs, legal and social institutions for sustainable development. It is identified with the chance of overcoming the basic barriers of growth. In the meantime, it may not only appear to be ineffective, but also may speed up reaching the civilization limits of growth. It results from the following reasons[20]:

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[18] D. Romer, *Makroekonomia dla zaawansowanych*, Wydawnictwo Naukowe PWN, Warszawa 2011, p. 33.

[19] Used: http://exignorant.wordpress.com/2014/08/24.

[20] http://exignorant.wordpress.com/2014/08/24.

- The supporters of growth change the justification for their paradigm but do not change the paradigm itself and, thus, the acts of producers, consumers and governments do not change.
- The global system has greatly exceeded the capacity of the environment. It has been estimated that we currently use 125% of the environmental capacity of the Earth.
- Replacing social changes with technological changes. We have not learned about new forms of life that could ensure access to natural resources. We have not managed to increase the degree of usage of the high, but still passive intellectual potential of humankind[21]. As a result of lack of knowledge concerning the core of the crisis and the circumstances of sustainable development, we have not been able – so far – to learn about methods for stimulating the common, eco-socially useful creative activity, while, at the same time, eliminating unnecessary innovative activity that is very often destructive.
- Economic systems focus on short-term matters, ignoring the long-term ones and the environmental side effects,
- Political, economic and even social pressure on growth based on quantity, despite the development of disciplines and methods to insure qualitative growth, which will preserve the characteristics of technological development without changes in actions and processes that are possible in economy. "The immanent weakness of the modern Western civilization is placing extensive trust in maximally fast quantitative economic growth"[22].
- The domination of financial goals based on quantitative growth, with the particular focus on the profit of individuals, organizations and any development projects, weakens the meaning and raises the costs of qualitative development.
- The peculiar loop of greening – marketing and advertisements stimulate physical growth in order to produce more and more goods, resources and human work are being exploited at a faster pace, while culture and the environment is being degraded. In order to recover the lost values – tranquility, beauty, a clean environment – more physical goods are consumed and this, again, degrades culture and the environment. This loop is becoming more problematic due to the common actions to fix the results, but not to counteract the causes. Counteracting the negative effects of crisis are some-

[21] L. Michnowski, *Nauka dla życia w stanie zmian i ryzyka*, op. cit.

[22] M. Cesarski, *Kryzys istoty kapitalizmu*, op. cit.

times more spectacular and better regarded by all stakeholders of economic and political actions than the less attractive, often more tedious and expensive preventive actions. This susceptibility is not only related to protection of the environment but also to e.g. health care.

- The pressure to solve the issues of climate changes without considering the key social and civilization factors. Despite the declaration to reduce greenhouse gases, (carbon dioxide in particular) their emission is increasing. The ecological goals of climate policy, both of the EU and Poland, are conducted to reduce the emission of greenhouse gases until 2020 by 20% in comparison to 1988, regardless the factors, especially regardless the changes in population density. Meanwhile, the degree of CO_2 contamination constitutes the product of four factors: the number of people on the Earth, capital per person (the standard of living on the Earth), energy intensity of capital unit and the amount of energy acquired from fossil energy sources. In the meantime, the activities and programs are aimed at reducing the share of energy from fossil fuels and development of alternative sources (wind, solar energy). Houses more often have insulation, engines are optimized more frequently. The technology is optimized regardless the population and standards of living. The problems of climate changes will not be solved without considering the social factors[23].
- Solving global problems, including climate changes, is of local nature. Such global problems include: global changes, terrorism, epidemic, distribution of nuclear weapons, extensive exploitation of the resource of sea fish and petroleum. In the meantime, solution of those problems depends on mutual actions and prospects of many nations. Global problems cannot be solved in one place (e.g. in Europe) without having the exact problem solved in another place (e.g. in China). Is is also highlighted that human nature itself, due to genetic reasons, does not make people think about the future but rather make them focus on their current survival.
- Chances for solving global problems may be found in sustainable, green technology. However, people sometimes call it a mere fantasy. Even if it was possible to increase the efficiency of power usage, the application of renewable energy sources or limit consumption,

[23] This is confirmed by the research results in the doctoral dissertation prepared under scientific guidance of the Authoress of this chapter, published in the monograph: K. Cięciak, *Skuteczność ekologiczna polityki energetycznej Unii Europejskiej w Polsce*, Fundacja Uniwersytetu Ekonomicznego w Krakowie, Kraków 2013.

it would not be able to extend the longevity of the current system. Production of petroleum shall halve in the following 20 years, even with the exploitation of tar sand and oil shale. The resources of oil reduce and have higher operational costs. The process is too rapid. The problem of petroleum extraction peak is a taboo subject, even for the World Bank since it destroys the belief in economic growth. It destroys the perspective for development of aviation industry that greatly depends on fossil fuels.

- Despite the conviction of efficient ecological and climate policy, the areas that are controlled and regulated by the state do not motivate to protect. The history of fishery shows destruction of sea ecosystems, while the atmosphere is used as a free dumping ground for industrial waste.

The scientific achievements, including those of Dennis Meadows, within the scope of limits of growth are substantial. However, the correct answer in science has low chances to be acknowledged if the truth contradicts to the dominant paradigm of the unlimited economic growth on a planet with limited resources[24]. Greening of the paradigm of growth seems to constitute the chance for using science as the tool for social and economic development. Nonetheless, the scientific line of argument is not dependant on quoting the authority, regardless the recognition this authority has. The scientific line of argument depends on experimental proof, logic and reasoning[25].

Science very often chooses protectiveness. The leading popular publications routinely mislead the public opinion. Scientists of the mainstream minimize the dramatic nature of the message. For years, the scientists have been diminishing the effects of climate changes[26]. People have a vital interest to not think about climate changes (those concerns are usually attributed to "mad environmentalists") and that is why the concepts of global warming win.

[24] http://exignorant.wordpress.com/2014/08/24.

[25] This is a claim by John William Farley, an American nuclear physicist and the professor of physics at the University of Nevadain Las Vegas, http://exignorant.wordpress.com/2013/10/02.

[26] The University of Maryland has stopped publishing the measurement data of methane etc., http://exignorant.wordpress.com/2013/10/02.

4. The methodological dispute between the Austrian and the Neoclassical schools – an example of a theoretical discussion concerning the institutional factors of economic governance

The Austrian School of Economy participated in the important period of elaboration of economic science at the end of the eighteenth century. It has mitigated the risks of the previous level of scientific analysis called "supposed history". It is about interpreting the processes of evolution and analyzing its results within the sphere of: customs, morality, law and institution. Such interdisciplinary approach that requires research from the fields of sociology, political science and anthropology exposes the scientist to make mistakes concerning the interpretation of the phenomenon of historical evolution since, it does not protect from application of wrong theories during this interpretation[27]. The research program of the Austrian School of Economy employs the formal analysis of the spontaneous and dynamic process caused by interactions among people. This degree is, then, based on the formal theory of social processes and the attempt to rationalize those processes. This gave rise to praxeology used in defining and describing the sustainable development and is represented by such respected followers as C. Menger, L. Mises and F.A. Hayek.

The Austrian school has been formed along with the publication of *Priciples of Economics* by Carl Menger in 1871[28]. The original and most important idea of this study is an attempt to construct economy in which the starting point would be human as the creative actor and participant of all social processes (subjectivism[29]). C. Menger also formulated the economic theory of the process of establishing public institutions (important from the points of view highlighted in other approaches towards development of sustainable order, including social order). Actions and institutions make possible to live in a society are, then, created in economy (money), law (moral principles and behavior), as well as in language[30].

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[27] J. Huerta de Soto, *Sprawiedliwość a efektywność*, Wydawnictwo Fijjorr Publishing Company, Warszawa 2010, pp. 119-120.

[28] C. Menger, *Priciples of Economics*, New York University Press, New York–London 1981.

[29] The subjectivistic concept of the Austrian School allows economy to be a general field of study, which analyzes every human activity, and has objective relevance, yet this may, but only seemingly, be paradoxical. See Jesus Huerta de Soto, *Sprawiedliwość a efektywność*, op. cit., p. 68.

[30] The professors from the German Historical School not only misunderstood C. Menger, but also considered him a threat to historicism. The Historical School in economy, represented by the nineteenth century German professors and the twentieth century American insitutional-

Paradigms of the neoclassical school (by monetarists and Keynesians), according to the assessment of macroeconomy by Austrian economists[31], were also accused of methodological errors, such as[32]: *ignoring the impact of time, treating capital as a homogeneous fund that restores itself independently*, *consideration of existence of a horizontal and one-dimensional structure of production in balance*, lack of endogenous theory on cycles (crisis results only from exogenous and psychological reasons, as well as from the mistakes of monetary policy, *lack of capital theory*, considering saving as unimportant and the function of production as fixed, set by the current state of technology (change of demand for capital goods occurs in the same direction as the change in demand of consumer goods, production costs are objective – pre-defined, historic costs of production determine market prices), *considering the interest rate mainly as a monetary phenomenon*, determined by a marginal productivity or efficiency (internal rate of return of capital).

The methodological dispute conducted by the Austrian school is controversial and remains outside the scope of analysis of this study, yet, in some aspects, it seems to be significant for the formation of the theory related to greening of economy.

The methodological dispute of the Austrian school against historicism, as well as its polemics (known as *Methodenstreit*) led to defining the methodol-

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ists negated the possibility of existence of a universally effective abstract economic theory that was defended by Menger and Austrian economists. Methodology of historicism tries to apply empirical observation (history) to verify or falsify theories that constitute another manifestation criticized by the Austrian school of Cartesian rationalism (constructivism or constructivist rationalism). Constructivists claim that public institutions, which served people (money, ownership, the state, language), had been established with the full acknowledgment of the related consequences. Such an approach of Cartesian rationalism was, by its critics, regarded as false individualism. See P. Leszek, *Interpretacja własności w doktrynie Hayeka: ewolucyjny przypadek usankcjonowany korzyścią*, Wydawnictwo Wrocławskie Studia Erazmiańskie, Wrocław 2009, Vol. III, p. 98. Contradictory to this, Friedrich Hayek – the economist and philosopher of the Austrian school who was skeptical about the capacities of human mind, formulated a concept of the so-called division of knowledge and developed the idea of spontaneous order that – in my opinion – complements the ordoliberal concept of economic order, in light of which the category of sustainable development is frequently discussed. See i.a. J. Famielec, *Rozwój zrównoważony a ordoliberalna koncepcja ładu gospodarczego*, in: *Ład gospodarczy a współczesna ekonomia*, scientific ed. P. Pysz, A. Grabska, M. Moszyński, Wydawnictwo Naukowe PWN, Warszawa 2014, pp. 197-210.

[31] From its very beginnings, that is 1871, the Austrian school has been conducting numerous doctrinal polemics of methodological nature, which are considered legitimate and influencing the theory of economy, see J. Huerta de Soto, *Sprawiedliwość a efektywność*, op. cit., p. 85 and further.

[32] Italics highlight those methodological mistakes, the liquidation and replacement with objective paradigms of which – in opinion of the Authoress – had a significant meaning for elaborating the theory of economy for sustainable development.

ogy of economy by C. Menager, which could be used in formulation of the theory and economy of sustainable development. This methodology includes: a set of theories that constitute the "form" (in Aristotelian meaning) that presents the content (substance) of economic phenomena and is discovered during the process of internal afterthoughts (introspection) during a logical process based on deductive conclusion. The theory is not being deduced from history, since a former theory is required for the correct interpretation of history. Consequently, C. Menger created the foundations of the traditional methodology of the Austrian school by reference to the continental Catholic tradition, which, in the secular context, constructed the basic elements that constitute the paradigm of the current Austrian school, in particular spontaneous formation of institutions, the divided nature of knowledge related to public institution – understood as spontaneous orders[33]. This characterizes the so-called subjective theory that is also developed by Spanish scholastics who use the subjectivistic concept from the theory of money, include the term of the entrepreneur who is, nowadays, the main participant of economic development. The achievements of subjectivism of values, entrepreneurship and pressure on practicality of markets and pricing (criteria that are important in the assessment of sustainable development) were nullified by A. Smith[34]. He replaced subjectivism of value with the labor theory of value and focused on the balance of long-term unchanging natural prices in a world that is expected to have no entrepreneurship.

The methodological dispute of the Austrian school was also joined by its reprentative – E. Böhm-Bawerk, argued with J. Clark (by formulating i.a. the thesis that the interest rate is determined by the marginal productivity of capital), G. Marshall (by claiming that supply specifies the historic cost of production and denying the Austrian term of the subjective alternative cost[35]) and with K. Marks (who did not take into consideration the subjective character of time preference).

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[33] Greening constitutes one of the subjects of spontaneous order. See J. Famielec, *Stanowiony porządek ekologiczny versus spontaniczny ład gospodarczy*, in: *Spontaniczne i stanowione elementy ładu gospodarczego w procesie transformacji – dryf ładu czy jego doskonalenie?*, scientific ed. P. Pysz, A. Grabska, M. Moszyński, Wydawnictwo PTE Warszawa 2014, pp. 113-134.

[34] "The paradigm of mainstream economy is the market and market relationships, so, by using the words of Adam Smith – 'the invisible hand of the market'. Perception of reality through this paradigm has led to the risks concerning the biosphere, which decide on the current shape of life on Earth and the biological foundations for the development of homo sapiens species. The economy of sustainable development must not reproduce this mistake". H. Rogall, *Ekonomia zrównoważonego rozwoju. Teoria i praktyka*, Wydawnictwo Zysk i S-ka, Poznań 2010, p. 21.

[35] The subjectivistic concept of alternative cost (important for the assessment of results of capital allocation, including natural resources) was created in 1876 by Friedrich von Wieser who – according to Mises – had never fully understood the real meaning of subjectivism. See L. von Mises, *Wspomnienia*, Wydawnictwo Fijjorr Publishing Company, Warszawa 2007, pp. 69-70.

The third generation of economists from the Austrian School: L. Mises, F.A. Hayek and H. Mayer, started polemics concerning the theoretical impossibilities of socialism. According to L. Mises, if the source of every need, valuation and knowledge is the creative resourcefulness of a human being, then each system based on violence against human actions will effectively limit generation and transmission of information essential for coordinating the society[36]. L. Mises claimed that "the illusion that rational organization of economic management is possible in a social system based on public ownership of means of production originates from the theory of value by classical economists. …Many contemporary economists did not manage to consistently reconsider the basic statement of subjectivistic theory and draw final conclusions… Those mistakes gave raise to blooming of socialist concepts"[37].

The economists of former socialist countries felt the truth and realized that the neoclassical socialists "never overcame the Austrian challenge". As the proof for truthfulness of the theoretical impossibility of socialism, considering it as a political issue and not a problem of the theory of economy, people acknowledge the statement by Joseph E. Stiglitz, a prominent neoclassicist (from 1994): "we can to some extent blame the standard neoclassical models for the catastrophic situation of so many East European countries. We will find a lot of evidence to support the thesis that economic concepts have become the cause of unspeakable suffering of half of the world population"[38].

It is also worthwhile to draw attention to the polemics of economists of the Austrian school, including, in particular, F.A. Hayek and macroeconomists, especially J. Keynes within the scope of analysis created exclusively in categories of macroeconomic aggregates in opposition to the Austrian, dynamic concept of the market. Economists of the Austrian school initiated polemics with the growing neoclassical paradigm, redefining, at the same time, their methodological positions presented in works by L. Mises, H. Mayer and F.A. Hayek. L. Mises specified and determined a method that is contradictory to positivism and application of mathematics in economy. H. Mayer formulated a devastating functional criticism and mathematical analysis of the neoclassical theory on prices. F.A. Hayek made a methodological criticism of empiricism, as well as the narrow utilitarianism of the neoclassical analysis of costs – benefits (profits), the basic method of economical analysis in protection of the environment.

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[36] J. Huerta de Soto, *Sprawiedliwość a efektywność*, op. cit., pp. 93-94.

[37] L. von Mises, *Ludzkie działanie*, Wydawnictwo Instytut Ludwiga von Misesa, Warszawa 2007, p. 179.

[38] J.E. Stiglitz, Whither Socialism, MIT Press, Cambrigde 1994, quoted after: J. Huerta de Soto, *Sprawiedliwość a efektywność*, op. cit., p. 95.

The attempt of positive application of the Austrian and neoclassical approach has led to the instruction ordering a reconstruction of the conclusions of the neoclassical theory via subjectivistic and dynamic methodology of the Austrian school, so that it would become clear which conclusions should be abandoned due to theoretical irregularities. As to its content, the neoclassical method is, from the Austrian point of view, wrong, which, at the same time, forms many sources of risk and misleads the researcher from truth. The view claiming that the Austrian methodology would be proper for constructing foundations of a scientific discipline, while the neoclassical empiricism should take the responsibility for all the issues of applied economy is also being demolished[39].

The social and economic changes of the twentieth century provide evidence that both the doctrines of Austrian, as well as neoclassical school had been applied. A sentence by F.A. Hayek is frequently being quoted: "it would not be overactive to say that every significant progress in the economic theory of the last century was another step towards coherent application of subjectivism". Simultaneously, the point of view of social engineering, promoted by the mainstream of neoclassical paradigm, is undeniably responsible to a large extent for the expansion of the state in the twentieth century. In the end – in the opinion of Hans-Hermann Hoppe – the neoclassical and positivist methodology has quite often been an intellectual cover for socialism[40].

The polemics and criticism of neoclassical economy, including those concerning the environment and natural resources, resulted in creation of green economy, in which sustainable development, also referred to as permanent (which has been already described as not widely acceptable) constitutes one of the basic categories[41]. Green economy accuses neoclassical environmental economics of such weaknesses as: ahistoricity of presentation (disregarding the uncertainty and irreversibility of processes), ignoring limits of growth, too optimistic assumptions concerning substitution of the environment as a result of technological progress, underestimation of the causes of pollution, a separate approach towards external effects and resources of the environment. Green economy has been considered as interdisciplinary and that requires methodological pluralism and going beyond the limits of cognition – apart from economy, also physics, social theory, system analysis etc. Green economy, however, has no vivid application of the Austrian school of economy in ecological economics, but, still, the holistic determination of social and economic phenomena may be treated as an important common feature of both of those schools.

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[39] J. Huerta de Soto, *Sprawiedliwość a efektywność*, op. cit., p. 102.

[40] H.H. Hoppe, *The Intellectual Cover for Socialism*, "The Free Market", February 1988.

[41] P. Jeżowski, *Ekonomia ekologiczna – nowa dyscyplina naukowa*, "Ekonomia i Środowisko", 2003, No. 2, p. 7-20.

When the Austrian School of Economy is concerned in terms of the theoretical analysis of sustainable development, we may make use of the acknowledgments for knowledge and creative resourcefulness of human stated by L. Mises[42] and the doctrine of economic liberalism, including the principle of freedom by F.A. Hayek[43].

Negation of Neoclassical economy in terms of acknowledging ecological factors is uncommon. Fascination with the Neoclassical paradigm, characteristic for environmental economics, criticized by green economy, is visible in the works of T. Żylicz[44]. Environmental economics must not, in any way, withdraw from the Neoclassical paradigm based on the model of perfect competition (a greatly exaggerated methodological fiction) and the *homo oeconomicus* model (which also constitutes methodological fiction). This paradigm is a common subject of criticism made by economists of green (evolution) economy, as well as by economists of the Austrian school, without the synthesis of achievements of those disciplines, which has been indicated by St. Czaja and B. Fiedor[45]. But, in opinion of the Authoress, the risk related to the category of sustainable developments is even greater. It constitutes an acknowledged category of green economy, but also of environmental economics[46]. Thus, this category should not be described with different paradigms in both of those twin disciplines.

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[42] "The fact that the Austrian School created the economic theory on activities, not a theory of economic balance or lack of activity is what makes it distinguishable and will make it famous for ever". See L. Mises, *Wspomnienia*, op. cit., p. 70.

[43] Extensively discussed in: J. Godłów-Legiędź, *Doktryna społeczno-ekonomiczna Friedricha von Hayeka*, Wydawnictwo Naukowe PWN, Warszawa 1992 and F.A. Hayek, *Konstytucja wolności*, Wydawnictwo Naukowe PWN, Warszawa 2011.

[44] Known study: T. Żylicz, *Ekonomia środowiska i zasobów naturalnych*, Wydawnictwo PWE, Warszawa 2004.

[45] St. Czaja, B. Fiedor, *Ekonomia środowiska i ekologiczna jako filary ekonomii zrównoważonego rozwoju*, in: *Ekonomia zrównoważonego rozwoju. Materiały do studiowania*, ed. B. Poskrobko, WSE, Białystok 2010, p. 39.

[46] T. Żylicz in *Ekonomia środowiska i zasobów naturalnych* applies the category of sustainable development by referring to the report of Brundtland and the sustainable development it defines, highlighting the importance of the principle of intergenerational justice. T. Żylicz, *Ekonomia środowiska i zasobów naturalnych*, op. cit., p. 197 and further. Thus – without terminological arguments, whether it should be sustainable or permanent development – it proves that green economy and economy of sustainable development should reconcile in terms of paradigms and the usage of Neoclassical economy or/and economy of some other school (e.g. Austrian) in formulating the theory of sustainable development. T. Żylicz considers permanent development as a category that is better than sustainable development, see K. *Górka, Kwestie terminologiczne w ewolucji polityki ekologicznej*, in: *Rozwój polityki ekologicznej w Unii Europejskiej i w Polsce*, ed. J. Famielec, M. Kożuch, Wydawnictwo Uniwersytetu Ekonomicznego w Krakowie, Kraków 2010. p. 19.

5. Conclusion

Further search for the foundations of knowledge and principles concerning greening of economy draw the attetion of the Authoress towards the works by St. John Paul II (JP II). The encyclical works of John Paul II (in reference to Pope Leo XIII) propose many principals of economic and social order[47]. The most important of them are:

- in the past, soil was the most crucial factor of production, later it was the capital, while nowadays it is the *human* himself,
- the right to private property,
- work means working with others and working for others (which refers to the meaning of social relationships),
- new form of ownership – apart from land ownership: ownership of knowledge, technology and skills,
- the role of disciplined and creative human work – it is the capacity concerning initiative and entrepreneurship – creation of working groups.

Despite many changes in the most developed societies, there are still some shortages of capitalism: domination of things over people, poverty, lack of knowledge and skills, humiliation and subordination of whole societies. Free market is an acknowledged tool for exploiting resources and satisfying needs (but only those, for satisfaction of which one must pay). There are, however, various human needs that have no access to the market. JP II approves the struggle with the economic system as the system that provides an absolute domination of capital and ownership of production instruments, and land over the right to recognition and freedom. An alternative model is a society that is characterized by: *freedom of work, entrepreneurship and participation.* Such a society does not object to free market, but demands that satisfaction of the needs of the whole society should be guaranteed by social movements and the state through proper control.

Those ideas are further discussed by the Encyclical of Pope Francis devoted to the concern for a common home. "The ethical and spiritual reasons for ecological problems encourage us to seek for solution not only in technology, but also in changing people since, otherwise, we will struggle only with the symptoms"[48]. The diagnosis and the call of Pope Francis addressed to scientists and researchers are significant: "After the period of irrational faith in progress and human abilities, a part of the society enters the stage of higher awareness. We notice an increasing conscience connected with

[47] *Encykliki Ojca Św. Bł. Jana Pawła II*, Wydawnictwo Rafael, Kraków 2012.

[48] This statement is recalled by Pope Francis in relation to the teachings of the Ecumenical Patriarch Bartholomew.

the environment and care for nature, as well as honest and painful concern about what is happening to our planet. Let us shortly analyze the issues that nowadays evoke our fear and that we should no longer avoid"[49].

[49] Chapter 1 of the Encyclical of Pope Francis, *Co się dzieje w naszym domu?*, http://deon.pl/religia/serwis-papieski/dokumenty/encykliki-franciszek/art,11,encyklika-pochwalony--badz,strona,2.html.

Katarzyna Król

CHAPTER II

THE ECOLOGICAL GOALS OF CLIMATE AND ENERGY POLICY OF THE EUROPEAN UNION AND POLAND

1. Introduction

Despite the lack of any specific actions at the global level, the European Union has decided to remain the world leader in the struggle against climate changes. The "2030 Package", which was accepted in Autumn of 2014, plans an increase of the binding objective of reducing the CO_2 emission of the EU economy from 20% to 40% and an increase of the renewable sources of energy (RES) from 20% to minimum 27% in the final energy balance in the European Union (UE). This is the continuation of an ambitious project of actions, proposed in 2007 at the EU forum, that is usually referred to as the Climate and Energy Package or "3x20% Package". For Poland, especially for the Polish energy sector, such a rigorous climate policy still remains a great challenge. In order to meet the ambitious objectives, as well as to provide energy safety, (also in the face of changes of geo-political character), many actions and investments have been, for several years, conducted in Poland to diversify the energy sources used in Poland, while reducing the negative impact of energy sector on the environment. The aim of this chapter is to present the ecological goals of the climate and energy policy of the European Union and Poland. A synthetic presentation of the origin, practices, problems and doubts concerning the EU climate and energy policy, with the particular reference to Poland.

The initial part of this text begins with the description of the reasons for the European Union climate policy and it has indicated the most important international arrangements, objectives, as well as their progress. In the next part of this work a detailed presentation of the EU climate and energy package has been made. Further on, the authoress describes the trade of allowances. The current problems related to greening of the EU climate and energy policy have also been presented. This paper has also drawn attention to the expansion of the gas infrastructure in Poland.

2. The origin of the European Union climate policy

The issue of climate changes that occur due to human activities has been promoted worldwide thanks to actions of the United States within this scope. From the global perspective, climate policy has been shifted to the area of the European Union. The adoption of the UN Framework Convention on Climate Changes in 1992 in Rio de Janeiro and the signing of the Kyoto Protocol in 1997, which constituted a complement to this Convention, was a significant incentive for the development of climate policy[50]. It was established that climate changes are the global problem that requires joint international solutions. It has been decided that there is a need to change the approach towards environmental issues and they must be taken into consideration while making political and economic decisions.

The Kyoto Protocol is a legally binding act under which developed countries were obliged to reduce the emission of greenhouse gases in years 2008-2012 by 5.2% in comparison to 1990. The Member States of the EU (15 countries at that time), by signing the protocol, agreed to mutually limit emission by 8% in years 2008-2012. However, the largest emitter of those gases – the United States – did not ratify the protocol. Mainly because of this fact, the EU took the lead within the scope of developing a global ecological policy concerning climate changes. In order to enter into force, the Kyoto Protocol had to be ratified by at least 55 countries that emit to the atmosphere at least 55% of the world's emission of CO_2. The protocol came into force in February 2005, after it was ratified by Russia. Reduction of greenhouse gases accepted the Kyoto Protocol concerns the limitation of the total country emission of greenhouse gases. Poland, by ratifying the UN Framework Convention on Climate Changes in 1994 and the Kyoto Protocol in 2002, joined the international activities counteracting climate changes. One of the main obligations arising from ratification of the Kyoto Protocol by Poland was reduction of greenhouse gases by 6% in years 2008-2012 in comparison to the base year for the former socialist countries, that is 1988[51]. With the consent of all member states, the EU obligation concerning reduction was unequally divided between respective countries. Guided by the principle of solidarity, member states of the community decided that countries with a worse economic situation might increase their emission in years 2008-2012 in comparison to 1990. This included Portugal (27%), Greece (25%), Spain (15%) and Ireland (13%). Other countries, on the other hand, declared commitment to higher

[50] Protokół z Kioto z dnia 11 grudnia 1997 roku do Ramowej Konwencji Narodów Zjednoczonych w sprawie zmian klimatu. Dz. U. 2005, No. 203, item 1684.

[51] *Krajowy raport inwentaryzacyjny 2012. Inwentaryzacja gazów cieplarnianych w Polsce dla lat 1988-2010*, KOBiZE, Warszawa 2012, p. 9.

reduction, including Luxembourg (28%), Germany and Denmark (21% each), Austria (13%) and Great Britain (12,5%)[52].

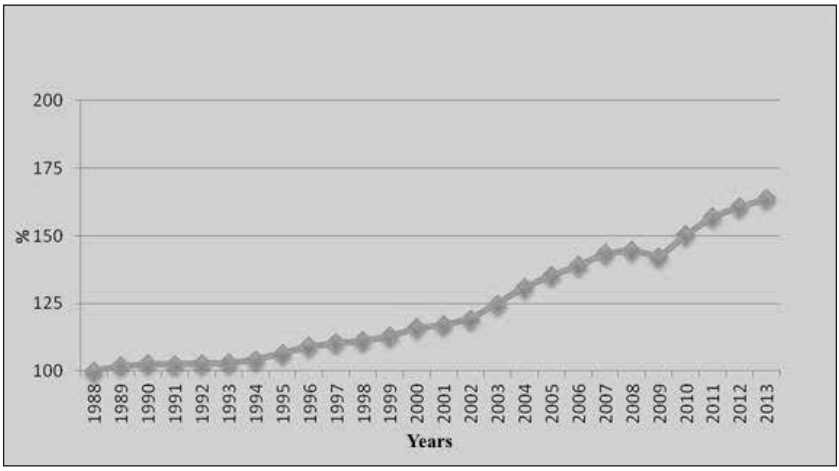
The main objective of the climate policy is to reduce emission of greenhouse gases, including, in particular, carbon dioxide. Carbon dioxide (CO_2) is the final product of metabolic processes and is reused by plants in the natural exchange in the atmosphere after it has been present there for 300 years. Emission of carbon dioxide to the atmosphere is not only caused through the process of breathing, but is also influenced by human activities. Carbon dioxide is thought to be the main cause of the excessive growth of the so-called greenhouse effect, which is treated as a synergistic form of pollution. It is commonly known that the greenhouse effect includes about 30 gases. The most important are: water vapor, carbon dioxide (CO_2), methane (CH_4), chlorofluorocarbons (CFC, freons), ozone (O_3), and nitrous oxide (N_2O).

China (28% of emission) and the United States (14% of emission) are the largest emitters of greenhouse gases, both of which constituted, in total, 42% of the overall world emission in 2013, while all the EU states were responsible for 10% of the overall emission. India, Russia and Japan are also significant emitters.

Chart 1 presents the dynamics of emission of carbon dioxide in the world in years 1988-2013. It may be concluded that the level of the global emission of CO_2 to the atmosphere had been increasing, each year in comparison to the base year, and reached its highest value in 2013 (over 36 billion t of CO_2). This means an increase of 63% in comparison to year 1988.

[52] Council Decision 2002/358/EC of 25 April 2002 concerning the approval, on behalf of the European Community, of the Kyoto Protocol to the United Nations Framework Convention on Climate Change and the joint fulfillment of commitments thereunder. The Official Journal of the EU L 130.

Chart 1. The dynamics of the emission of carbon dioxide in the world in years 1988-2013



Source: The Author's analysis based on the data from the Global Carbon Atlas.

It is assumed that reduction of emission is to achieve enhancement of the climate and to offset the risks of ecological catastrophies in the world. This effect may only be achieved in global terms. However, only the EU has been conducting actions and has elaborated a climate policy. Still, without the political will or prescriptive measures against such large emitters like the US, China, or India, it is impossible to accomplish a full ecological efficiency of the climate policy in the EU – regardless the strict principles imposed on its member states. The policy is doomed to fail.

3. The European Union climate and energy package and its ecological purpose

The Kyoto Protocol has its bearing on the actions of the European Union through the increase of the problem concerning climate changes in the Fifth Community Action Programme within the scope of protection of the environment. It referred, above all, to the completion of a convention related to climate changes. In 2000, the European Commission formed the European Climate Change Programme (ECCP). It includes the undertakings that help in lowering the emission of greenhouse gases. The system of trading in allowances for greenhouse gas emission constitutes the most important instrument of ECCP[53].

[53] *Counteracting climate changes. The European Union as the leader*, European Commission, Office for Official Publications of the European Communities, Luxembourg 2008, p. 12.

The EU climate policy is aimed, in particular, at the energy sector. The energy industry, next to transport, is the main emitter of greenhouse gases. Energy is perceived by governments as a strategic branch. That is why the energy sector was distinguished as a separate part of economy. Energy is an area of economic activity that should not be developed only by the market, but also must be shaped through instruments of the state.

In terms of size, the European Union is the second energy market in the world; it has over 507 millions of consumers[54]. The increase of energy usage connected with Member States having a higher import of energy production materials, as well as rigorous standards within the scope of limiting the impact of power production on the environment accounted for in the EU policy resulted in the fact that the EU member states made an attempt of creating a long-term programme of actions that would provide competitive and safe supply of energy, while maintaining the principles of sustainable development.

Common energy has been one of the main EU priorities. Two out of three fundamental treaties that regulated the operations of the contemporary Community were devoted to extractive industry (in particular, all the energy production materials) and the energy sector. The Treaty of Paris established the European Coal and Steel Community, while the European Atomic Energy Community was set up by the Treaty of Rome. In the last 30 years, there were no radical changes in the approach of the Communities since there was no such need. The Maastricht Treaty replaced the energy policy within the Community activities, but it does not contain a separate chapter devoted to energy issues. It defined the energy policy as an aspect of the EU industrial policy[55]. However only after the Russian supply cut at the beginning of 2006 concerning Ukraine, which also had impact on many EU countries, constituted a great impulse to take actions in order to reach the idea of a joint EU policy. The Union accepted then 3 objectives of common energy policy that remain valid till today: sustainable development and counteracting climate changes, increase of energy safety and creation of one common internal market of electric energy and gas[56].

Until the Treaty of Lisbon came into force, that is until 1 December 2009, the European Commission (EC) had no own competences in the development

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[54] *Green Paper: A European Strategy for Sustainable, Competitive and Secure Energy*, COM 2006/105, p. 4. and *Conclusions on 2030 Climate and Energy Policy Framework*, European Council, Brussels 2014, note SN 79/14.

[55] Texts of the Treaties are available on http://europa.eu/legislation_summaries/institutional_affairs/treaties/treaties_eec_pl.htm and http://eur-lex.europa.eu/browse/summaries.html.

[56] The Communication from the Commission to the European Council and Parliament of 10 January 2007 – An energy policy for Europe, COM (2007) final version – not published in the Official Journal.

of the external dimension of European energy policy. Those issues constituted the own competences of the Member State. The Treaty on the Functioning of the European Union has new provisions that allow for conducting common energy policy. One of its chapters has been devoted only to energy. It defines energy policy as an area of shared competences of the EU and member states[57]. For the first time, the solidarity clause was included, which guaranteed that if a particular member state encounters greater obstacles in energy supply, other member state will immediately provide help. Each member state, however, decides independently on the structure of energy supply, on the method of using own energy resources, as well as on the choice between various sources of energy.

The ecological goals that guarantee enhancement of climate may be mainly executed through the energy sector. That is why climate changes, which is the mission of many organizations and documents, depend on the progress within the scope of the structure and organization of energy, energy markets and its consumption. It mainly refers to greening of sources of fuel and the processes of its combustion. Thus, the efficiency of climate changes is dependent on the restructuring of energy, which regulates not only the market itself, but also the states, including the EU. This is the reason we use the phrase climate and energy, even if, in fact, it includes ecological objectives aimed at energy. Despite numerous initiatives that determine this policy in the world, it has been currently institutionalized only in the EU under the motto of the aforementioned climate and energy package.

Until the ratification of the Kyoto Protocol, institutions of the EU had many times indicated the need for reduction of the emission of greenhouse gases without, however, specifying the quantitative objectives of such reduction. The only quantitative goal, up to 2005, was the indication of the need to maintain emission of greenhouse gases by Member States at the level in 1990[58]. The obligations arising from the Kyoto Protocol was an impulse for the EU to undertake further activities related to the reduction of the emission of greenhouse gases. In 2006, the EC focused on the fact that the contemporary energy policy did not guarantee a reduction of the amount of greenhouse gases released to the atmosphere since, up to 2030, emission of carbon dioxide to the atmosphere would not decrease, but increase by 5%[59]. The EC assumed

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[57] The Treaty on the Functioning of the European Union (TFEU), Official Journal 2010, C 83, Chapter XXI, art. 191, section 1.

[58] 93/389/EEC: Council Decision of 24 June 1993 for a monitoring mechanism of Community CO2 and other greenhouse gas emissions, Official Journal 1993, L 167, pp. 31-33.

[59] *EU energy and transport trends to 2030*, European Commission, Directorate-General for Energy in collaboration with Climate Action DG and Mobility and Transport DG, Publications Office of the European Union, Luksemburg 2010, www.energy.eu.

that the foundations for the European energy policy should contain actions concerning reduction in emission of greenhouse gases. The new climate and energy policy was accepted by the European Council in 2007. The accepted programme of actions, directed towards all EU countries, that was called the climate and energy package or 3x20% by 2020, refers to the following objectives:

1. Reduction of green house gas emissions within the EU territory by 20% by 2020 in comparison to the level in 1990.
2. Increase of share of renewable energy up to 20% of the final gross energy usage in the EU in 2020.
3. Enhancement of energy efficiency within the EU territory in relation to the forecasts for 2020 by 20%, as well as increase, up to 10%, of the share of bio-fuels in the overall consumption of transportation fuels in 2020[60].

As the result of the provisions of the EU Council, in January 2008, the European Commission presented an extensive set of legislative measures that are usually referred to as the climate and energy package[61]. After intensive negotiations conducted among the heads of the EU Member States and in the European Parliament, binding measures were accepted in December 2008, which came into force in April 2009. Thus, all member states of the EU became the main addressee of the climate policy, since one must remember that protection of the environment constitutes a part of "shared" competences, i.e. the decision made on this matter at the European level must be implemented to the legal order of respective member states due to the obligations deriving from article 4 of the treaty on functioning of the European Union. The key internal assumption of such actions was the necessity of common execution of climate objectives by all EU countries, while, at the same time, maintaining a fair division of burdens among particular economies and the minimization of costs for the implementation of the package.

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[60] The conclusions of the presidency dated 8-9 March 2007, the Council of the European Union, Brussels 2007, No. 7224/07.

[61] It needs to be highlighted that, as the outcome of this summit, the European Commission also presented, in September 2007, the so-called third legislative package related to the internal energy market, which was to provide competitiveness and create conditions favorable for investments, diversification of supplies and their safety. The competitive energy market is important to achieve the objectives of the *3x20%* by 2020 initiative.

4. Trading with emission allowances as the greening instrument concerning emitters of greenhouse gases

An allowance (also called permit) is an instrument of protection of environment that allows to emit a particular amount of pollution. Together with charges, taxes and subsidies, allowances form the group of the so-called economic instruments. The idea of disposable rights to use the natural environment appeared in the 1960s. For the first time, it was presented by Thomas Cocker on the example of air protection and few years later it was popularized by a Canadian economist, John Dales. This concept was based on administrative indication of the permissible degree of pollution for a particular area or sector of economy, and then on dividing it into many unit rights for emission that are finally distributed among respective economic entities that have access to this mechanism. Some of the entities acquire allowances that cover, with a surplus, the current level of pollution emissions. Thus, those entities own goods that can be resold in the form of unused allowances for emission in the quantity lower than their current emission. Emissions of pollution that are higher than the granted limit, without an allowance, would be charged with financial penalties. Consequently, by creating an object of trade, the market of disposable allowances for emission has been formed.

The system of trading with allowances for greenhouse gas emission (European Union Emissions Trading System – EU ETS) that functions within the EU territory may serve as an example of environmental protection instruments. It was implemented due to the problems arising from the ratification of the Kyoto Protocol and its postponed time of coming into force. EU ETS was divided into three stages constituting, at the same time, the reference periods. The first stage of operation of the system is dated in 2005-2007. The system included then the installations of energy and heat industries with a high level of carbon dioxide emissions. The second stage (2008-2012), which occurred during the first reference period of the Kyoto Protocol, added to the system installations that emit nitrous oxide. The third trading period is 2013-2020, when the rest of greenhouse gases were included into the system.

The companies that are part of the system have the obligation to participate in this mechanism. The main element of the mechanism is the common trading "currency" in the form of units of allowance for emission. Emission unit is EUA (European Union Allowances) – for stationary installations – and EUAA (European Union Aviation Allowances) – for the operators of aircrafts (included into EU ETS since 2012). One allowance grants a permission to emit one tonne of a particular greenhouse gas. EU ETS includes over 12 thousands of installations in the following sectors: energy industry, smelting and metallurgy, mineral and paper industries. Thus, trad-

ing with allowances has become the main tool of lowering the emission of greenhouse gases in the EU.

In years 2005-2012, the majority of allowances was granted to entities of the EU free of charge – at least 95% during the initial stage (2005-2007) and at least 90% in years 2008-2012. Although the limits are granted only to companies that are included in the European system of allowance trading, everybody – individuals, institutions, non-governmental organizations and other entities – is allowed to buy and sell respective allowances on the market. In order to achieve the goal of 20% reduction of greenhouse gas emissions until 2020, the EU has assumed that the third, eight-year reference period in years 2013-2020, shall mainly grant allowances through an auction system that will replace the current mechanism, in which the majority of allowances is granted by the governments free of charge.

In Poland, during the 1st stage of functioning of EU ETS, that is in years 2005-2007, 878 installations were included into the system, while the volume of allowances amounted to 239.1 million tons of CO_2 per year. During the second reference period, the system included 858 installations, while the resources of allowances was 208.5 million tons of CO_2 per year.

In order to achieve the planned objective of a 20% reduction of greenhouse gases emission by 2020, the EU assumed that the third, the eight year reference period in years 2013-2020, shall mainly grant allowances through an auction system that replaced the currents mechanism, in which the majority of allowances is granted by governments free of charge.

Due to the considerable resistance of Poland, the EU has introduced some exceptions to the obligations of purchasing emissions through auctions. Those exceptions concern i.e. the electric and energy sector in some of the member states (including Poland) that are eligible for derogation[62] and energy-intensive sectors of industry that are exposed to the risk of the so-called carbon leakage[63]. It was decided that the number of allowances will be gradually lowered to reach zero in 2020. The lacking allowances must be bought by power stations through auctions. The obligation of buying allowances is to result in investments concerning renewable energy sources. In exchange for free allowances, the electric and energy industry must, however, execute

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[62] Derogation is an exemption of the EU member state from fulfilling some (specially negotiated) obligations that arise from the rules of law of the Community. Derogation may be temporary or permanent. Here, it stands for an exemption of some Member States from the obligation to purchase allowances through auctions within the electric and energy sector. (http://sjp.pwn.pl).

[63] This phenomenon which concerns the moving of the industry by a particular country to countries outside the EU, in which there are less restrictive regulations within the scope of emission reductions.

investments that lower the CO_2 emission indicated in the National Investment Plan. The Polish investment plan, by 2020, includes over 300 projects of total value of 28 billions EUR. Investments are to modernize the infrastructure and generate new power.

Trading with allowances for greenhouse gas emissions in Poland includes installations, in which such allowances are granted. The supervision over the system of trading is performed by the Minister for the Environment. Installations, meaning entities, that emit pollution have the obligation to acquire a permit for emission of carbon dioxide that provides them an allocation or possibility of purchasing allowances for emission. It must be highlighted that participation in the system does not require a permit – a particular entity is included in the system on the basis of legal regulations. However, there is the obligation to acquire an administrative decision for emission of greenhouse gases[64].

It must be taken into consideration that trading with allowances concerns only selected sectors of the EU economy (including Poland). The sectors that are not included in EU ETS form the so-called non-ETS area. It refers to: transport, agriculture, construction and the municipal and household sector. They constitute about 60% of the whole greenhouse gas emissions in the EU. The reduction objectives planned by the EU refer, however, to all the sectors of economy, including those not covered by the EU ETS scheme. For the non-ETS area, the EU has determined a reduction objective of 10% in 2020 in reference to the level from 2005. This objective has been made different for respective member states, which means that some of the member state may even increase their emission during the 2013-2020 period. Poland can increase its emission in non-ETS sectors by 14% in comparison to 2005.

Figure 1 describes the method of achieving the planned reduction of greenhouse gas emissions by the EU by 2020 for the whole economy (ETS and non-ETS areas). The presented scheme indicates that the objectives on the level of respective countries refer only to sectors from outside ETS, while the objective within the scope of reducing emission for ETS sectors is determined as a total value, for the whole EU. The complexity of reduction objectives and the method of assessing them, various base years in comparison to the Kyoto Protocol, and the lack of fixed limits on the level of respective countries have given rise to doubts whether the execution of the EU climate policy is efficient.

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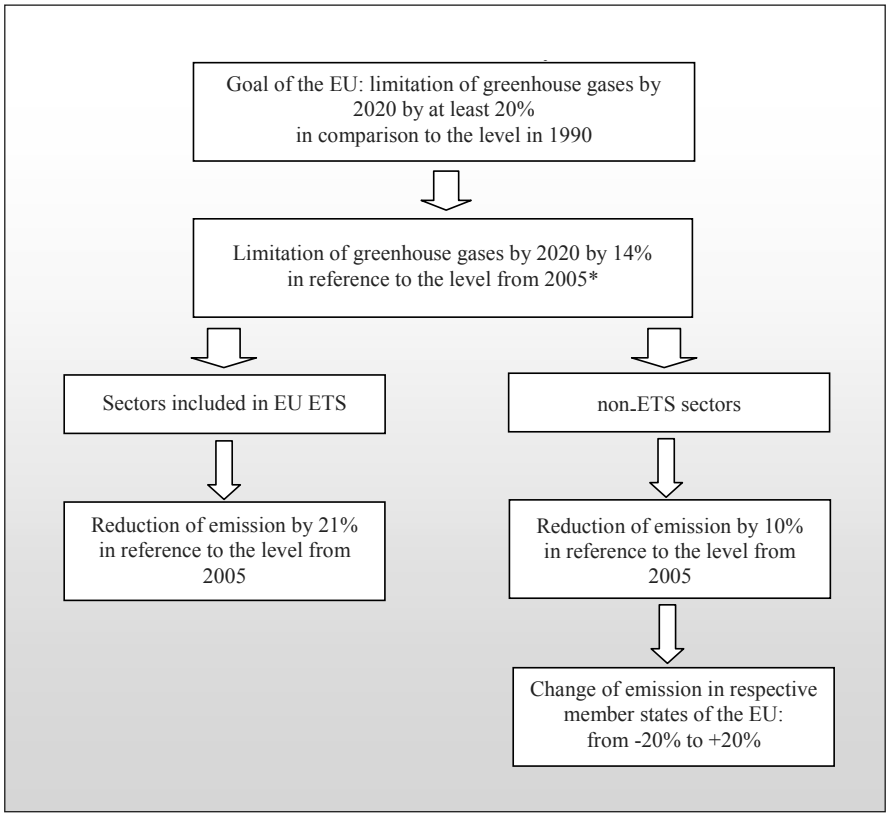
[64] Ustawa z dnia 22 grudnia 2004 r. o handlu uprawnieniami do emisji do powietrza gazów cieplarnianych i innych substancji, Dz.U. 2004, No. 281, item. 2784 which has been repealed and replaced with the law: ustawa z dnia 28 kwietnia 2011 r. o systemie handlu uprawnieniami do emisji gazów cieplarnianych Dz.U. 2011, No. 122, item 695.

Figure 1. Method of achieving the objective of decreasing greenhouse gas emission in the EU countries by 2020



*The reduction objective set for 2020 calculated in relation to year 1990 was recalculated for new "percentages" in comparison to 2005, which gives a 14% reduction in comparison to this year due to the fact that this year introduced trading with allowances for greenhouse gas emissions in the EU.

Source: own analysis on the basis: Europe 2020 indicators – climate change and energy, http://ec.europa.eu/eurostat/statistics-explained/index.php/Europe_2020_indicators_-_climate_change_and_energy.

5. New challenges in greening of the European Union climate and energy policy

The leaders of the EU accepted the climate and energy package as the foundation of reducing greenhouse gas emissions at the global level, within the context of the planned international agreement on climate changes, which was to replace the Kyoto Protocol in 2012. This international agree-

ment was to be concluded during the UN conference devoted to climate, which was held in December 2009 in Copenhagen. The Copenhagen summit was, however, unsuccessful – there was no decision made on the reduction of greenhouse gases in the world by 20% until 2020. Other summits in Cancun (2010), Durban (2011) and Qatar (2012) were also not very successful on this matter. Nevertheless, in Durban in December 2011, after two weeks of negotiations, over 190 countries that signed the UN climate convention agreed to the plan of implementing a new global plan concerning protection of the climate. A decision was also made that the EU will accept the second period of the Kyoto Protocol – after 2012. However, no arrangements were made on the methods of executing those actions. The last climate summit of the UN, held in Warszawa in Autumn 2013, was also unsuccessful. The agreement, that was reached during the summit in Warszawa, sets the new directions for further negotiations and gives reasons for hope that next years will bring global solutions, which will become a step towards environmental protection. However, similarly to previous years, not details of the modified global policy were established.

In 2014, in order to create a new global agreement, the EU accepted new goals for the climate and energy policy after 2020[65]. The EC proposed that the new policy should be based on the following objectives: a 40% reduction of CO_2 emission by 2030 (compared to 1990), an increase in energy efficiency by 30% and an increase of the share of renewable energy sources to the degree of 27%. Poland strongly opposed those propositions. The Union, on the other hand, did not suppose any compromises or ask any questions. Finally, owing to the determined stand of Poland, the European Union took into consideration the situation of the poorer countries and countries whose energy is based on "coal". The accepted reduction of 40% will be executed in accordance with the principle of solidarity. This means that less affluent EU countries – including Poland – will be able to transfer free allowances for CO_2 emissions in the energy sector until 2030. Without this provision, Polish economy would need to incur significant costs to achieve the accepted goals.

6. Development of gas infrastructure as the condition for greening of the energy policy in Poland

In Poland, the climate policy that has been executed since 2004 is, similarly as in the EU, mainly aimed at the operation of the energy sector. After this policy was implemented, there have been several significant analyses

[65] The European Council in Brussels on 23-24 October 2014 – conclusion of the presidency, the Council of the European Union, 169/14.

and reports elaborated by the state and international institutions and research centers[66]. They assess the economic and social results of the implementation of the climate and energy package in Poland. All those analyses present one common conclusion that Poland and other new member states will experience more negative economic results related to the introduction of this package in comparison to the average result in the EU. A similar evaluation is presented in the report elaborated in 2013 by the Polish Chamber of Commerce and the company EnergSys. This report clearly states that the EU climate policy causes an increase of energy costs in households within the European Union, as well as does not result in the lower emission of greenhouse gases at the global level. However, it may be noted that countries that execute this policy experience welfare losses[67].

Poland produces 80% of its energy from bituminous coal, while professional electrotechnology itself produces over 90% of energy generated from coal. All the recently elaborated expertises and analyses concerning the impact of application of the new proposed climate policy for our country, without additional free allowances, have indicated a threat of 2-3 times higher prices of heat and electric energy and a threat to the profitability of the Polish industry sectors that employ over 500,000 people and are included in the system of trading with allowances for greenhouse gas emissions.

There have been international opinions that Poland is the actual main opponent of the climate policy. Poland is presented as if constituted the main responsible agent for climate changes in the European Union since it does not plan to withdraw from the use of coal in energy production. This opinion is unacceptable because Poland actively participates in activities that are to reduce CO_2 emission to the atmosphere, gradually lowering the share of coal in fuel structure and developing renewable energy sources, while other countries that are considered as environmentally friendly, such as e.g. Portugal, Germany or Great Britain, have increased emission in recent years.

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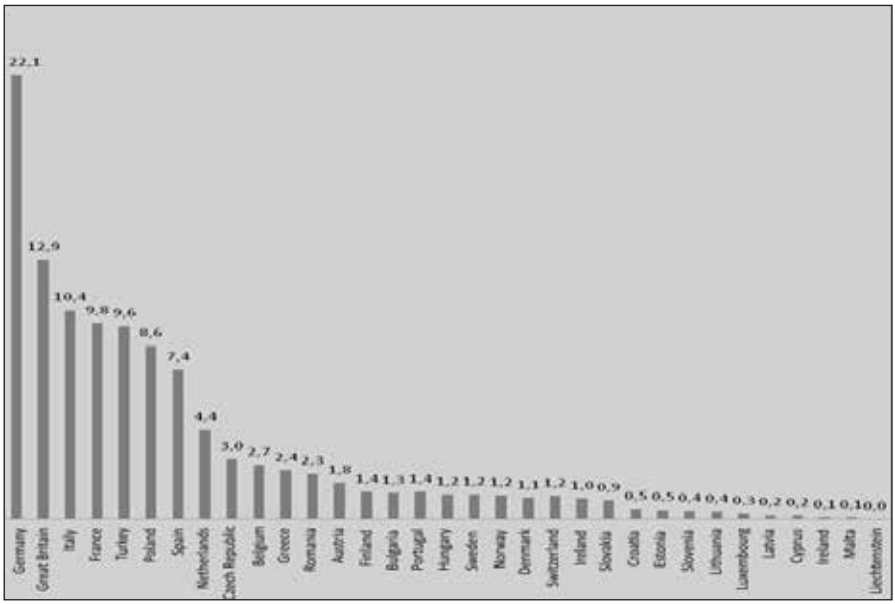
[66] *Transformacja w kierunku gospodarki niskoemisyjnej w Polsce*, the World Bank, Washington, February 2011; Raport 2030. *Wpływ proponowanych regulacji unijnych w zakresie wprowadzenia europejskiej strategii rozwoju energetyki wolnej od emisji CO_2 na bezpieczeństwo energetyczne Polski, a w szczególności możliwości odbudowy mocy wytwórczych wykorzystujących paliwa kopalne oraz poziom cen energii elektrycznej*; (in short: Raport 2030) Energsys, Warszawa 2008; *Krótkookresowe skutki makroekonomiczne pakietu energetyczno-klimatycznego w gospodarce Polski Wnioski dla polityki pieniężnej*, the National Bank of Poland, Economic Institute, Warszawa, March 2012; *W stronę nowego klimatycznego kompromisu dla konkurencyjności europejskiej gospodarki – szanse i wyzwania pakietu energetyczno-klimatycznego Unii Europejskiej*, Instytut Kościuszki, September 2012.

[67] *Polityka klimatyczno-energetyczna Unii Europejskiej. Ocena, propozycje zmian, nowa filozofia, nowe cele*. The Polish Chamber of Commerce, EnergSys, Warszawa 2013.

The main European emitters of carbon dioxide are: Germany, Great Britain, Italy and France. Poland is the fifth emitter of CO_2 in the whole EU (the sixth if Turkey is considered[68]). It emits to the atmosphere over twice less emission of carbon dioxide than Germany and has only 9% share in the overall emission in the European Union.

Chart 2. The % share of the EU members in emission of carbon dioxide in 2012



This data includes countries from outside the EU: Turkey, Norway, Switzerland and Lichtenstein.

Source: own analysis on the basis of EEA.

The opinion addressed to Poland is unfair and can be attributed to the followers of the EU propositions of strengthening the EU reduction requirements by 2030 that Poland opposes to. The objection of Poland is legitimate since unless China, the USA and Brazil, as well as other non-EU economies, do not participate in the climate policy, all restrictions of the EU concerning greenhouse gases seem to be pointless. Without a global agreement that would also include the factors of life quality, reduction of emissions achieved only by the EU countries will lead to a counterproductive effect. The EU will become a less competitive region and the overall global emission will be still

[68] The European Environment Agency in statistics concerning emission also includes Turkey, Norway, Switzerland, and Lichtenstein.

growing as a result of the shift of production centers to the less ecologically restrictive regions of the world. For instance, in 2013, the global emission of CO2 was 2% higher than in the previous year. An increase was noted also in China and the United States. The EU, indeed, has experienced a decrease, but it is responsible only for 9.6% of global emissions, while the USA and China constitute 42% of world emissions. By analyzing the statistics of emissions, one may easily notice that we should not consider the total emission in a particular country. One should also analyse the data on emissions per capita. Table 1 presents the amount of carbon dioxide emissions in connection to number of citizens of particular member states.

According to the data in Table 1, Poland was on the eighth place in the EU, reaching the degree of 8.1 t Co_2/citizen in 2013. It was overtaken by Luxembourg, Estonia, Germany, the Netherlands, Czech Republic, Belgium, and Finland.

Apart from the development of RES, as a part of the execution of the EU climate policy, gas has become more significant and the demand for gas has been systematically increasing in Poland in recent years. During the last 25 years, gas usage increased by 50% and amounted to 15.8 billion m^3 in 2012. Thus, in order to enhance energy safety, we should focus on development and diversification of gas infrastructure. We should buy gas from various places in the world, but, still, we should remember about its physical supply. In this case, we are highly dependant on countries, with which we have gas pipeline connections. As a result of this, Poland is mainly dependant on the import of Russian gas.

The majority of Polish gas is used in industry – about 37% of the total usage, then the residential and service sectors – accordingly 26% and 13% of gas in total. About 2/3 of gas usage in Poland is imported. The main source of natural gas import (over 80%) comes from Russia. We also import gas from Germany, Czech Republic, as well as Azerbaijan and countries of Central Asia.

The liquefied natural gas (LNG) terminal that is being constructed in Świnoujście may be treated as an alternative. This is not only the first investment of this type in Poland, but also in that part of Europe.

This investment is to diversify sources and supply chains of natural gas to increase energy safety in Poland. Construction of the LNG terminal will allow reception of liquefied natural gas from almost any place in the world. Construction of the LNG terminal will satisfy the increased demand for gas in Poland and allow its export as well.

Table 1. Emission of carbon dioxide/ per capita in the EU countries in 2013

Country	Carbon dioxide in tCO_2/citizen
Luxembourg	20
Estonia	15
the Netherlands	9.8
Czech Republic	9.4
Finland	9.3
Germany	9.2
Belgium	8.9
Poland	8.1
Ireland	7.9
Slovenia	7.5
Austria	7.4
Great Britain	7.3
Denmark	7.1
Cyprus	6.7
Greece	6.7
Slovakia	6.2
Malta	6.0
Italy	5.8
Bulgaria	5.7
France	5.3
Spain	5.1
Portugal	4.9
Croatia	4.8
Sweden	4.7
Lithuania	4.3
Hungary	4.2
Latvia	3.6
Romania	3.5

Source: own analysis on the basis of the Global Carbon Atlas.

According to the investor's announcements, the first stage of the LNG terminal operation will enable reception of 5 billions m^3 of natural gas per year. During the next stage, depending on the increase of demand for gas, it will be possible to expand this capacity to 7.5 billions of m^3, without the necessity of expanding the area of the terminal. It is planned

that the LNG terminal in Świnoujście will have two tanks of regular size, i.e. the capacity of 160,000 square meters. The terminal, which is being constructed, will be facilitated with modern technologies that are safe for the environment, if the procedures are complied with. In case of an accidental leak, LNG will evaporate and dilute in the air. The estimated costs for constructing the gas terminal amounts to PLN 2.8 billion, while the total investment costs of the whole infrastructure, and its functioning, amount to PLN 4.4 billion.

Blue fuel owes its popularity in Polish energy supply due to several factors. Firstly, power plants or combined gas heat and power installations are characterized with relatively low investment costs, short time of building and large flexibility of operation. Due to this fact, in the coming years, gas will play a more significant role in the development of Polish electroenergy sector and fuel will be the main factor of increasing generation capacities. Secondly, apart from economic aspects, one should also consider the fact of lower emission capacity in comparison to oil or coal, which is important, having in mind the restrictive requirements set by the European Union.

Moreover, apart from the construction of a gas terminal, there are other investments that are to expand the country's gas network. For the last 3 years, Poland has increased its technical capacities concerning transport of natural gas into the country by about 3.3 billions of m^3 per year in comparison to 2011, which constitutes 30% of import of natural gas to Poland. Increasing the capacities of gas transportation is the result of new investments, i.e. the expansion of the connection in Lasów (increase of up to 1.5 m^3 per year) and Cieszyn (0.5 billion of m^3 per year). Additionally, the service of virtual reverse has been launched on the Yamal gas network (2.3 billions of m^3 per year).

Gaz-System, the company owned by the State Treasury, that is responsible for the transport of natural gas to our country, plans to construct, within years 2014-2023, about 2,000 km of new gas pipelines in the Western, Southern and Eastern part of Poland, as well as construction of networks with Lithuania, Slovakia and the Czech Republic. Those actions will allow to create a properly functioning, flexible and efficient transmission network that will cover the whole country. The greatest challenge is the one of providing the highest quality and timeliness of works conducted during execution of new investment tasks. By investing in the gas infrastructure, Poland will, apart from increasing the energy safety, start to play the key role in this part of Europe. The Baltic gas terminal in Świnoujście will be significant for the energy of Slovakia, Czech Republic, Lithuania, Latvia, Estonia, and Finland – countries that are dependant on supplies of the Russian gas.

7. Conclusion

Greening of the climate and energy policy, both in the EU and in Poland, requires subordination of many economic sectors, especially energy, in order to reduce greenhouse gas emissions, mainly carbon dioxide. In particular, the process of gas combustion constitutes the source of emission of those gases. Poland is very dependant on coal and many economic, but also environmental and social, factors justify its further usage as the material for energy generation. It is known that this raw material is characterized by its high emission capacity, despite the technological innovations undertaken in energy industry. The problem of further development of economy and making it subject to the paradigm of greening requires economy based on coal with, at the same time, low emission capacity. Low emission capacity based on coal influences a high level of energy safety in Poland, while lowering emissions formed from coal combustion.

However, cheap energy is the main social condition for accepting the capital-intensive actions concerning decrease of pollution emissions (greening of the energy sector). New technologies, as well as good usage of country energy resources will help in lowering the price of energy. Poland may find its great opportunity in shale gas, the search for which is being performed, provided that Brussels – as some of the countries have requested – does not make a decision that will limit its extraction. The United Stated, owing to the extraction of large amounts of shale gas, has almost twice as cheap electric energy and gas for chemical industry is four times cheaper than in the European Union. With such a price difference, the EU industry is not able to become competitive. In the meantime, the European Union discusses mainly the risks of shale gas extraction instead of deciding on how to increase its exploitation.

The problem of economic development, including energy, is not only the greenhouse gas emissions, but also the requirement to reduce emissions in accordance with sustainable development – actions within the scope of environmental protection should, then, constitute an integral part of the development process and should not be executed separately. Climate policy should not cover objectives that are not related to factors of life quality. We can easily close energy plants to reduce emissions, but questions will arise – who will generate current and provide it to final recipients, who will employ the workers of such plants etc. The list of this questions is much longer, while solving them is connected with high social costs.

For several years, the EU has been observing the phenomenon of "emission escape", which means that many industrial companies in the EU transfer their offices to countries, in which the ecological standards and norms are less restrictive than in the EU. Moreover, the discussion on the EU energy

policy very often omits a very important issue, the so-called emission related to product consumption. EU countries import products from the outside of the European Union, pollution occurs in the area of the producers from outside the EU. The global balance has the same amount of CO_2, but its level in the EU becomes lower.

If one includes into this balance the emissions formed during the production of goods imported into the EU, the European Union presents, above all, the emission formed within a particular territory, not the amount of consumed emission (which is skipped in the official reports), one will find out that, for instance, 23% of emissions consumed in Germany came from import, while in France this amount reached 56%. At the same time, the Polish consumption was on the level of emissions produced within the country, while 23% of emissions consumed by the EU came from the production of imported goods.

By analyzing the situation in Europe and the increase of emissions in other parts of the world, we may confirm the thesis that climate changes are not the only circumstances for greening of production and consumption of energy. What is more, without a global climate policy and the commitment of other countries, not only the EU member states, the EU climate and energy policy will not achieve its ecological objectives.

Krzysztof Wąsowicz

CHAPTER III

GREENING OF LOCAL PUBLIC TRANSPORT

1. Introduction

The reasons for special consideration of public utility services may be sought in many factors that result from the specific nature of such services. As part of this study, the author has, in particular, analyzed one of such factors, i.e. occurrence of external effects and the related advantages and costs for a particular society as well as related evidence for greening of public transport in the light of greening of economy, meaning the attempts to lower the usage of energy, materials and the amount of created pollution with its burden.

Development of research concerning costs and external advantages is determined by the level of awareness of the society. Currently conducted research is closely connected with the issues of road transport as the significant cause for the negative ecological impact on the environment we live in. The development of means of transportation is mostly conducted in uncontrolled way that, consequently, leads to the degradation of the environment and this breaches the biological balance inevitably increasing factors limiting life on the planet[69]. Thus, if we analyze the influence of transport on the natural environment, we should not only focus on the factors that have a direct impact on living organisms and nature since the actions caused indirectly by means of transportation may be, after some time, much more dangerous.

The thesis of the study aims at the assumption that public utility companies of public transport have a direct influence on the quality of life, especially in the case of the weakest giving the passengers access to, for instance: education, social insurance, health care centers. Moreover, public transport even manages to acquire passengers that own and may use own cars which helps in reducing problems such as noise, emission of exhausts, as well as crowded roads and the number of accidents.

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[69] J. Famielec, *Straty i korzyści ekologiczne w gospodarce narodowej*, Wydawnictwo Naukowe PWN, Warszawa–Kraków 1999, pp. 23-37.

This chapter aims at systematizing the theoretical foundations concerning the specific nature of public utilities, companies of local public transport and the services they provide, as well as to determine the meaning of such services for public utilities in terms of external effects. The operational aim of public utility companies of local public transport and the organizer of urban transport is to provide everyone with access to transportation, reduce the negative impact of transport on health and safety of people, limit air pollution and noise, lower energy usage and, at the same time, increase the economic efficiency for transport of passengers and goods, internalize external costs, enhance attractiveness and quality of the urban environment, improve the image of the city.

2. Prerequisites for creating the sector of public utility services

In the majority of modern countries, the economy is of a mixed type: the activity of private sector is complemented with tasks appointed to the public sector. This implies that only part of decisions is made by the state – the remaining part by private entities. Assessment of those decisions has been conducted by many economists specializing in economy of prosperity on the basis of a criterion called Pareto Efficiency[70]. According to an Italian economist and sociologist, Vilfred Pareto, allocation of resources, in case of which it is impossible to enhance someone's situation without decreasing someone else's situation, is considered efficient[71]. In economic practice, Pareto Efficiency occurs only in particular circumstances. The market is usually inefficient and this is caused by its various faults. Market failures are to some extent justification for the country to interfere.

Even if the market is efficient, interference of the country into its mechanisms is sometimes essential. State institutions determine the ownership rights and protect conclusion of agreements, motivate people to be active on the free market. Was it possible to lose one's private possession due to unpunished plunder, nobody would like to own such possessions. The activity of public sector, inherently characterized by protection of citizens and their possessions, constitute an integral part of market economy.

Failures of the market, which are significant due to the issues discussed in this study, result, among others, from the existence of public goods. From

[70] J. Hicks, *The Foundations of Welfare Economics*, "The Economic Journal", September 1939, Vol. 49, No. 196, Wiley-Blacwell, New Jersey, pp. 697-712.

[71] D. Begg, S. Fisher, R. Dornbush, *Mikroekonomia*, Wydawnictwo PWE, Warszawa 1996, pp. 426-430.

the perspective of every human being, those goods are of key importantance yet the market does not provide them or provides them only in small amounts. Availibility of those goods constitutes justification for initiatives of many countries. Free market fails not only when it does not produce a sufficient amount of goods and services, but also when private markets do not provide certain goods, although their cost is lower than the price consumers want to pay.

Another important prerequisite for existence of public sphere is the presence of internal costs. If the activity of one entity results in costs incurred by other entities, one may refer to this as the so-called negative external effects. When such effects occur, this means that the market is faulty since the entities do not pay the full price for their negative activities. External effects may also be of a positive character, for instance, investments in health care may minimize costs (lost profits) incurred by people and companies due to illnesses. External effects also have a huge impact on the state of the natural environment. This is also confirmed by the followers of free market economy who focus on the environment and its protection. They state that "existence of capitalism is the main cause of polluting the environment, because socialist economy present far worse situation"[72].

From a theoretical point of view, existence of external effects results in the fact that the balance between market demand and supply for a particular good does not correspond with the socially effective production. The curve of the marginal social cost resembles private and public costs correlated to production of goods, while its intersection with the curve of supply depicts the equity of social cost with only marginal utility. Due to such reasons, the socially effective production is higher in a situation of market balance for goods that generate positive external effects (e.g. public transport services)[73].

The failures described above give rise to inefficiency that constitutes justification for the country to interfere. It should also be highlighted that the term of failure of the market coexists with the term of failure of the state[74]. Despite the fact that the country may be defective, nowadays, protection of the environment has been the area of interest and care of the public sec-

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[72] M. Skousen, *Narodziny współczesnej ekonomii. Życie i idee wielkich myślicieli*, Wydawnictwo Fijorr Publishing Company, Warszawa 2012, p. 611.

[73] M. Wolański, *Efektywność ekonomiczna demonopolizacji komunikacji miejskiej w Polsce*, Oficyna Wydawnicza Szkoła Główna Handlowa w Warszawie, Warszawa 2011, pp. 20-21 and J.E. Stiglitz, *Ekonomia sektora publicznego*, Wydawnictwo Naukowe PWN, Warszawa 2004, p. 254.

[74] C.M. Tiebout, *A Pure Theory of Local Expenditures*, "Journal of Political Economy", October 1956, Vol. 64, University of Chicago Press, Chicago, p. 16-24; T.N. Tideman, G. Tullock, *A New and Superior Process for Making Social Choices*, "Journal of Political Economy", December 1976, Vol. 84, University of Chicago Press, Chicago, pp. 145-160.

tor that seeks the answer to the question concerning the ways of making use of economic growth without polluting the air and contaminating waters or soil.

The interactions between the environment and economy that occur due to universal laws should not be left on their own. There is a sound need for a system that may shape economic processes within the environmental and social surroundings. This happens, for example, due to the fact that the state provides its citizens with a set of various services. Theory of economy connects such services with public utilities[75]. Among goods and services provided by public institutions, a significant role is performed by public goods.

The basis for distinguishing the traditional public goods from private ones is constituted by criteria connected with the term of consumption. The first criterion of distinguishing goods is the competitiveness of consumption. In the light of this criterion, consumption of traditional public goods has an uncompetitive character, which means that goods may be consumed by many people simultaneously, in terms of economy, this means no marginal costs of their production. Yet, when private goods are concerned, we encounter a very complex competition[76].

Another significant criterion, which helps in finding the differences between public and private goods, is the possibility of excluding them from consumption. Excluding pure public goods from consumption, without paying high costs, is impossible[77]. At the same time, it is impossible to apply a system of prices, since consumers do not have an imperative to pay for those goods. On the contrary, the fixed price of public goods is their coherent feature. Not making a particular payment excludes from consuming this good. It should be highlighted that costs related to exclusion in reference to public, as well as private goods are called transaction costs.

The specific properties of public goods (pure public goods) lead to failures of the market, which justifies the activity of the country concerning supply of such goods. The basic forms of market failures connected with those specific goods constitute the problem of insufficient consumption and supply. Exclusion leads to an undesired effect in the form of limitation of consumption, while resignation from exclusion will cause an insufficient supply[78].

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[75] R.A. Musgrave, P.B. Musgrave, *Public Finance in Theory and Practice*, McGraw-Hill, New York 1984, pp. 7-8.

[76] Ibid., p. 8.

[77] P.A. Samuelson, *A Diagrammatic Exposition of a Theory of Public Expenditure*, "Review of Economics and Statistics", November 1955, Vol. 37, MIT Press Journals, Massachusetts, pp. 350-356.

[78] M. Broll, *Zarys ekonomii sektora publicznego*, Wydawnictwo Uniwersytetu Ekonomicznego we Wrocławiu, Wrocław 2010, p. 48-49 and D. Begg, S. Fisher, R. Dornbush, *Mikroekonomia*, op. cit., pp. 103-104.

A country provides few goods that meet the requirements of pure public goods (apart from national defence, it is hard to find such an example). However, goods supplied by the country show – to a various degree – one of two properties that define the traditional public goods. Thus, those are mixed public goods that are characterized with a varied intensity of competitiveness and possibility to exclude from consumption[79].

Some of the most important goods provided by the public sector (e.g. health care services) are characterized by low costs of exclusion and high marginal cost of consumption by an additional person. According to the line of reasoning, these are then, in the opinion of the Author, private goods that come from public sources. Private goods that originate from public sources due to the performed social policy and the accepted social norms are called social goods. Classical public goods, due to their specific properties, are public goods *in the strict sense.* Pure public goods together with social goods are called public goods *in the broad sense*[80].

Among public goods, mixed public goods and social goods that are financed or directly provided by the state, there are also *public services* characterized by specific properties strongly connected with the described public goods.

Those properties include[81]:

- set proceedings concerning payments for their provision,
- their non-exclusion from consumption,
- imposition of consumption,
- limitation of freedom of choice,
- using mainly public property for their execution,
- public utilities.

As the last of the presented properties that determine the original character of public services, many Polish authors claim in their studies that public goods and services bear the character of public utilities[82].

As part of the conducted analysis, we get the term of *public utility service*, the economic definition which practically does not exist. The strong connection of terms of public utility service with a public good is the most proper method of determining the achievements of economic science in this issue. Despite noticing the fact that the idea of public utility service does not

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[79] M. Broll, *Zarys ekonomii sektora publicznego*, op. cit., p. 47.

[80] S. Owsiak, *Finanse publiczne. Teoria i praktyka*, Wydawnictwo Naukowe PWN, Warszawa 2005, p. 33.

[81] M. Janoś-Kresło, *Usługi społeczne w procesie przemian systemowych* w Polsce, Wydawnictwo SGH, Warszawa 2002, p. 28.

[82] M. Dylewski, B. Filipiak, *Usługi publiczne*, in: *Współczesna ekonomika usług*, ed. S. Flejterski, A. Panasiuk, J. Perenc, G. Rosa, Wydawnictwo Naukowe PWN, Warszawa 2005, p. 456.

correspond to the principles defining classical public good, the features that form this term result directly from properties of public goods and services.

On the other hand, *tasks of public utilities* (in connection with the theory of public goods) should be identified by means of an objective of a current and continuous satisfaction of collective needs of the population via provision of commonly available services that are characterized by the responsibility of public administration, imposed by legislature, for their provision[83].

Existence of such specific goods is also related to the necessity of taking actions for respecting and securing the natural environment, which constitutes both the need and the obligation of humans, entrepreneurs, consumers and the state.

3. Urban transport as the area of activity of public utility character

During the analysis of the terms used in Polish legislation for describing the term of public utility, the Author claims that the most significant meaning is the one that is implied by the act on municipal management, which regulates the principles and forms of municipal management including, in particular, the tasks of public utility nature, the aim of which is to currently and continuously satisfy the collective needs of the population via provision of commonly available services[84]. Despite the fact that the term of public utility has not been directly defined in the act, but was only used as an element defining municipal management, the value of this record was confirmed by the interpretation of the Constitutional Tribunal entitled *Zadania o charakterze użyteczności publicznej (Tasks of Public Utility Nature)*[85].

With reference to the content of the act on municipal management and the interpretation of the Constitutional Tribunal, one should notice that the execution of tasks of public utility character is within the responsibilities of public administration. Special role in satisfying the collective needs,

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[83] K. Strzyczkowski, *Prawo gospodarcze publiczne*, Wydawnictwo LexisNexis, Warszawa 2011, p. 333; K. Byjoch, S. Redeł, *Prawo gospodarki komunalnej*, Wydawnictwo Naukowe PWN, Warszawa 2000, p. 60; K. Bobińska, *Zdefiniowanie pojęcia "usługi użyteczności publicznej"*, in: *Użyteczność publiczna w sektorach infrastruktury gospodarczej*, ed. K. Bobińska, Dom Wydawniczy Bellona, Warszawa 2003, p. 27.

[84] Regulation of 20 December 1996. *O gospodarce komunalnej*. Dz. U. 1997, No. 9, item 43 with further amendments, art. 1 ust. 2.

[85] Constitutional Tribunal Interpretation: Zadania o charakterze użyteczności publicznej, "Rzeczpospolita" dated 14 April 1997 quoted after: K. Bobińska, *Zdefiniowanie pojęcia "usługi użyteczności publicznej"*, in: *Użyteczność publiczna w sektorach infrastruktury gospodarczej*, op. cit., p. 29.

including provision of services of public utility character, is performed by self-government administration, i.e. the units of local governments. The Local Government Law enumerates the main own tasks of the commune that cover satisfaction of the needs of the community. The district complements the execution of those tasks, in accordance with the District Government Law, by performing tasks of supra commune character. The own tasks of the voivodeship include tasks of voivodeship character[86]. Many of the tasks within the responsibility of respective units of local governments have the nature of public utilities. Those are the so-called *communal services*.

Human activity is related to the necessity of transporting people, shipments and information. Every day, millions of people in Poland move to other places thus satisfying their basic need to commute to work, school, shop, office, hospital. For this purpose, urbanized areas use collective local transport[87], also called *urban transport*. Urban public transport is characterised by one of the main properties of public utilities, i.e. legislation imposes responsibility on public administration for providing it.

Performance of tasks of public utility character is mainly the responsibility of the self-government, which, according to the Constitution of the Republic of Poland, was formed by the law as a separate unit in the structure of the country. The local or regional communities participate in exercising public powers, executing some of the public matters on their own behalf and responsibility, and are facilitated with material measures that allow execution of the imposed tasks[88].

The role of the local public transport in the functioning of urbanized areas is undisputed and its existence results from occurrence of needs that exceed the capacity of being satisfied by an individual citizen. Those needs are called communication needs and are considered as the will or claim submitted by the members of a particular society to local authorities that concern execution of the process of transportation from one place to another. In order to indicate their presence within urbanized areas, they must have the following properties: prevalence, irregularity and mass occurrence[89].

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[86] Regulation of 8 March 1990 *O samorządzie gminnym*, Dz. U. 2001, No. 142, item 1591 with further amendments, art. 7; law of 5 June 1998 r. *O samorządzie powiatowym*, Dz. U. 2001, No. 142, item 1592 with further amendments, art. 4; law of 5 June 1998 *O samorządzie województwa*, Dz. U. 2001, No. 142, item 1590 with further amendments, art. 14.

[87] The term *local public transport* is not defined directly in the Local Government Law, as well as in other legal acts.

[88] Constitution of the Republic of Poland of 2 April 1997, Dz. U. 1997, No. 79, item 464 with further amendments, art. 16.

[89] Z. Pawlicki, *Przewozy pasażerskie*, Wydawnictwo WKiŁ, Warszawa 1978, p. 14 and O. Wyszomirski, *Ekonomika komunikacji miejskiej*, Wydawnictwo Uniwersytetu Gdańskiego, Gdańsk 1986, p. 30.

An example of the prevalence of communication needs in a town is the large number of overall journeys in a day made by the inhabitants of this town. Irregulairity of such needs is resembled in the changes of demand for urban transport, both in time and space. Time and space irregularity, and the prevalence determine the last, specific feature of transport needs, that is its mass occurrence. It is set by the number of travelers measured in one hour[90].

The presented features of communication needs that are satisfied by means of urban transport resemble the basic criteria qualifying services as those with the character of public utilities. That implies current and continuous character, satisfaction of collective needs of the society and common availability.

Urban transport is one of the most important elements of the modern, urbanized world since it offers citizens the opportunity to move from one place to another. Local public transport has a direct impact on the quality of life, especially the weakest people who do not have funds to buy their own vehicle or, due to disabilities, are not able to use one. Urban transport helps passengers by giving them access to education, culture or healthcare. Moreover, public transport decreases noise, exhausts, traffic and the number of accidents. Emission of carbon dioxide (CO_2) per one passenger during a travel of one kilometer by car is, on average, 148 g, while in case of eighty people travelling by bus – only 11 g. In order to provide traffic for forty thousand travellers in one direction in one hour, there is a need for a 136 m wide road or two 14 m wide tram rails[91]. The indicated positive features of local public transport in comparison to private transport are significant for the proper social and economic development of the city, as well as they help in generating positive external effects attributed to services executed by public utility companies.

4. Lowering the external costs by means of activity of urban public transport companies in the light of greening the economy

External costs incurred by the society are connected with the results of the existence of transport that are negative for the natural environment and life of people. Those results are[92]:

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[90] O. Wyszomirski, *Gospodarowanie w komunikacji miejskiej*, Wydawnictwo Uniwersytetu Gdańskiego, Gdańsk 2002, pp. 57-58.

[91] M. Wolański, *Efektywność ekonomiczna demonopolizacji komunikacji miejskiej w Polsce*, op. cit., p. 55.

[92] O. Wyszomirski, *Transport miejski. Ekonomika i organizacja*, Wydawnictwo Uniwersytetu Gdańskiego, Gdańsk 2010, p. 137.

- pollution of natural resources,
- emission of noise,
- taking over land,
- accidents and catastrophes in transportation.

Noticing the problem of external costs is connected with their internalization, i.e. assigning particular negative results to entities that are responsible for their occurrence. This enables creating solutions that encourage users of transport to choose the correct measure of transportation.

There are usually distinguished three aims of assessing the external costs of local public transport[93]:

- assessment of usage of natural resources,
- determination of the conditions of the transport policy,
- determination of social advantages and costs, depending on the planned infrastructure investments.

Proper assessment of external costs should overcome many methodological and implementation difficulties. Most often, two complementary approaches are applied that are based on the evaluation of damages caused by transport activity and of funds required to restore the original state or protect against negative effects[94]. Thus, the level of costs of air pollution is being determined on the basis of the size of increased expenditures on e.g. renovation of building façade. Another method includes questionnaires concerning the eagerness to incur higher costs of rent or additional charges (e.g. a tax) in order to increase the quality of air. The method related to the eagerness to pay is also applied in reference to costs of noise. In developed countries, it is estimated that rent for an apartment is 1% lower when the degree of noise is 1 db higher[95]. The method based on costs of actions that are to protect against noise include e.g. the analysis of construction costs of sound absorbers, soundproof windows etc.

Costs of accidents and catastrophes in road traffic, as one of the groups of external costs incurred by the society are related to effects of existence of transport that are negative for the natural environment and human life comprise: direct costs related to damages to vehicles, treatment of victims and moral losses. One may also indicate costs of the land that is used by transport, the assessment of which, as in the case of indirect costs of accidents

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93 R. Tomanek, *Funkcjonowanie transportu*, Wydawnictwo Akademii Ekonomicznej im. Karola Adamieckiego w Katowicach, Katowice 2004, p. 66.

94 R. Tomanek, *Funkcjonowanie transportu*, op. cit., p. 62.

95 A. Tylutki, J. Wronka, *Znaczenie kosztów zewnętrznych dla polityki transportowej państwa*, "Przegląd Komunikacyjny" 1995, No. 8; www.deutschland-bleibt-mobil.de; S. Keuchel, *Wirkungsanalyse von Massnahmen zur Beinflussung des Verkehrsmittelswahlverhaltens*, Vadenhoeck, Gottingen 1994, pp. 25-26.

and moral losses due to accidents, also encounters methodological difficulties. It is commonly believed that the advantages, which can be achieved by means of the alternative usage of transport or construction costs of infrastructure in the case of moving it under or above the ground, should constitute the basis for determining such costs.

The German research center IWW in Karlsruhe, which deals with the problems of assessing external costs, by indicating types of such costs, gives them certain values, i.e.: climate changes (30% of external costs), emission from motor vehicles that are released to the atmosphere (27% of external costs), damages due to car accidents (24% of external costs)[96].

On 1 March 2011, the law on collective public transport entered in force in Poland[97]. This law specified the organizers of collective public transport and attributed certain tasks to them. The role of the organizer of urban transport in a commune was given to the commune or association of communes. Tasks of the organizer include: planning the development of transport, organization and management of public transport. The basic factors for planning urban transport in the European Union (EU) countries are based on the awareness of negative effects of mobility in form of congestion, communication accidents and environmental damages. That is why the main principles of organization of urban transport provided by public utility companies must consider rational proportions – keeping balance between social, economic and environmental aspect and keeping balance between costs and advantages of transport – assessment of benefits and costs of transport within the economic, social and environmental aspect through internalization of external costs in order to provide a market mechanism that regulates the transport sector.

The aim of activities of entities responsible for execution of urban communication service is to lower the number of people who travel individually by car or to create means of transport, methods of travelling, mechanisms and initiatives that allow enhancement of access to various facilities by ecological means of transport. From the point of view of greening of economy, not only public transport is of key significance, but also private transport executed with private cars. This type of transport is the reason for increasing threats to the proper functioning of towns and it requires taking actions that can limit its burden imposed on the natural and human environment. Such actions should be planned at the strategical and operational level, next to actions referring to public transport. Such a need finds resemblance in the practices employed by

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[96] J. Burnewicz, *Sektor samochodowy Unii Europejskiej*, Wydawnictwo WKiŁ, Warszawa 2005, p. 95.

[97] Ustawa z dnia 16 grudnia 2010 r. o publicznym transporcie zbiorowym, Dz. U. 2011, No. 5, item 13.

the developed EU countries that were the first to declare the negative results of mass development of individual motorization[98].

Development of urban transport, which could be observed in our country during the last few years, results from rising attractiveness of Poland and its regions due to expansion of technical infrastructure and an increased availability of financial resources. Investment activities executed in relation to acquisition of the EU funds shall respect the principles of protection of natural environment in order to enhance its quality and increase the welfare of the society. Distribution of the EU funds, which were available as part of the Operational Programme Infrastructure and Environment for years 2007-2014 among respective economic sectors resulted in seventy percent granted to the transport sector.

This Programme supported projects that promoted a system of public transport that was environmentally friendly. It preferred undertakings that helped in integration of the transport subsystems that functioned within the metropolitan area and that were compliant with the contemporary integrated plans for the development of public transport. Activities within the scope of promoting public transport resulted in decrease of street noise and emission of exhaust from different means of transport. Systems of environmentally friendly public transport were granted additional funds, i.e. rapid urban rail, metro, trolleybus, or ecological bus.

5. Evaluation of the influence of urban transport on the natural environment on the example of bus transport

A significant influence on the state of the natural environment and substantial negative changes within this area results from one of the types of local public transport, a form of communication very often used by inhabitants of towns, i.e. bus communication. In order to decrease the external costs generated by urban transport, especially bus transport, it is required to have a set of systematic and system actions that concern technological, financial, investment and organizational matters. Greening of bus transport is related to development of bus drives, including hybrid technology (such buses may be found on the streets of e.g. Kraków). Hybrid technology involves at least two sources of power, one of which is the original source of high energy capacity (e.g. a combustion engine), while the second is the secondary source in the character of energy accumulator. The energy of the accumulator is used

[98] K. Górka, B. Poskrobko, W. Radecki, *Ochrona środowiska*, Polskie Wydawnictwo Ekonomiczne, Warszawa 2001, p. 338.

for the powering of the vehicle, which, in case of a proper control of the process, leads to a significant decrease (by about 35%) of the power required from the original source in comparison to a regular drive system. Hybrid system may create condition of optimum work for combustion engines in relation to energy efficiency, durability, as well as ecological efficiency[99]. Requirements that refer to mobility, limited resources of fossil fuels and standards of emission capacity are nowadays an important evidence of modernization and upgrading of the so-called bus fleet. By making the comparative assessment of various concepts of drive systems, one should take into consideration not only the lowering of emissions of local gas and dust pollution, but also the influence on the balance of emission to the air that are of global character, as well as the intensity of noise. Despite the noticeable actions in the country within the scope of greening of bus public transport, there are still possibilities to introduce new technical enhancements.

In the light of current research, elements that are considered particularly detrimental, and which accompany the urban bus transport (also due to the extent of emission), include: carbon monoxides, nitrogen oxides and lead and sulphur oxides. A great contamination of the natural environment is also caused by emissions of non-combusted hydrocarbons. Among compounds that are formed in incomplete combustion, there are: carbon monoxide, hydrocarbon, and smoke (carbon black).

The research conducted in highly developed countries shows that motorization causes about 60% of the overall emissions of carbon monoxide and nitrogen oxides, 50% of hydrocarbons and 15% of solids. In Poland, transport pollution constitutes about 40% of emissions. Statistical data, however, do not resemble the actual extent of danger since they do not consider the degree of transport concentration near human settlements, the geographical and climate conditions and the organization of vehicle traffic. Thus, in areas of large agglomerations, communication emits even up to 80% of pollution, locally exceeding the safety level many times. One of the most dangerous occurrences, resulting from emissions of automotive exhaust, in the condition of high air moisture, is the formation of the so-called atmospheric smog.

The research conducted in the UE countries shows that the share of buses in pollution of the atmosphere in cities amounts only to 0.5-1%[100]. A bus that takes, on average, 100 passengers emits less hydrocarbon and uses less energy than a passenger car facilitated with a catalytic convertor that may take, on average, 1.4 passenger. Data indicate that transport absorbs 67% of liquid fuels, yet it should be highlighted that bus communication is almost

[99] Z. Pawelski, *Napędy hybrydowe dla autobusu miejskiego*, Wydawnictwo Politechnika Łódzka, Łódź 1996, p. 27.

[100] www.deutschland-bleibt-mobil.de.

3 times less energy-intensive than car transport and it emits over 100 times less pollution[101].

During rush hours, 500 buses, on average, drive onto the streets of larger Polish cities. One of such buses may regularly carry 112 persons. Then, by taking the average burden of passenger cars in the city (vehicles that may take 1.4 passenger on average), one gets the conclusion that one bus eliminates 80 passanger cars from the urban traffic. Consequently, not only the amount of pollution released to the air from transport is lowered, but also the occurrence of congestion, i.e. the traffic on the streets.

The problem of emissions and poisonous substances from bus transport may be presented in many aspects. One of them is the determination of the share of bus transport in the overall balance of pollution in a large Polish city. The average emissions of carbon monoxide amount to 218.3 t per year, emission of hydrocarbons is 162 t/year, while emissions of nitrogen oxide is only 194 t/year[102]. Table 2 presents emissions of pollution caused by bus communication in a large Polish city.

Table 2. Share of urban transport in emissions of poisonous substances in a large Polish city in 2011 in %

Type of pollution	Bus transport pollution	Other pollution
Carbon monoxide (CO)	0.17	99.83
Hydrocarbon (HC)	2.31	97.69
Nitrogen oxide (NOx)	0.84	99.16

Source: own analysis based on *Publications of Urban Transport*, IGKM, Warszawa 2000-2012.

The actual ratio of pollution becomes especially meaningful in the light of the conducted comparative analysis concerning bus and individual transport. Hypothetically, if all passengers who pollute the environment of a large Polish city by using buses started using regular cars, this would cause the following: firstly, an increase of the number of cars by about 36,000, which would greatly influence the congestion during rush hours. Secondly, an increase of emission of exhaust: 18,000 times in the case of nitrogen oxide, 27,000 times in the case of hydrocarbon and 540,000 times in the case of carbon monoxide.

[101] J. Burnewicz, *Sektor samochodowy Unii Europejskiej*, op. cit., p. 117.

[102] *Raport o stanie komunikacji autobusowej*, Wydawnictwo Biuletyn Komunikacji Miejskiej, the Polish Chamber of Urban Transport, Warszawa 2012.

6. Conclusion

Considerations mentioned above are of theoretical and empirical nature. As a result of the conducted analysis, tasks of public utilities have been identified according to their specific objective, that is the current and continuous satisfaction of the collective needs of the society. The reasons for the special approach towards public utility services result from, among others, the occurrence of external effects. One of the types of enterprises that generate positive external effects that have influence on the natural environment are those of the local public transport.

Urban transport is a very important element of the modern, urbanized world since it provides citizens of a particular city with an opportunity to successfully move to their target location or from one place to another. Local public transport has a direct impact on the quality of life. Public transport that manages to acquire passengers who own and may use a car helps in lowering problems such as noise, emission of exhaust, as well as the problem of crowded roads and the number of accidents. The foundations of organizing urban transport should include the acknowledgment of the significant meaning of transport mobility for the social and economic development of cities, as well as of the negative consequences of car transport in the form of congestion, communication accidents and damages to the environment.

The determination and assessment of damages in the environment, including, in particular, losses caused by transport, constitute a complex and very difficult issue. The problem of measuring external costs requires an interdisciplinary approach, while the background for the economic losses caused by transport should be constituted by the circumstances resulting from geographical, ecological and technological aspects. Losses due to automotive pollution are estimated at the level of 0.5-5% of national income[103], considering only some of the threats since not all of them may be assessed with finanses. The conducted analysis shows that the only alternative for the passenger car in cities (in the aspect of lowering environmental damage) is an efficient and cheap public transport, that requires constant investment. There is a growing necessity to promote public transport, including bus transport, which causes significant external costs. That is why the argumentation for financing public transport draws attention to the fact that mass motorization requires more financial resources and considering the negative external effects. Preventing degradation of the environment is an expensive process, while the desirability to incur those costs is a justified move of eliminating disadvantages brought to society and the economy by degradation.

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[103] O. Wyszomirski, *Transport miejski*, op. cit., pp. 67-76.

Małgorzata Kożuch

CHAPTER IV

INNOVATIONS IN GREENING OF ECONOMY

1. Introduction

In the economic development, not only the resources of work, land and capital play a significant role, but also the immeasurable factors, such as the ability to generate and introduce changes, especially within the scope of organizational solutions, knowledge and technology. Innovations are an important impulse that determines the further development and competitiveness at the level of an enterprise, as well as the region and, consequently, the whole country. They play a significant role, not only of economic, technical and production character, but also of social and ecological one, because they are the foundation and the imperative of changes that lead to greening of economy. The aim of this part of the study is to determine whether Polish enterprises undertake innovations and what those innovations are, as well as how deeply their innovation influences exert an influence on structural changes in light of greening of economy.

2. Innovations as the tools of greening of economy

In order to achieve positive economic changes, it is required to withdraw from "routine" and introduce to the market a product or good that is characterized by new properties. At the beginning of the twentieth century, the person who connected, in a new way, measures of production was called by J. Shumpeter an entrepreneur (*innovator*)[104]. The author of the innovation theory mainly focused on technical innovations and their influence on economy. He considered introduction and popularization of innovations as a separate type of changes called *imitations*[105]. Nowadays, the term innovation gained a more

[104] J. Shumpeter, *Teoria wzrostu gospodarczego*, Wydawnictwo Naukowe PWN, Warszawa 1960, p. 104.

[105] M. Dolińska, *Innowacje w gospodarce opartej na wiedzy*, Wydawnictwo PWE, Warszawa 2010, p. 16.

broad meaning and this makes that it is defined in various ways. Many authors use the terminology proposed by OECD and Eurostat, according to which *innovation* "is an implementation of a new or greatly improves product (good, service) or process, a new marketing method, or a new organizational method into economic practices"[106]. This definition suggests that one can indicate four types of innovations: product, process, marketing and organizational innovation. Thus, by innovations one should understand not only the introduction of new production methods to the production process, or new ways of organizing production, which result in an innovative effect in form of new products, but also a new approach towards organization of e.g. the working place or the relations with one's environment.

Innovations are connected with *innovativeness*, a feature of individual entities, as well as whole economies. In general, it stands for the ability to create broadly understood innovations. It is related to the active participation in innovative processes and undertaking actions on this matter. Innovativeness is influenced by the owned resources and abilities to participate in processes of creation, implementation and absorption. Innovativeness may be considered at the level of a unit, organization or the macroeconomy[107]. As innovative activities, one may consider also creation of new economic entities, as well as discovering and acquisition of new supply of resources and other materials, as well as new outlets[108].

From the macroeconomic point of view, the innovativeness of economy or a region is preferable. Thus, innovativeness is a derivative of owned resources (human, material, capital, information) and skills and abilities to constantly seek for and use in economic practice the results of scientific research, research and development works, new concepts, ideas, inventions, implementation of new methods and techniques in organization and management, improvement and development of infrastructure and the level of knowledge[109].

Due to the originality of the introduced changes, we may distinguish creative (absolute) innovations and imitative and adaptive innovations. On the other hand, when focusing on the spatial criterion, the following innovation systems may be indicated: the National Innovation System (NIS), the Regional

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[106] *Podręcznik Oslo. Zasady gromadzenia i interpretacji danych dotyczących innowacji.* MNiSW, Warszawa 2008, p. 34.

[107] J. Guinet, *National Systems of Financing Innovation*, OECD, Paris, 1995, p. 21.

[108] K. Górka, *Czynniki hamujące oraz stymulujące rozwój przedsiębiorczości i innowacyjności w przemyśle*. "Zeszyty Naukowe Akademii Ekonomicznej w Krakowie" 2006, No. 708, p. 53; S. Pangsy-Kania, *Polityka innowacyjna państwa*, in: *Polityka gospodarcza. Teoria i praktyka*, ed. B. Kryk, Wydawnictwo Economicus, Szczecin 2012, pp. 112-126.

[109] A. Nowakowska, *Regionalny kontekst procesów innowacji*, in: *Budowanie zdolności innowacyjnych regionów*, ed. A. Nowakowska, Wydawnictwo Uniwersytetu Łódzkiego, Łódź 2009, p. 21.

Innovation System (RIS) and the Local Innovation System (LIS)[110]. It should be reminded that the concept of the innovation system constitutes an approach towards the issue of innovation, according to which economy is considered as a network of interrelated economic entities and institutions that influences the occurrence of synergistic effects of cooperation[111]. In the EU countries, regional innovation strategies are the basic instrument of development that is to increase innovativeness of regions through the research sector and optimization of its usage for the development of sustainable economy. It is possible owing to the cooperation between industry, regional self-government and government administration, economic self-government, science and research facilities, and business infrastructure. Among the listed participants of the innovations strategy, the significant role is performed by the entrepreneurs – innovators.

When clarifying terminological issues, it should be mentioned that scientific publications, government documents and economic practices very often use the term *eco-innovation*. This means every innovation that leads to achieving sustainable development by limiting the negative impact of production activity on the environment, increasing the resilience of the nature to the burden or providing higher efficiency and responsibility while using natural resources. The term eco-innovation refers to all forms of innovation – both technical and non-technical, which create chances for enterprises that bring advantages to the natural environment by preventing negative effects on its element, limitation of this impact, or optimization of usage of natural resources. Eco-innovations are strictly connected with the way the natural goods are exploited and with the production process, as well as the character of consumption. Eco-innovations are also related to the terms of eco-efficiency and ecological industry. They favor the shift of enterprises from the "end-of-pipe" technology to the solutions of "closed-loop" (integrated technologies), which, by minimizing the flow of materials and energy in the production activity, allow to gain competitive advantage for economic entities, sectors, and, consequently, lead to greening of economy[112].

Introduction of eco-innovation does not only support greening of economy, but also brings measurable advantages to the entrepreneur; they include[113]:

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[110] K. Miszczak, *Charakterystyka funkcjonowania terytorialnych systemów innowacyjnych*, in: *Kierunki transformacji społeczno-ekonomicznej przestrzeni Polski ze szczególnym uwzględnieniem obszarów metropolitalnych*, ed. S. Korenik, M. Rogowska, Wydawnictwo Katedry Gospodarki Przestrzennej i Administracji Samorządowej we Wrocławiu, Wrocław 2006, p. 39.

[111] N. Capanidu, *Znaczenie innowacji w rozwoju regionalnym*, "Zeszyty Naukowe Uniwersytetu Szczecińskiego. Problemy Zarządzania, Finansów i Marketingu" 2006, No. 10, p. 70.

[112] *Ekoinnowacje. Klucz do przyszłej konkurencyjności Europy*. The European Commission, http://ec.europa.eu/environment/pubs/pdf/factsheets/ecoinnovation/pl.pdf.

[113] M.E. Porter, C. van der Linde, *Green and Competitive – Ending the stalemate*, "Harvard Business Review", https://hbr.org/1995/09/green-and-competitive-ending-the-stalemate, p. 126.

- from the process perspective – material savings, shorter periods of emergency downtimes due to a better control and monitoring of processes, better utilization of by-products, conversion of waste into useful resources, lowering of the usage of processing energy, cutting costs of storage, transport and waste management, savings related to higher work safety,
- from the product perspective – a higher quality of goods, lower production costs, lower costs of packaging, higher unit productivity, higher degree of product safety.

Although innovations, especially eco-innovations, are an important determinant of the development of an economy that more efficiently makes use of resources, is more environmentally friendly and more competitive, their implementation to economic practices is a difficult undertaking that requires system solutions, a suitable policy and proper incentives.

3. Measures and instruments of innovation policy

Not only the innovation policy employed by the country, but also the instruments of such policy have a significant influence on the innovativeness of enterprises and economy. This policy has evolved from a scientific policy and technical policy, via scientific and technical policy, as well as industrial policy, into a separate innovation policy. The changes concerned both the goals and the priorities of the performed policy, as well as the applied instruments, the role of the country and the scope and relations with other types of economy.

Innovation policy, considered in accordance with the international standards, is a form of industrial policy focused on creating deeper relations within the National Innovation System, enhancing the abilities to introduce innovations, and on optimization of their usage as the factor of economic growth[114]. The innovation policy of a country must determine the general directions of the economic development of a country and open the frameworks for the innovative activity of enterprises. Its objective should be, above all, the support of innovativeness of industrial and service enterprises, especially the small and medium ones, through, i.a. providing them support in introduction of new technological processes, products, services and techniques of management.

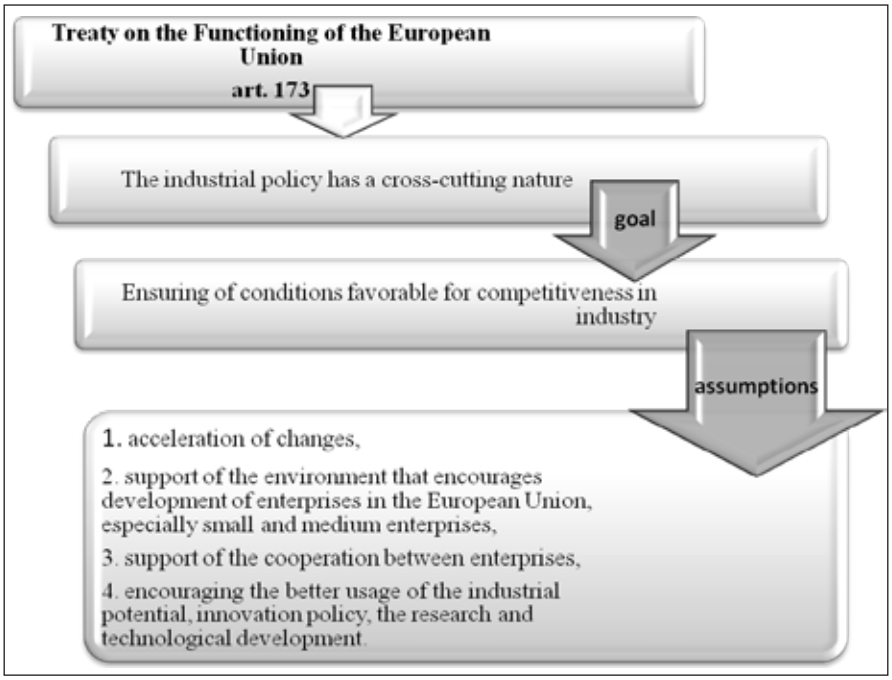
In our country, the modern innovation policy is created in reference to the economic policy of the European Union. It was already indicated in the Treaty on the Functioning of the European Union that there is a neces-

[114] M. Słupińska, *Ewolucja polityki innowacyjnej w warunkach członkostwa Polski w Unii Europejskiej*, in: *Budowanie zdolności innowacyjnych regionów*, ed. A. Nowakowska, Wydawnictwo Uniwersytetu Łódzkiego, Łódź 2009, p. 129.

sity for connecting industrial policy with innovation policy and scientific research, which has been shown on Figure 2.

According to the European Commission, innovation policy is a set of specified behaviors that are to increase the number of innovative actions and improve their efficiency. Such actions refer to creation, adjusting and application of new or enhanced products[115]. The subject of influence of innovation policy are mainly economic entities that bear the risk connected with implementation of innovations in case of their failure[116].

Figure 2. The position of innovation policy in the strategic document of the European Union



Source: own analysis based on: *Traktat o funkcjonowaniu Unii Europejskiej*, Dz. Urz. UE 2012, C 326/47.

In 2010, the European Commission accepted the strategic document *Europe 2020* to support smart, sustainable economic growth that helps achieve social integration. It employs the plan to achieve a constant growth that will lead to

[115] *Innovation Policy in a Knowledge-based Economy*, Enterprise Directorate – General, European Commission, Brussels-Luxembourg, 2000.

[116] J. Prystrom, *Innowacje w procesie rozwoju gospodarczego. Istota i uwarunkowania*, Wydawnictwo Difin, Warszawa 2012, p. 75.

innovativeness and more efficient usage of natural resources. In order to fulfill the objectives of the *Strategy*, there are seven flagship initiatives, including "Europe that Efficiently Makes Use of Resources" and "Union of Innovations"[117].

The initiative "Europe that Efficiently Uses its Resources" highlights the important meaning of eco-innovation and lists types of support offered as a part of numerous instruments of the EU policy. A plan that is connected with the initiative has included information on the manner of achieving economic growth with economical management of natural resources and has presented tools and indicators that are to help in guiding the undertaken actions at the European and global level. On the other hand, the initiative "Union of Innovations" includes bold, integrated and strategical approach that shows the new and more efficient way for using owned capital, property and human resources. As a part of this initiative, it is advisable to employ a roadmap connected with eco-innovations, which will include the challenges and capacities of protecting the environment with the use of innovations.

According to the European Commission, elaboration and promotion of new solutions is necessary, thus it may be possible to use the potential within the scope of economic advantages based on savings in costs, innovativeness and international trade exchange. In order to encourage people to use environmentally friendly technologies, the European Union has proposed a set of tools, including: green public procurement, eco-labels, verification of environmental technologies, financial incentives, voluntary agreements and industry standards. In years 2014-2020, "Horyzont 2020" will be the new EU programme financing the initiative "Union of Innovations" to support scientific and innovation research, which received a budget of approximately EUR 80 billion. The funds of the programme will be used not only to help in research regarding new solutions, but also their supervision, presentation of results and the development of the effects achieved on the market. It will also include the facilitation that will allow the full usage of the EU financing in the process from scientific research to the introduction of the results of this research to the market[118].

Poland, similarly to other members of the Community, conducts its own policy according to the strategic state documents and the EU instructions. A significant focus is put in our country on wide usage of innovativeness and information techniques in order to speed up economic and social developments. The experience of developed country has shown that economic growth based on usage of information techniques results in improvement of working

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[117] M. Kożuch, *Polityka przemysłowa w warunkach kryzysu gospodarczego*, in: *Ekonomia przemysłowa w warunkach kryzysu finansowego*, ed. P. Małecki, Wydawnictwo Uniwersytetu Ekonomicznego w Krakowie, Kraków 2012, pp.79-81.

[118] *Eco-innovations. The key to the future competitiveness of Europe*. The European Commission, http://ec.europa.eu/environment/pubs/pdf/factsheets/ecoinnovation/pl.pdf.

efficiency and, at the same time, creates new working places, so it speeds up economic growth in accordance with the ideas of sustainable development. Efficient innovation policy must then result from a fusion of scientific policy and the industry, while its strategic goal should be aimed at achieving and maintaining a high level of international competitiveness of the goods manufactured in the country. The place of innovation policy in state strategic documents has been shown in Table 3.

Table 3. The place of innovation policy in the state strategic documents

Name of document	Objectives related to innovation policy
The concept of a horizontal industrial policy in Poland	• An improvement of conditions to conduct industrial activity and to increase the competitiveness of enterprises • Development of special sectors: bio-technological, electronic, ICT, pharmaceutical, chemical, machine and automotive, light, furniture and wood industries
Strategy of Innovativeness and Efficiency of Economy *"Dynamiczna Polska 2020" (*Dynamic Poland 2020)	• Stimulation of innovativeness through an increase of work and knowledge efficiency • Concentration of public expenditures on pro-development and innovative activities • Simplified support procedures and instruments, including a system of micro-financing, the Programme "Przeciwdziałanie upadłościom i polityka nowej szansy" (Counteracting bankruptcy and the policy of new chance) • Intelligent specializations and competitive industrial fields • An efficient usage of natural resources
The Enterprise Development Programme 2014-2020	• Stimulation of the innovativeness of enterprises • Removing barriers in the functioning of enterprises – the Programme "Lepsze Regulacje 2015" • Instruments of Financial and non-financial support (loans, subsidies, sureties, guaranties, tax exemptions for research, development and innovation, a public, private and social partnership, consultancy, workshops)

Source: own analysis based on: *Koncepcja horyzontalnej polityki przemysłowej w Polsce*. the Council of Ministers, Warszawa 2007; *Strategia Innowacyjności i Efektywności Gospodarki. "Dynamiczna Polska 2020"*, the Ministry of Economy, Warszawa 2013; *Program Rozwoju Przedsiębiorstw do 2020 roku*, the Ministry of Economy, Warszawa 2014.

The mechanism of competition, the main driver for innovative processes, imposes introduction of new technologies on the producers. However, a significant role in this process is also performed by factors that do not directly result from market mechanisms, but also from the intervention function of the country, in form of a skillful innovation policy and varied in terms of the applied instruments.

Innovation policy in our country is executed through the following instruments[119]:

- legal – proper legislation, control over monopoly, protection of intellectual property,
- financial – research grants, investments subsidies, preferential loans, credits, guarantees and sureties, tax preferences, capital shares in innovative risky undertakings[120],
- institutional (organizational) – institutions that provide training and consultancy services, services within the scope of transfer of technology, building relations, providing information,
- infrastructural, business incubators, science parks, centers for technology transfer,
- structural – education at various levels, research programmes, state and international,
- commercial – trade agreements, export subsidies, duties, contingents.

The most important entities supporting innovations, through which the government executes the innovation policy, are: the Polish Agency for Enterprise Development, the National Capital Fund, Bank Gospodarstwa Krajowego (the National Economic Bank), Marshal Offices of respective voivodeships, the National Fund for Environmental Protection and Water Management and, directly, the State Treasury. The National Centre for Research and Development and the National Centre of Research are institutions that mainly finance basic and applied research, meaning research that constitutes a base for creating innovative solutions.

The size and access to the capital for research and development influence the employed innovation strategy, which in our country corresponds to the so-called adaptation model. Due to the delays within the scope of research and innovations, as well as the limited financial capital, it is necessary to have a transfer of innovation from other countries, mainly through direct foreign investments. It is essential, however, to develop the research and development facilities in order to i.a. achieve a constant improvement of imported technologies and support of domestic technical ideas[121].

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[119] S. Ciok, *Polityka rządu wobec wspierania działalności innowacyjnej i badawczo-rozwojowej*, in: *Endo i egzogeniczne determinanty obszarów wzrostu i stagnacji w województwie dolnośląskim w kontekście Dolnośląskiej Strategii Innowacji*, ed. H. Dobrowolska-Kaniewska, E. Korejwo, Dolnośląska Agencja Współpracy Gospodarczej, Wrocław 2009, p. 121.

[120] *Ocena wpływu polityki spójności na wzrost konkurencyjności i innowacyjności polskich przedsiębiorstw i gospodarki*, Instytut Badań Strukturalnych, Warszawa 2009, p. 41.

[121] S. Bukowski, J. Misal, *Wzrost gospodarczy i finanse międzynarodowe*, Wydawnictwo Fachowe CeDeWu.pl, Warszawa 2011, p. 82.

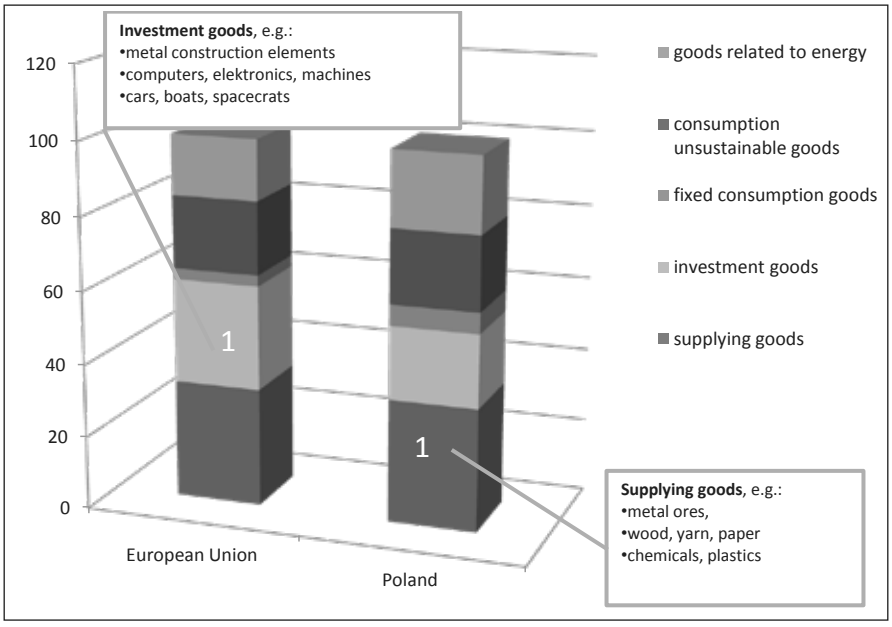
4. The degree of innovativeness of Polish industry and companies

Along with development of knowledge, technological progress, access to capital and the ability to use achievements of the research and developments sector in practice, the previous century brought a change in economies of highly developed countries, as well as in economies of the developing ones. The phenomenon of "servitization" of economy (meaning enforcement of the role of service in economy) became more common and, thus, it resulted in the emergence of a "post-industrial" society. The tendencies of such changes were painfully verified by the financial crisis in 2008-2009. It appeared that economy based on services (especially financial services) is less resistant to market failures and it takes them longer to restore after crisis situations. Nowadays, it becomes more common to think that the industry may become the stabilizer and the force for growth of economies, but it must be based on new, innovative solutions that support the so-called low-emission economy. Chart 3 shows that although the European Union started putting more attention to production of investment goods of high degree of processing (electronics, computers, pharmaceutical industry), the structure of our domestic industrial production is still dominated by consumables, lowly processed, production of which is connected with emissions of pollution and degradation of the natural environment.

International innovation rankings place Poland much lower than the majority of the EU countries. For instance, the IUS *(Innovation Union Scoreboard)* report in 2013 included Poland among the group of moderate innovators – to compare, in 2012, it was listed in the group of the so-called modest innovators. Our country is characterized by a Summary Innovation Index lower than the average level of all member states. In 2013, Poland was fourth from the bottom in the IUS ranking[122]. The low level of innovativeness of domestic entrepreneurs has been confirmed by the data presented in Chart 4. Years 1995-2005 in Poland were dominated by production of high material consumption (mainly food, drinks, manufactured tobacco, paper and paper goods, furniture, wood products, cork products, straw and wicker products).

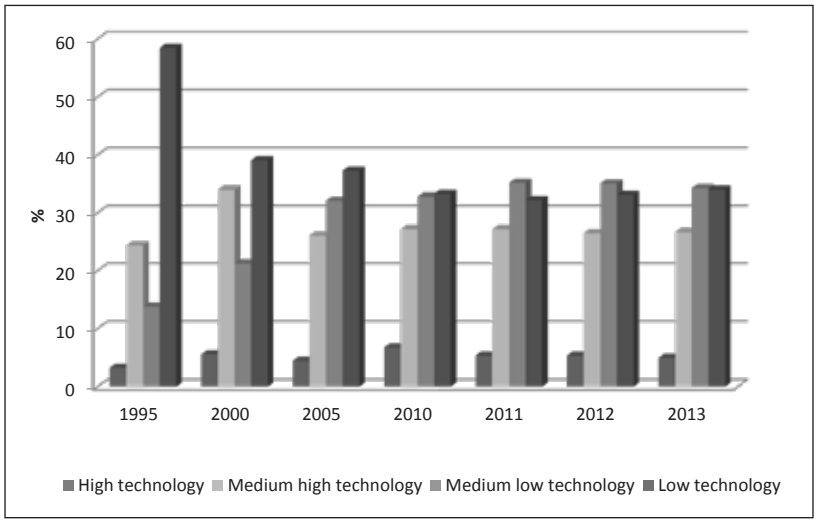
[122] *Polska 2014. Raport o stanie polskiej gospodarki*, the Ministry of Economy, Warszawa 2014, p. 257, http://www.mg.gov.pl/files/upload/8436/RoG20130829.pdf. See also J. Staśkiewicz, *Ocena zdolności innowacyjnej wybranych krajów Unii Europejskiej w latach 2000-2009*, "Studia i Prace Wydziału Nauk Ekonomicznych i Zarządzania" 2012, No. 25.

Chart 3. The structure of industrial production in the European Union and in Poland according to industrial groupings in 2013



Source: own analysis based on *Rocznik Statystyczny Przemysłu 2013*, www.stat.gov.pl.

Chart 4. The degree of innovativeness of Polish industry in years 1995-2013



Source: own analysis based on *Rocznik Statystyczny Przemysłu*, www.stat.gov.pl.

After Poland joined the European Union, some advantageous changes occurred. There was an increase in the usage of medium low technology (e.g. production of coke and products of refining of crude oil, metal and metal articles, rubber and plastic articles) and medium high technology (e.g. manufacture of cars, trailers and semi-trailers, chemicals, electric devices, weapons and ammunition). For years, the share of technologically intensive production (computers, electronic and optical articles, pharmaceutical products, aircrafts and spacecrafts) has been constituting only 5% of the overall industrial production in Poland.

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In creation of innovations, education enterprises and education sector are of crucial importance, while a significant role is performed by the consumers since they generate demand for modern goods and services. The size of innovative activity is measured i.a. by the number of entities that introduce innovations, so the structure of sales of new or greatly improved products. Statistics show that there was a minor increase of innovation activities of enterprises in years 2010-2012 (Table 4). At that time, 17.7% of industrial enterprises and 13.9% enterprises from the service sector introduced changes of innovative character (accordingly 16.9% and 12.3% in years 2009-2011). In terms of changes, new or greatly improved *products innovations* were implemented by 11.2% of industrial enterprises and 7% of service enterprises[123]. Enterprises analyzed by the Central Statistical Office, both industrial and service, mainly introduced process innovations and, later on, innovations of products.

The highest share of enterprises, which introduced such innovations, occurred in industry sectors like: manufacture and processing of coke and products of refining of crude oil (52.3% of enterprises within the industry), as well as production of basic pharmaceutical substances, medicines and other pharmaceutical articles (44.8%), while in the case of service sector – in insurance, reinsurance and pension funds, excluding the obligatory social insurance (64.9%) and scientific research and development works (43.3%).

[123] *Działalność innowacyjna przedsiębiorstw w latach 2010-2012*, Central Statistical Office, Szczecin 2013, p. 2, http://stat.gov.pl/cps/rde/xbcr/gus/dzial_innow_przed__sek_usl_2010_2012.pdf.

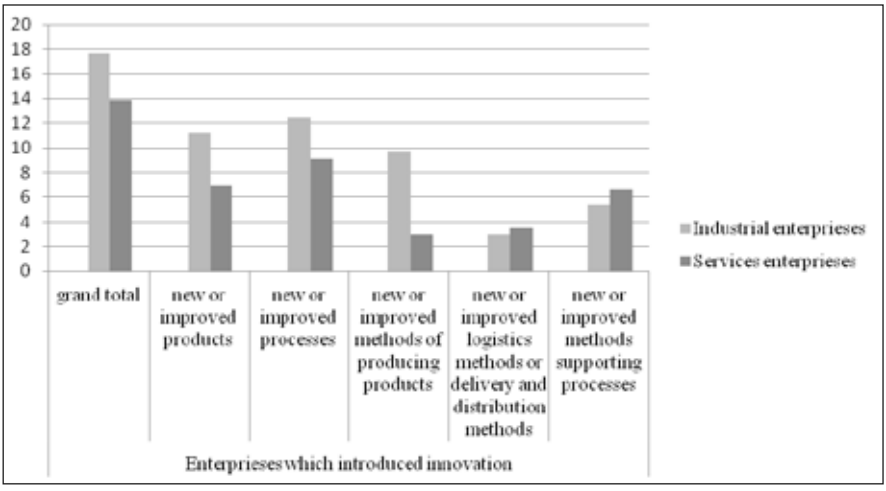
Organizational innovations in industrial enterprises mainly included new methods of operating (7.3%), while in the service sector – new methods of distributing tasks and decisive rights (6.8%)[124], Chart 5.

Table 4. Share of innovative enterprises in the total number of enterprises according to the type of innovation in 2010-2012 in %

Specification	Enterprises which introduced innovations						Share of income from sales of new products or greatly improved in sales income
	total	new or improved products	new or improved processes	new or improved methods of manufacture	new or improved logistics/ distribution methods	new or improved methods supporting processes	
Industrial enterprises	17.7	11.2	12.4	9.7	3.0	5.4	9.2
Service enterprises	13.9	7.0	9.1	3.0	3.5	6.6	3.1

Source: own analysis based on *Działalność innowacyjna przedsiębiorstw w latach 2010-2012*. Central Statistical Office, Szczecin 2013, p. 3-4. http://stat.gov.pl/cps/rde/xbcr/gus/dzial_innow_przed__sek_usl_2010_2012.pdf.

Chart 5. Share of innovative enterprises in the overall number of enterprises according to the type of innovation in 2010-2012 in %



Source: own analysis based on *Działalność innowacyjna przedsiębiorstw w latach 2010-2012*. Central Statistical Office, Szczecin 2013, p. 3-4. http://stat.gov.pl/cps/rde/xbcr/gus/dzial_innow_przed__sek_usl_2010_2012.pdf.

[124] *Działalność innowacyjna*, op. cit., p. 3.

The share of income from sales of new or greatly improved products introduced to the market in years 2010-2012, in comparison to overall income, only amounted to 9.2% in industrial enterprises, and 3.1% in the service sector. In terms of the size of enterprises, the highest ration of innovative enterprises (11.9%) occurred in industrial enterprises that employ 250 or more persons. Expenses for innovative activities in industrial enterprises analyzed, within the period by the Central Statistical Office, were slightly increased and amounted to PLN 21.5 billion (PLN 20.8 billion in years 2009-2011), while in the service sector – to PLN 15.2 billion (previously about PLN 11 billion). The dominating type of expenses were the investment expenses, which constituted 74% of all expenses for innovations. Enterprises of the service sector invested the majority of funds to the research and development activity (40.1%). Expenses for investment activities were primarily financed from the funds of the enterprises (73.7% expenses for innovations in industrial enterprises and 69.6% – in the service sector).

In our country, development of innovations is mainly influenced by economic factors, as well as of organizational and bureaucratic, legal, information, motivation, culture, or even awareness character. For many years, the factors that have been discouraging innovativeness of entrepreneurs include: low funds for research and development, weak transfer of technologies, insufficient financial resources of enterprises and, consequently, low participation in innovative undertakings, lack of economic knowledge and experience of innovators in terms of technology.

The experience of highly developed countries shows that in order to achieve an efficient competitive advantage, enterprises must try to surpass competitors in searching for new solutions. Improvement of the competitive position may be achieved only by entities that take risk and introduce new technological solutions[125]. Innovative solutions also help in decreasing the emissions of pollution and limiting the burden of the conducted activity to the environment, which influences the image of the company, enhances the position of the company on the market, as well as increases the quality of life and the working conditions of the society.

Entrepreneurs who introduce eco-innovations obtain advantages in form of lower usage of materials per unit of the product, lower energy consumption of production processes, lower pollution of soil and air, and a lower degree of noise. Eco-innovations allow usage of materials that are less dangerous to the environment, as well as re-usage of waste, water and materials in pro-

[125] R. Tylżański, *Wpływ innowacji na konkurencyjność polskich przedsiębiorstw*, "Studia i Prace Wydziału Nauk Ekonomicznych i Zarządzania" 2012, No. 25, p. 401.

duction processes. However, such solutions are very expensive, which has impact on the financial results of an enterprise[126].

Despite many barriers, there have been more innovative activities recently. An interesting example of cooperation of science and industry is the project consortium that includes 150 Polish scientists and nine research facilities. The Biogratex Project, worth PLN 150 million, resulted in creating biodegradable fibres. The one-off products made of those fibres, e.g. implants for bone tissue losses, prostheses of blood vessels with small diameter, materials securing plants against frost, foil for creating strings, industrial dust extraction filters, half masks for protection of respiratory tracts – decompose in the ground (as a mixture with compost) after 24 weeks and carbon dioxide with water is what is left after the used products[127].

The innovative undertakings executed in the Special Economic Zone of Kraków are another example of connecting modern technologies with protection of the environment. Permits for conduct of activities were granted to enterprises of chemical industry, as well as to electronic and biotechnology companies (Selvita SA is the largest Polish biotechnological company, the first company in the country that has three commercialized projects of innovative medicines). The Technological Park of Kraków – that governs this economic zone – is one of the intelligent specializations of the region of Małopolska that are conducted in harmony with the natural environment[128].

Thanks to innovations, entrepreneurs may gain higher profits, achieve a better adjustment to their environment, a higher quality of products and, consequently, may improve their position on the market. Moreover, innovativeness helps in removing barriers and in activating resources through the overall efficiency and effectiveness of actions, results in better work safety, improves organization and methods of work, substitutes live work with better organization and a higher efficiency based on more modern technical

[126] M. Kożuch, *Inwestycje ekologiczne a konkurencyjność przedsiębiorstw*, "Studia i Prace Wydziału Nauk Ekonomicznych i Zarządzania" 2012, No. 25, p. 340. See also J. Piotrowska, *Ekoinnowacje – wyzwanie dla polskiej gospodarki*, "Studia i Prace Wydziału Nauk Ekonomicznych i Zarządzania" 2012, No. 28.

[127] Research facilities: the Faculty of Material Technologies and Textile Design at the Technical University of Lódź (the leader of the project), the Institute of Biopolymers and Chemical Fibres in Łódź, the Centre of Molecular and Macromolecular Studies of the Polish Academy of Sciences, the Centre of Carbon Polymer Materials of the Polish Academy of Sciences in Zabrze, the Institute of Textile and Polymeric Materials Engineering of the University of Bielsko-Biała, the Institute of Textiles in Łódź, the Central Research and Development Facility of Polmatex-Cenaro Textile Machines in Łódź, the Institute of Experimental Surgery and Biomaterial Testing of the Medical Academy in Wrocław, the Department of Market Gardening with Horticulture Economics of the Agricultural University in Kraków, *Włókna dla medycyny i rolnictwa. Innowacje, przyszłość, technologie*, "Gazeta Wyborcza" 2014, No. 130, p. 4.

[128] E. Cegła, *Nowoczesny przemysł ma priorytet*, "Dziennik Polski" 2014, No. 134, p. 3.

equipment, and increases export capacities[129]. Innovations not only increase the competitiveness of a particular entity in comparison to domestic enterprises, but also enforce its competitive position worldwide, as well as support greening of economy.

5. Conclusion

Innovation policy has recently become one of the most important sector policies in the European Union as well as in Poland. The role of innovation in modern economies has increased in comparison to traditional factors for growth, such as land, capital and workforce. Despite numerous instruments and forms of help that have been available and used nowadays as a part of the conducted state innovation policy, the degree of innovativeness of enterprises, regions and the whole economy is still too low when compared with economies of the developed EU countries.

A properly conducted innovation policy is the basic tool for executing the objectives of low-emission economy, which fulfills the requirements of, among others, the climate and energy package. The increase of energy efficiency of both enterprises and households is possible thanks to the usage of new organizational and technological solutions. Innovations help in changing the structure of the energy balance of the country (e.g. via promotion and dissemination of investments in renewable energy sources – the popular photovoltaic cells, solar collectors or wind turbines)[130], but they are also helpful in case of investments in energy sufficient construction, fuel efficient, as well as they can be efficiently used in the exploitation of available materials in industry and waste management. Low-emission economy, which is based on innovations, also brings health advantages to the society and lowers the burden of economic activity concerning the natural environment in accordance with the assumptions of the widely understood greening of economy. Modern technologies and clean industrial sectors constitute, as well, the proof of social business responsibility for people and the natural environment.

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[129] W. Grudzewski, I. Hejduk, *Projektowanie systemów zarządzania*, Wydawnictwo Difin, Warszawa 2001, p. 48.

[130] One should also take into consideration that in 2014, Poland started the execution of a large, innovative project as part of the Polish Investment Programme. LOTOS SA, Spółka Polskie Inwestycje Rozwojowe, Bank Gospodarstwa Krajowego and Bank Pekao together execute an investment at the Baltic Sea that is to exploit the deposits of B8 oil and to increase the share of oil in the energy balance of the country. This is an interesting example of cooperation between a public party, a private partner, and finance institutions, *Polskie Inwestycje Rozwojowe*, http://www.pir.pl/pl/media-o-nas.

Józefa Famielec

CHAPTER V

THE IMPORTANCE OF RELATION IN GREENING OF ECONOMY

1. Introduction

Gail Tverberg from the University of Illinois, who does research on the shortages of oil and natural gas, lack of waterand climate changes, as a reply to the question concerning the threat of the inevitable limits of growth, said, i.a. *focus more on relations*[131]. Relations give more happiness than accumulation of goods. Establishing fixed relations, restoration of old ties, and procedures of reconciliation seem to be a more useful goal than the pursuit of profit.

Relations are the element of all economic and social structures, including the structure of an enterprise. They lead to creation of synergistic effects in the processes of management and functioning of enterprises as the most important entities concerning generation of GDP. Those effects are, usually, free of charge mutual benefits (also called relational goods) that are independent of the financial capital shortage. They constitute the basis for respecting common resource, including the natural environment in which we live and perform our economic activity and consumption. Such an approach reveals other motives of behavior rather than economic benefits. It teaches that a free good is not free of charge since even if people do not need to pay for accessing them, their creation and provision i.a. by ecosystems, requires using natural resources and efforts of the country to protect them, restore, and prevent from deterioration. The approach of the human towards natural environment is the pattern for all other social relations because people are the most important element of the natural environment. Relation structures are more resistant to crisis and other factors of the economic instability.

This chapter is an approach of using the relation theory to define the greening of entrepreneurship. Such aspect allows to treat greening of enterprises as the problem of presence of people who are related to each other, who

[131] http://exignorant.wordpress.com/2014/03/01.

trust each other, provide mutual goods, who are not limited by the shortage of financial and physical capital, and who are motivated to respect the nature and its laws.

The inspiration for this part of the study was taken from the economy of three values: exchange, love, and constraint[132]. It makes use of social ontology in order to elaborate new, alternative and fair chances for development of people, who work to maintain themselves and their family. Out of those three values, exchange (market) and constraint (central management) are the subject of descriptive economy. Love, on the other hand, within the meaning of non-equivalent services, which are important in relations of humans and nature, has not been a subject of economic considerations (but rather of philosophical, ethical, and sociological. The social aspect of love means friendly relations between people and entities, surroundings, and the environment, including the natural environment. The experience of the Authoress gained through years of research on cooperation and its reliability in industry has also been the reason for getting involved in the analysis of the problem of relations[133]. This research was conducted in Germany, during the scientific visit of the Authoress to Fachhochschule M*ü*nster in 1990[134].

2. The origin of relational economy – from coercion to trust

Relations within the structures of enterprises and between those structures have been present since the appearance of economic activity – even maintaining a household (so from the beginning of human civilization). Their scope, circumstances of their occurrence and functioning have varied, as well as the awareness of their existence, or their inclusion in the process of learning or formulated laws. One may perhaps claim that those relations have always existed, regardless the knowledge on their presence. On the other hand, the knowledge, especially scientific knowledge, on relations within economic activity has been shaped along with the development of subsequent concepts of scientific management. For a long time, the main focus was put on resource management, in which the basic consideration was devoted to

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[132] W. Grassl, *Ekonomia obywatelska. Trynitarny klucz do odczytywania ekonomii papieskiej*, "Pressje" 2012, No. 29, p. 60.

[133] The results of this research was the basis for the doctorial dissertation of the Authoress and the monograph: J. Famielec, *Układy kooperacyjne w gospodarce rynkowej. Doświadczenia, strategie*, Wydawnictwo SECESJA, Kraków 1992.

[134] It was used during the elaboration of the habilitation study: J. Famielec, *Wybór między wytwarzaniem a zakupem środków produkcji w strategii przedsiębiorstw przemysłowych*, Wydawnictwo AE w Krakowie, "Zeszyty Naukowe", series Monografie, 1994, No. 121.

material factors (physical capital), or financial factors (finance capital) along with the marginalization of the human factor with its relational capital. Paradoxically, it appears that financial crises, especially at the turn of the 20th and 21st century, helped to discover the role of relational capital. Its diagnoses made by sociologist, politicians and some of the economists are the same. The lack of trust is considered the cause of the economic and financial crisis of the last decade[135].

Trust is the belief that other people or institutions will meet our requirements or fulfill their obligations. Due to the fact that we cannot be sure about their fulfillment, trust is connected with risk[136]. In the economic life, trust, so the "pre-contractual condition of contracts" – as already described by Adam Smith – has countless forms. Bank customers believe that banks shall properly protect their deposits and, at the same time, banks assume that customers will pay back their loans, while investors believe to gain profit from their shares. Some banks trust other banks to grant them loans, while those banks that have granted such loans, expect to have them paid back. Entrepreneurs trust that customers will buy their products and customers want to buy good quality products at a fair price. All of them trust central banks and governments that the determined interest rates and legal frameworks of economy will help maintain a stable value of money and a constantly growing national income.

When such expectations remain satisfied for some time and the whole system works properly, trust is not limited to a single act, but it is generalized to create an atmosphere of trust and a culture of trust. The culture of trust is accompanied with optimism and the feeling of causation, that is the feeling with the help of which we may control our own fate. Such a combination of social moods is priceless for economy.

3. Relational capital

Relations are used to distinguish the so-called relational capital. It is considered separately from the human and structural capital[137]. Relational capital includes reputation, loyalty of the customer, and strong bonds with stakeholders. On the other hand, human capital stands for intellectual ability, motivation

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[135] A well-known political scientist, Benjamin Barber, writes: "This is, most of all, a crisis caused by lack of trust", http://archiwum.polityka.pl/art/odbudowac-piramide.

[136] This is the description of the mechanism by P. Sztompka. He discusses it in detail in his great book: P. Sztompka, *Zaufanie. Fundament społeczeństwa*, Wydawnictwo ZNAK, Kraków 2014.

[137] W. Danielak, *Wykorzystanie kapitału ludzkiego, strukturalnego i relacyjnego w budowaniu wartościowych relacji z interesariuszami przedsiębiorstwa*. A paper submitted during the 9th Congress of Polish Economists, PTE, Warszawa 2013.

and predispositions of employees. Structural capital means patents, licenses, software and technologies.

In other aspects, each of the elements of those three capitals is being called relational. Relations with customers – this is the commonly acknowledged relational capital, but information technology, media, the Internet are also referred to as relational capital[138].

The most known reference of relation, both in economy and in economic practices (including management engineering) is marketing. The so-called relational marketing refers, in particular, to establishing and maintaining market and social relations with the purchasers (customers) and partners[139]. Every form of negotiating them is constituted by conclusion of an agreement. Consideration of relation not only from the perspective of science, but also of engineering, is a new element of those approaches. It appears that using engineering in formation of market relations is not that new. It was already done by Ph. Kotler who formulated the so-called lateral marketing[140]. Lateral marketing is a process that, when applied to production or service activities, leads to elaboration of new, innovative products that include new needs of target customers and circumstances (place, time, situation and purpose). Thus, due to this fact, relations are the subject and the tool for describing the reasons for social and economic processes and their innovations.

Relational capital has many functions. Its meaning in modern concepts of management is about: enhancing the structure of non-material resources of an organization, creating values for partners of relation networks, an efficient factor of success in conditions of globalization and a financial crisis[141].

Scientists who analyze this problem agree that relational capital forms a unique value of the enterprise[142]. This value is also called relational value[143].

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[138] Various forms of those relations, as networks of social relations, have been discussed in many chapters of the monograph: *Wiedza i technologie informacyjne w kreowaniu przedsiębiorczości*, scientific ed. A. Nowicki, D. Jelonek, Wydawnictwo Politechniki Częstochowskiej, Częstochowa 2013.

[139] Among many publications on this matter, attention of the Authoress was drawn by the monograph: *Marketing. Ujęcie relacyjne*, ed. M. Brzozowska-Woś, Wydawnictwo Politechniki Gdańskiej, Gdańsk 2010.

[140] Ph. Kotler, F. Trias de Bes, *Marketing lateralny*, Wydawnictwo PWE, Warszawa 2004.

[141] Functions of this capital are discussed by K. Perechuda, I. Orsa, *Znaczenie kapitału relacyjnego we współczesnych koncepcjach zarządzania*, "Zarządzanie i Finanse" 2013, Vol. 4, No. 2.

[142] M. Kieżel, A. Kwiecień, *Kapitał relacyjny i customer relationship management w kontekście tworzenia wartości (z uwzględnieniem specyfiki sektora bankowości detalicznej)*, "Zeszyty Naukowe Uniwersytetu Szczecińskiego" 2012, No. 55.

[143] R. Kata, *Bankowość relacyjna a dostęp rolników do usług finansowych*, "Roczniki Ekonomiczne Kujawsko-Pomorskiej Szkoły Wyższej w Bydgoszczy" 2013, No. 6.

Such an approach prevails in i.a. banking and represents its new paradigm towards transactional (market) approach.

4. Functions of relations in agreements of a company

Development of an enterprise requires application of set principles and efficient management practices. The model of an enterprise elaborated and accepted by the neoclassical economy becomes more and more controversial. What is more, already in the 1950s, the usefulness of the neoclassical theory of enterprise was questioned or people even doubted that such theory existed at all[144]. The neoclassical theory of an enterprise is, in fact, the theory of markets, which are not the only determinant of activities and behavior of an enterprise[145].

The neoclassical theory of an enterprise is critically assessed due to many gaps, especially in the aspect of relation for:

- separating the value from the control of capital in commercial companies,
- lack of focus put on the influence of the interests of people employed in an enterprise (employees and managers), interpersonal relations, or group interests on the behavior of enterprises, determination of its objectives and their execution,
- lack of dependence of the behavior of an enterprise according to the structure and nature of contracts concluded by this enterprise and, consequently, lack of the basic economic category, that is transaction costs.

The alternative modern theories of an enterprise use an institutional approach, in which the contract is the basic element of the economic life as such, and of every enterprise. An enterprise is a beam of contracts. They must be negotiated and coordinated. Their functioning includes various rules, such as: opportunistic behavior of contract partners, creation of transaction costs. The criteria for their optimization should not be constituted only by profit, but also by other functioning objectives[146]. Contracts, as the basic ele-

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[144] In 1954, P.F. Drucker wrote about "lack of any possible defence for the economic theory of an enterprise". P. Drucker, *Praktyka zarządzania*, Wydawnictwo Czytelnik, Akademia Ekonomiczna w Krakowie, Kraków 1994, p. 41.

[145] T. Gruszecki, *Współczesne teorie przedsiębiorstwa*, Wydawnictwo Naukowe PWN, Warszawa 2002, p. 117-122.

[146] Among many new publications that discuss this problem, it is worthwhile to mention the concept of social personalism when determining the objectives of an enterprise. It is a system and a direction, which concerns reality through the phenomenon of a huma, J. Komorowski, *Cele przedsiębiorstwa a rozwój gospodarczy. Ujęcie behawioralne*, Oficyna Wydawnicza SGH, Warszawa 2012, pp. 308-321.

ments of the structure of an enterprise, help to combine various factors for production of resources into one whole. They create a network of connections (compared with working on a spider web), in which the management of necessary production factors is focused. This structure is about organization of team work that is only available in an enterprise. The market has no capacity to replace an enterprise in this particular function.

An enterprise, considered as a structure of relations (contracts), distinguishes itself with a selection of a proper beam of objectives. In order to determine those objectives, we should quote the concept of P.F Drucker. He explains that the idea of an enterprise has many objectives. "Objectives are necessary in every domain, efficiency and results of which have a direct and lively influence on the existence and success of the business"[147]. In various economic circumstances and various size and stage of growth, it is essential, according to Drucker, to set the objectives within eight domains:

- the market position of an enterprise,
- innovativeness,
- productivity,
- physical and financial resources,
- the earning capacity,
- efficiency of managers and their development,
- efficiency of employees and their approach towards work,
- public responsibility of an enterprise.

All the objectives must be integrated with each other and coherent. There are no superior or subordinate objectives. The capacity to fulfill them is determined by physical and financial resources, while those resources are set by long-term earning capacity. Profit is the natural and the only standard of durable earning capacity that sets the capacity of the eneterprise to exist on the market. However, the problem does not refer to the amount of the profit, but its fairness – rationality. Profit – according to Drucker – serves three purposes[148]:

- it measures the pure efficiency and reliability of the efforts of managers,
- constitutes a "risk insurance" – it covers the costs of maintaining oneself in business, the cost of decrease of value over time, the cost of market risk and uncertainty,
- profit provides inflow of capital for innovations and future expansions, directly supplying funds for self-financing and indirectly creating the encouragement for inflows of new capital.

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147 P. Drucker, *Praktyka zarządzania*, op. cit., pp. 78-80.

148 Ibid., pp. 93-94.

Profit may also be the social aim of an enterprise, if this aim is acknowledged in the philosophical foundations of social personalism. It refers to human personality and to any other entity, including an enterprise. This concept has the following assumptions[149]:

- the personality of a human being, as a free, rational, practical and responsible individual, concentrates on his or her individuality, actions within his or her own individual interest and the pursuit of development and self-realization,
- humans have a pro-social orientation directed at establishing various social and economic communities, strategic alliances, cooperation and capital relationships, forming, thanks to this, a social space for participation and development of individuals of the community this human being belongs to.

Such understanding of relation as the element of all structural relations of an enterprise allows to call it a contractual structure, more broad in scope than it is considered by the theory of cooperation. Relations mean every act, each process, each agreement of a human with another human, of a legal entity with another legal entity, in which, regardless the awareness and form of acknowledgment, acceptance or the lack of it, emotional and spiritual intelligence is essential.

The attempt to identify and systematize the areas of activity of an enterprise, which are regulated by contracts on the basis of relations, is beyond the scope of this study. However, it is worthwhile, apart from cooperation[150], mention also relations between the owner and the manager (management contracts). In a more broad perspective, it is about the ownership relations in an enterprise. Ownership of a property is the basic element of an enterprise, which is regulated by the civil code, while ownership of capital is about the rights to control assets, the managers and the share in profits or covering the losses of the enterprise, which is regulated by the commercial code. This forms the foundations of authority and, consequently, a relation in an enterprise that R. Coase understands as the mechanism that coordinates the activities within an enterprise. Establishment of a corporation creates the need to give, by the investors, a significant part of their control rights (that result from ownership) to the managers who are employed by them[151]. A relation, called agency relationship, is formed between the owner and the manager. This

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[149] J. Komorowski, *Cele przedsiębiorstwa a rozwój gospodarczy*, op. cit., p. 310.

[150] In the last few years, the interest in cooperation increased; new works are published. It is worthwhile to mention here: D. Nowak, *Zarządzanie międzyorganizacyjnymi relacjami kooperacyjnymi w przedsiębiorstwach przemysłowych*, Wydawnictwo UEK, Poznań 2012.

[151] A. Szewc-Rogalska, *Wpływ struktur własnościowych spółek giełdowych na kreację wartości dla akcjonariuszy*, Wydawnictwo Uniwersytetu Rzeszowskiego, Rzeszów 2012, p. 12.

relation occurs when one party is dependant on the other. Those parties are the ordering party (principal) and the assignee (agent). The principal engages the agent to perform, on its behalf, services and assigns to him or her a part of its privileges to make decisions. This process is conducted on conditions of uncertainty and lack of information[152]. Parties may hold a different amount and quality of information on a particular state of affairs, but it is the ordering party (principal) who may have an information advantage over the agent. However, the agent may also have an information advantage (e.g. concerning the market). Here, the interesting phenomenon of asymmetry of information, which has been discussed in many theories and research studies, concerns the difficulty, or sometimes the impossibility to monitor the agent's actions and behaviors by the principal. Information advantages may be treated as attributes of entrepreneurship of both parties of agency (contractual) relations, in which modern enterprises must function.

5. Relational goods as a gift and reciprocity

The basic subject and objective of development of every system, including an enterprise, is the human. Humans become themselves only when they start relations with other people and participate in a motiveless gift. In economy, the relational aspect of humans means the relational goods and generic reciprocity.Those categories are developed by the so-called trinitarian economy that is the source of the search for alternative ways of thinking about economy, including the so-called post-walrasian economy[153].

The post-walrasian economy raises the following question: "why economy of macro scale is so stable, while, considering the fact of its complex character, one should expect a total instability?"[154]. D. Colander solves this dilemma through selection of objectives – a choice of the mountain one should climb on, not the choice of the method of climbing. Colander and other representatives of post-walrasian economy strongly criticize the improper scientific approach used as a part of the main stream of economy, including the common models created on the basis of stochastic general balance. This also refers to the neoclassical theory of the enterprise. As an alternative, they propose a serious consideration of relations between entities, especially on financial markets.

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[152] *Instytucjonalne problemy transformacji gospodarki w świetle teorii agencji*, ed. A. Wojtyna, Wydawnictwo AE w Krakowie, Kraków 2005, p. 7.

[153] M. Przanowski OP, *Antropologia trynitarna. Sześć elementarnych twierdzeń*, "Pressje" 2012, No. 29.

[154] J. Janus, *Ekonomia postwalrasowska*, "Pressje" 2012, No. 29.

Humans in the post-walrasian economy are "reciprocal humans". They start relations with others, not only to gain their own profit, but also to achieve something for the community they belong to.

The aggregated function of production in terms of post-walrasian economy, apart from capital (K) and work (N) includes the variable C, which determines the degree of non-market coordination in economy; this may be described with the following function[155]:

$$Y = f(K,N,C)$$

The scientific effort of economists mainly lead to the determination of the scale of the influence and reasons of the C component. Including this components leads to conclusions that are different than in the case of the ordinary function of production. Economic downturn (meltdown), measured by Y, may take place in a situation in which no changes will occur in the resource of production and technology factors, but will have a coordination defect at the expectations level (e.g. reasons for decrease of employment in entities regarding an increase of real earnings). In this aspect, market forces, including the price mechanism of coordination, do not lead to one, perfect state of balance.

The mechanism of coordination executed by institutions is particularly important. It is the foundation for acknowledgment that efficiency of resources is a must-have condition, but it is not sufficient for human development. Humans should be the entity and the addressee of development, including economic development. Social ontology, which uses the so-called citizen economy, has discussed this matter. Wolfgang Grassl – a philosopher and economist, shows its concepts in form of a triangle of three social entities – the market, the country and the society. The objectives of those entities are (also arranged as a triangle) efficiency, equality and reciprocity, and they perform the functions of autonomy, control and cooperation[156].

Citizen economy constitutes an alternative for subordinating the society to the market. Apart from an equivalent exchange, a citizen society experiences a transfer of values in form of reciprocity. Both the giver and the recipient invest in the relation, even if their contribution is not the same. The purpose of this is to make the social network of direct mutual relations more firm. Such gifts create lack of stability, obligations that do not require an immediate reconciliation. In exchange, social capital is being created, which constitutes an equally important factor of generating wealth that, as in the case of capital and work, is underestimated in classical economy.

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[155] Ibid., p. 49.

[156] W. Grassl, *Ekonomia obywatelska*, op. cit.

Citizen economy distinguishes relational goods, next to private (market) goods and public goods. It includes: friendship, social acceptance, solidarity, emotional support, and sense of belonging. They constitute the anti-competition to consumption – their nature concerns sharing with others. They are produced personally, one is not able to order their production to someone else, such goods may not be consumed alone and do not lead to a surplus. People need them, but the market cannot produce them. Such goods are formed through the balance or social shortages, not material ones. Relational goods have value but have no assigned market price. They meet the requirements of common goods, but are not public goods.

Relational goods, as the effect of reciprocity, constitute an important, but not tested factor of social balance. Reciprocity (R) is the function of: contracts – agreements (A), friendship (F) and love (L). The fundamental principle of citizen life (social balance) is simplified to the following relationship[157]:

$$M > P > U$$

Agreements must be subordinated to friendship, while friendship should be subordinated to love (affection). A high value of L is a sufficient condition for existence of a good society, including companies, while a certain value of F is the necessary condition for existence of any society. On this basis, we may construct models of citizen society and assign to such them models of economic balance and role of entrepreneurs (who generate GDP).

6. Conclusion

Results of the issue of relations may enforce the durability of development. The controversial problem, which is used against considering spirituality of the company as the development factor, includes profits as a category of necessary purpose of a market company. Relational economy does not avoid profits. It recommends the so-called real profit. Real profit concerns development of the individual and the society[158]. Financial profit is only a part of the real profit.

However, profit is not only the only indicator of a proper functioning of a company. The purpose of economic activities does not aim at generation of profit at any time, but at creating a company that is the community of people that will bring profits in the future. Apart from profits, one also has to consider human and moral factors that, from a longer perspective, appear to be at least equally important in the life of a company.

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[157] W. Grassl, *Ekonomia obywatelska*, op. cit.

[158] S. Gałecki, *Przedefiniujmy pojęcie zysku*!, "Pressje" 2012, No. 29.

Małgorzata Kożuch

CHAPTER VI

PUBLIC SUBSIDIES IN ENVIRONMENTAL PROTECTION FUNDING IN POLAND AND GREENING OF ECONOMY

1. Introduction

Natural environment constitutes one of the basic elements of the economic system. It is a specific resource, which is characterized by economic features that are useful for both the economy and the society. Over the years, economic activities and pollution emissions have considerably altered natural resources and human environment.

The problems related to the allocation of natural resources result primarily from the fact that, providing raw materials, the natural environment constitutes an a priori condition for the operation of the economic market. Secondly, negative external effects of economic transactions are connected with pollution and excessive exploitation of natural resources. The free market is not always capable of counteracting negative trends and hazards.

The defects of the market mechanism that are related to the degradation of the natural environment can be eliminated by means of internalisation of external costs. The state policy and the tools for the implementation of this policy are relevant for the achievement of this purpose. Formulating the principles of the environmental policy, and then introducing this policy, the state can use a wide range of instruments, including both economic incentives and direct regulations. Subsidies are seen as a special instrument in the state economic policy. This study aims to identify forms of public subsidies and to indicate their significance for the environmental protection funding. In the study, it has been assumed that public subsidies as instruments of the ecological policy are widely applied and important measures that stimulate actions aimed at limiting the pressure on the natural environment caused by economic activities. Acting as investment incentives, subsidies improve the investment standards and living conditions of the society. They also contribute to the achievement of the objectives of the state ecological policy.

2. Environmental protection as subsidy recipient

For centuries, natural resources have been treated as free goods, i.e. widely available free of charge, indestructible and non-depletable. Being converted, processed and consumed, those have been used in economic activities. People, however, have forgotten that natural resources are limited in capacity.

In the economic theory, the problem of natural resources and their depletion was identified as late as in the 19th century. J.S. Mill formulated a theory, according to which, scarcity of natural resources leads to an increase in labour and capital outlays per unit of industrial output. *Exhaustibility* of natural resources may result in reduced effectiveness of economic activities, and even totally hamper economic growth[159].

The higher is the level of social and economic development, the more intensely natural resources are utilised and the natural environment is altered. Currently, compared with the needs, the quality and structure of natural resources do not meet the criteria of free access and unlimited usability. Therefore, natural resources are subject to economic principles and need to be regarded as having economic value[160]. It has become necessary to rationalise the use of natural resources, even those once considered commonly available.

An increased interest in the depletability of natural resources was observed in the 1960s, when industrialised countries became aware of the scarcity of their own resources and problems related to imports. The theories of economic management under conditions of limited natural resources and environmental pollution fully developed in the 1970s, which was connected with the fact that severe environmental crisis unfolded and became international in character. It was noted that under the scarcity conditions, rare goods need to be valued and the management function has to be introduced into analyses[161]. It was also indicated that the use and allocation must be rationalised.

Pollution is the side effect to the conversion of raw materials into finished products, namely capital, producer or consumer goods. As the wastes assimilation capacity and nature's *ability* to *regenerate* itself are limited, the natural environment becomes degraded. External costs are generated, which originate from the disturbance in the functions of the natural environment.

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[159] A.C. Fisher, F.M. Peterson, *The Environment in Economics*, "Journal of Economics Literature" 1976, Vol. XIV.

[160] *Podstawy ekonomii środowiska i zasobów naturalnych*, ed. B. Fiedor, C.H. Beck, Warszawa 2002, p. 52.

[161] K. Górka, B. Poskrobko, W. Radecki, *Ochrona środowiska. Problemy społeczne, ekonomiczne i prawne*, Wydawnictwo Naukowe PWE, Warszawa 1991, p. 108, and D.W. Pearce, *The Economics of Natural Resources Management*, Projects Policy Department University College, London 1986, p. 25.

Excessive load on the ecosystem due to civilisation transformations has led to the situation, in which environmental protection (both in the local and global scale) has become a necessity. Environmental protection should be understood not only as a set of actions aimed at rational modelling of the natural environmental and the management of its resources. The primary aim is to counteract pollution, prevent its harmful environmental impact, and to restore once existing environment, or its components so that those could perform their functions.

Tasks (actions) geared towards environmental protection can be capital and non-capital in character (rationalisation of organisational or technical issues, administrative matters). Those can also include educational activities aimed at counteracting changes considered harmful to, or undesirable for the environment. The activities concern the construction, modernisation, maintenance and service of devices for pollutant neutralisation and atmospheric air purification, water treatment and soil. The activities also include conservation of wildlife species, natural habitats and landscapes[162].

Systematisation of environmental protection activities in accordance with the *European System of the Collection of Economic Information on the Environment* (SERIEE*)* and the *European Standard Statistical Classification of Environmental Protection Activities and Facilities* (CEPA) concerns the following groups[163]:

- clean air and climate protection,
- wastewater management,
- wastes management,
- soil, ground and surface water protection,
- limits on noise and vibration,
- biological diversity and landscape conservation,
- radiation protection,
- development and research, and other environmental protection tasks.

In the OECD methodology (adopted by the *Eurostat Informal Working Group*), the tasks aimed at environmental protection are classified as belonging to the sector of environmental goods and services[164]. Those include clean

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[162] Rozporządzenie Rady Ministrów z dnia 2 marca 1999 r. *w sprawie Polskiej Klasyfikacji Statystycznej dotyczącej działalności i urządzeń związanych z ochroną środowiska*. Dz. U. 1999, No. 25, item 218.

[163] E. Broniewicz, *Sektor wyrobów i usług ochrony środowiska w Polsce*, in: *Funkcjonowanie przedsiębiorstw w warunkach zrównoważonego rozwoju i gospodarki opartej na wiedzy*, ed. E. Sidorczuk-Pietraszko, Wydawnictwo Wyższej Szkoły Ekonomicznej w Białymstoku, Białystok 2009, p. 200.

[164] The term "sector of environmental goods and services" concerns actions indented to protect the natural environment, whereas the term "goods and services provided by the natural environment" refers to all aspects of the natural environment used by humans.

technologies, products and services that reduce environmental hazards and minimise pollution and consumption of resources. Environmental services cover measurements, prevention, limitation or repairs of environmental damages that occurred in the water, air or soil. Those also deal with issues related to wastes, noise and ecosystems[165].

Sector of environmental goods and services covers those economic transactions that are directly related to the exploitation, management and protection of the natural environment, and also natural resources management and use[166]. The abovementioned sector, however, does not include activities related to public health, intended to avoid or repair damages caused by environmental pollution, activities connected with the exploitation of natural resources and natural hazards, or those intended to reduce the impact of natural disasters on the environment.

The following participate in the environmental protection[167]:

- users of the goods and services provided by the natural environment,
- those who generate external costs (economic operators),
- manufacturers of environmental protection equipment and specialised service providers, for whom environmental protection is the principal business activity (e.g. processing metallic and non-metallic wastes, collection and purification of water, distribution of water, disposal and treatment of wastewater, wastes management, sanitary activities), and also non-specialised service providers engaged in activities that are complementary or ancillary to environmental protection,
- units that fund, directly and indirectly, activities intended for environmental protection.

The market defects related to the degradation of the natural environment have become a reason for the state to interfere. By using the instruments of economic policy (including the environmental one) the state can act in the public interest and to make polluters take actions indented to limit their negative impact on the environment.

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[165] I. Telega, *Sektor dóbr i usług środowiskowych czynnikiem zrównoważonego rozwoju*, in: *Funkcjonowanie przedsiębiorstw w warunkach zrównoważonego rozwoju i gospodarki opartej na wiedzy*, ed. E. Sidorczuk-Pietraszko, Wydawnictwo Wyższej Szkoły Ekonomicznej w Białymstoku, Białystok 2009, p. 184.

[166] E. Broniewicz, *Sector*, op. cit., p. 198.

[167] *System finansowania ochrony środowiska w Polsce*, ed. J. Famielec, Wydawnictwo Akademii Ekonomicznej w Krakowie, Kraków 2005, p. 12.

3. Subsidizing environmental protection under the conditions of market economy

Deterioration of the natural environmental quality results in the fact that the economic growth becomes apparent. Pollution leads to changed usability of natural resources and a decrease in the implementation of the function of manufacturers' objectives. The natural environment becomes a transfer route for the external costs of business activities. Depending on the degree of human intrusion on the ecosystem and the character of economic processes, at the interface of economy and the environment, the loss of balance can occur, which causes environmental hazards, occasionally leading to a crises.

Consequently, it is justifiable for the state to put itself above allocation decisions resulting from market supply and demand forces. As the market is not an ideal instrument, it can fail in a few cases. Market failure with respect to natural environment is related, among others, to the discrepancy between demand for and the need of clean environment, or market being incapable of finding socially acceptable management range of natural resources[168].

Market failure calls for state involvement by the use of environmental policy and the tools of policy implementation. Environmental policy is an area of economic policy, which is focused on environmental hazards and damages. It concerns making, by the state and local authorities (sometimes also businesses), informed, purposeful decisions for actions aimed at rational use of natural resources and environmental assets, environmental protection and planning based on theoretical and practical knowledge[169]. The goals of environmental policy include modelling business activities in such a way so that those would not be incompatible with the principles of sustainable development and social objectives, defined by the state authorities and expected to ensure health and high-quality living conditions[170].

Implementing the principles of its environmental policy, the state has at its disposal a wide range of instruments. Those tools include both solutions based on Pigou tax, or the Coase theorem, and also regulatory instruments. In practice, the instrument set usually contains a mix of legal, economic and persuasive measures.

While selecting instruments for environmental protection, it is important to determine to what extent the market, or the state can affect the behaviour of the users of the natural environment, and how to find sources and mecha-

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168 *Podstawy ekonomii*, op. cit., p. 68.

169 K. Górka, B. Poskrobko, W. Radecki, *Ochrona środowiska*, op. cit., p. 65.

170 *Polityka gospodarcza*, ed. B. Winiarski, Wydawnictwo Naukowe PWN, Warszawa 2006, p. 308.

nisms of funding environmental protection tasks. It is generally believed that to implement environmental policy goals, the state should not use the financial tools for environmental protection directly. Alternatively, it ought to use its influence to create conditions supportive of activities geared towards this end[171]. In the market economy, the activities related to environmental protection need to be undertaken by those economic operators who have a share in the ecosystem deterioration. The environmental policy of the state permits an option of using funding instruments, such as public subsidies, though that might be considered controversial.

The major assumption of the environmental policy under the conditions of market economy is *the polluter(s) pay(s)* principle. That allows the transfer of the theory of external costs to economic practice. This principle was adopted by the European Economic Community already in 1975[172]. The rule underlying this principle, which is the easiest to validate, assumes "zero subsidy" in the state environmental policy[173].

An alternative formulation of the principle *the polluter pays* is *no-subsidy principle*. The range of the application of the principle is determined by the assessment criteria, namely whether and to what extent environmental policy in a given country is compliant with the philosophy of market economy. That means introduction and use of methods and instruments in the environmental policy, which limit the application of the *polluter pays* principle[174] should be avoided.

In the case when selected nature's goods, activities aimed at environmental protection, or environmental services are subsidised, the allocation effectiveness is no longer fundamental. The state interference in economic processes leads to the situation in which the beneficiaries of public subsidies do not cover all the costs resulting from obligations stipulated by environmental protection legislation, or from the market mechanisms. Internalisation of external costs takes place only in the range that is not covered by subsidies. This part of the costs, the internalisation of which takes place through public funding, becomes socialized[175]. Subsidisation of activities aimed at environmental pro-

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171 J. Famielec, *Straty i korzyści ekologiczne w gospodarce narodowej*, Wydawnictwo Naukowe PWN, Warszawa 1999, p. 277.

172 *Council Recommendation of 3 March 1975 regarding cost allocation and action by public authorities on environmental matters*. Official Journal of the European Communities 1975, No. 194.

173 K. Górka, *Instrumenty ekonomiczne polityki ekologicznej w Polsce*, in: *Ekonomika ochrony środowiska naturalnego*, ed. K. Górka, Biblioteka „Ekonomia i Środowisko" 1993, No 14, p. 103.

174 P.A. Samuelson, W.D. Nordhaus, *Ekonomia*, Wydawnictwo Naukowe PWN, Warszawa, p. 52.

175 A. Graczyk, *Ekologiczne koszty zewnętrzne. Identyfikacja, szacowanie, internalizacja*, Wydawnictwo Ekonomia i Środowisko, Białystok 2005, p. 170.

tection by public funding is thus contradictory to the principles *the polluter pays* or *the user pays*. In the field of environmental protection, those principles express the basic assumptions of market economy. In accordance with those, economic operators and consumers, i.e. users of environmental goods and polluters should take full responsibility for running their economic activities, including external environmental costs, or the costs related to the restoration of the environment to the condition that is perceived to be socially desirable.

Subsidizing selected economic operators with public funding results from their meeting procedural requirements, and not from the position they gained in the market. That leads to improvement in the status of selected businesses in the market, an undeserved reward that is regarded as an infringement of the principles of market competition[176]. The principle of ensuring equal competitive opportunities for all economic operators in accessing public funding is also infringed, which is inconsistent with economic freedom ideas and common market rules. That can also lead to the competitive advantage of beneficiaries over foreign businesses[177].

The use of public funding as instruments supposed to stimulate environmental protection is connected with the *subsidiarity principle*, which assumes that the state should play an active role in the life of the society. It should also encourage people to act on their own initiatives, make efforts and produce effects, though with the proviso that excessive state interference does not affect the market mechanism to a large extent. The state aid is supposed to provide backing when it is justifiable, but not to take over, or interfere in the matters, the businesses are able to cope with on their own[178].

The *no-subsidy principle* in environmental protection was relaxed as early as in 1974. The European Economic Community developed a framework to specify conditions under which the systematically arranged aid of the state in funding pro-environmental investments was acceptable. When the recommendation on internalisation of external costs in environmental policy was made, that indicated it was necessary to limit subsidizing environmental protection by budget resources, and to make such transfers complementary to the investors' own resources.

One of the reasons why environmental protection should be subsidized under the conditions of market economy are high costs of the implementation of the principle *the polluter pays*. That would involve calculations of the costs of pollution for every type of manufacturing process. At the company level,

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176 J. Śleszyński, *Ekonomiczne problemy ochrony środowiska*, Wydawnictwo Aries, Warszawa 2000, p. 211.

177 Some consider this phenomenon as a form of environmental dumping.

178 H. Spiker, *Pomocniczości. Podstawy antropologiczne i konsekwencje polityczne*,"Społeczeństwo" 1995, No. 1, p. 33-38.

cost calculations, control of emissions and exercising this control generates high administrative costs. Consequently, encouraging companies to make appropriate investments by means of financial stimuli might prove to be a cheaper solution than controlling them. The decision whether to enforce standards or use subsidies depends on many factors, namely technical condition of the company, social acceptance for the introduction of regulatory measures, or costs of technological innovations[179]. The assessment of those factors should be decisive for the use of public subsidies as alternative means of pollution reduction.

Although majority of economists believe public subsidies are inconsistent with *the polluter pays* principle and the rules of market economy, it seems the infringement does not occur if the polluters are wholly responsible for their emissions, but subsidies help to get adjusted to the standards, or they contribute to enhanced requirements in environmental protection[180]. That happens when subsidies are direct, because the aid is most often connected with investments and is a single occurrence, aimed at creating conditions for internalisation of external costs in the future.

4. Characteristics and types of subsidies

The concept of subsidy, often found in literature, is widely used, though not always correctly, as a substitute for grant or subvention. In subsidy descriptions alternative categories are used like: support, aid (also public one), or financial transfers. Public aid is a particular form of subsidizing. Due to the range of use, donors and forms, subsidies convey a wider meaning than public aid. Subsidies, which can be public or private, can be used as instruments that produce a direct or indirect affect, they can take the form of financial transfers or stopped expenditures. In the author's opinion, for the reasons mentioned above, subsidies and subsidizing, e.g. environmental protection, need to be seen in a wider perspective. Then, those can be defined as instruments (including subventions, grants and others) geared towards a specified category of investors, manufacturers or consumers, which due to increased profits (financial and non-financial ones), motivate and enable them to take tasks they did not intend, or were unable to do.

In economic practice both formal and informal subsidies are found. The formal (or institutionalised) ones show systemic characteristics, and are granted by both public and private institutions in accordance with common legal and administrative regulations. That means that the economic operators

[179] *Pomoc państwa. Wybrane zagadnienia*, ed. B. Kurcz, Wydawnictwo C.H. Beck, Warszawa 2009, p. 195.

[180] *Podstawy ekonomii*, op. cit., p. 261.

who have met certain specified criteria, like e.g. have successfully passed the assessment procedure of co-funding application, become beneficiaries of such subsidies. Those instruments show differences in form, administrative information and spatial structure. In the category of formal subsidies, public subsidies are prevalent[181].

On the other hand, informal subsidies (i.e. hidden ones*)* can be found in situations, in which a company does not meet the requirements resulting from environmental protection legislation, but such practices are approved of by public institutions responsible for environmental protection. Subsidies of that kind can also include unpaid charges for environmental goods, environmental charges, or penalty payments for exceeding the conditions of the use of environmental goods. For the beneficiary, those are stopped expenditures. Although they increase the beneficiary' liabilities, it is possible those might be amortised in the future, or even be converted into capital.

Subsidizing the tasks related to environmental protection is performed by means of direct or indirect backing of businesses, institutions or organisations. Direct subsidies involve co-funding of the beneficiary who is interested in environmental protection, by means of stimulating investment processes, in which financial constraints are alleviated. From such standpoint, subsidies are substantive in character, i.e. they are closely related to the issues of the natural environment deterioration, its restoration or protection. Direct subsidies increase public expenditure. They can take different forms including grants, co-payments (e.g. partial repayment of credit, co-payments to environmentally friendly technologies, to interest on loans, or to commercial credits for environmental protection purposes), capital brought into a company that makes investment into environmental protection, and also guarantees or securities.

Indirect subsidizing specificity consists in the fact that the aid takes the form of reduced financial obligations (e.g. taxes or interest) due on different basis, and payable to public institutions and bodies. Beneficiaries are not directly supplied with extra funding, but their spending is reduced. Consequently, indirect public subsidies result in lower public budgetary receipts. Indirect subsidies include the following: tax preferences, special (increased) depreciation deduction resulting in tax preferences, favourable funding terms obtained by enterprises running activities related to environmental protection

[181] It is worth mentioning that in Sweden, subsidies for environmental protection are termed as *subsidies motivated by care for the environment.* Those include subsidies defined in the system of domestic accounts, investment subsidies and other subsidies granted by the government to local authorities, or made available to beneficiaries by the Swedish National Financial Management Authority. In Denmark, subsidies motivated by care for the environment are only those that contribute to the stopping of generation of at least one pollution unit negatively affecting the natural environment. *Environmental Subsidies. A Review of Subsidies in Sweden between 1993 and 2000*, Statistika Centralbyrĺn Press, Stockholm 2001, p. 20-21.

(e.g. payment grace periods, favourable arrangements for interest instalment payment), low and constant interest rate that is valid for the *whole loan repayment* period, conversion of debts (liabilities resulting from unpaid charges or environmental penalties) into stocks and shares in companies. Indirect subsidies, as stopped expenditure, are used to finance current business activities.

It should be added that subsidies do not always contribute to positive developments in the natural environment. Those can be detrimental if they produce a negative effect on one or more resources of natural, manufacturing or human capital, which contribute to the social wellbeing. Subsidies, which promote the production or consumption of goods or services harmful to the environment, are considered environmentally unfriendly. Such subsidies are connected with establishing a privileged position of selected businesses on the market. Subsidies are regarded as environmentally unfriendly when aid produces results that are not compliant with the concepts and goals of environmental protection. Subsidies are tools, by means of which the state can purposefully influence business people, institutions or natural persons, established to pursue specific goals and perform well-defined tasks. OECD countries consider subsidies to be detrimental to the environment when those cause greater environmental deterioration compared with the situation when such subsidies were not granted.

5. Environmental protection subsidies in Poland

Investigations into the scope of subsidies for environmental protection in Poland have shown it is a very complex process, which is illustrated in Figure 3. The process contains many components including subsidy-granting bodies, beneficiaries and areas addressed by subsidies. A wide range of subsidy instruments is presented in Table 5.

Figure 3. Components of the process of environmental protection subsidizing

Source: the author's study.

It should be noted that funds for environmental protection subsidies originate from both financial transfers made by the users charged for the use of the natural environment elements (consumers of environmental goods and entities processing natural resources), and also payments made by business and household taxpayers. Thus public subsidies for environmental protection are funded by all the participants of economic life. In some extreme cases, it can be considered double taxation for environmental purposes. Firstly, taxes are converted into public spending used to fund environmental protection. Secondly, charges for the use of the environment contribute to public environmental funds, which are then used to subsidize environmental protection.

Table 5. Types of public subsidies in environmental protection

Categorization criterion	**Type of subsidies**	**Forms of subsidies**
Legal and administrative regulations in force	formal	grants, co-payments, amortisation of debts owed to environmental funds
	informal	non-payment of charges related to the use of the natural environment
Relation to public budgets	Increasing expenditure – active subsidies	• grants from the budgets of the state and local authorities • grants from environmental funds
		• co-payments to preference loans and credits (funds compensate the difference between commercial and preference interest rate for environmental credits) • co-payments to commercial credit interest (for banks) made by environmental funds • difference between the market and constant interest rate over the whole period of debt repayment
		loan guarantees and securities granted by the government and Fund for Environmental Protection and Water Management
		public funds engaged, by environmental funds that have legal personality, in purchase of stocks and shares in companies investing in environmental protection

Relation to public budgets	Decreasing budgetary receipts – passive subsidies	• tax preference e.g. lower VAT rates on services related to environmental protection, investment-related agricultural tax allowance • increased (special) depreciation deductions (lower budgetary receipts from income tax) • the state or public entities giving up dividend due in the capital company • exemption from investment deposit when making pro-environmental investments
		• grace period for payment of costs and preference loan instalments • amortisation of a portion of preference loan • amortisation, arranging instalments of a payment, or deferment of payment of environmental charges and penalties • amortisation of interest arrears
		conversion of debts (liabilities resulting from unpaid charges or environmental penalties) into stocks and shares in companies which obtain environmental funding
Impact on the funds of beneficiaries	direct	grants, co-payments, loan amortisation, capital brought into the company, guarantees, securities
	indirect	tax preferences, loan preferences, conversion of debts into stocks and shares

Source: the author's study based on M. Kożuch, *Subsydiowanie ochrony środowiska przyrodniczego w gospodarce rynkowej. Doświadczenia Polski*, Wydawnictwo Uniwersytetu Ekonomicznego w Krakowie, Kraków 2013, pp. 70-72.

Subsidy-granting bodies, or more precisely, institutions engaged in the redistribution of monies, are not only public budgets (domestic and foreign, including environmental funds and structural funds), and also financial institutions, like national, state-owned bank (preference credits provided by Bank Gospodarstwa Krajowego), domestic commercial banks which cooperate with public institutions and have public funds at their disposal (e.g. BOŚ SA), and foreign financial institutions, e.g. the European Investment Bank.

The entities receiving subsidies are investors, manufacturers and consumers of products and services aimed at environmental protection. Subsidizing investors (including local authorities) consists in co-funding the activities taken to protect the natural environment. Subsidies to consumers provide aid, social in its character, which is permissible if it does not result in product discrimination due to origin. Subsidies to consumers provide co-funding of such behaviour of households which leads to the rationalisation of environmental goods consumption and promotes the use of environmentally friendly equipment in everyday-life situations. Conversely, subsidies to entrepreneurs,

those who generate external costs, are an aid, the granting and use of which is supervised by law, and is limited and controlled. Here, co-funding is mainly used to design undertakings that will reduce pollutant emissions and reduce pollution nuisance for the public and the environment.

Subsidies are predominantly directed towards investments aimed at pollutant load reduction and improvement in the quality of the environment components. The investments can involve environmental protection technologies integrated with the manufacturing process, or the so-called *end*-of-the-*pipe* technologies. Non-investment tasks are also co-funded, e.g. those intended to alter production patterns and consumption habits. Public subsidies are also used to fund portion of capital costs of the entities investing in environmental protection, which were established for servicing loan capitals. Subsidies can also help when financial obligations to, e.g. environmental funds due to environmental charges or penalties, are to be settled.

Depending on their form, public subsidies affect financial management on the part of the beneficiary, increasing their receipts (incomings) or decreasing costs (expenditures). For that reason, subsidizing might be regarded as contradictory to *the polluter pays* principle and the market economy assumptions. In the author's opinion, such an infringement does not occur, because subsidies rely on the funds established on the basis of charges, penalties and environmental taxation. The financial means, collected and administered by the state-designated legal persons, originate directly from polluters. Additionally, subsidies can be acceptable, if the manufacturer of pollution-generating products bears responsibility for indemnity, and also legal and administrative outcomes, and subsidies are used to comply with the environmental protection standards. An important function of subsidies is also to support activities that are not profitable from the standpoint of private entrepreneurs, yet they produce social benefits.

6. Assessment of environmental protection subsidizing and recommendations for changes

Public subsidies are instruments used by the state to influence economic processes, including environmental protection. Although classified as economic stimuli, those are special in character. Their specificity results from the fact that principles applied to subsidy granting do not result from market mechanisms, but from policy implemented by the state.

Direct subsidies increase the investor's incomes, thus making it possible to realize the investment. They are investment multipliers that promote undertaking environmentally friendly tasks by complementing financial engineer-

ing. It is important that financial engineering of this kind combines investors' own funds and public subsidies with commercial funds provided by financial institutions. On the one hand, public subsidies ensure the delivery of domestic financial resources to the project, on the other, they facilitate the capacity to absorb aid funds, e.g. from the EU, and enhance pro-environmental actions. Those instruments are not widely accessible because of strict assessment criteria of potential beneficiaries, which in turn allows the monitoring of the use of the instruments.

Subsidies, when adequately addressed may increase budgetary receipts from taxation, thus reducing transactional costs. That will happen due to co-payments, from public funds, to loan capital interest. Such co-payments facilitate the development of the sectors supported by the state, including environmental protection, additionally they lower the financial costs of current operations on the part of investors. This form of direct subsidies, modifying financial costs, indirectly affects, i.e. increases, the basis of income taxation. Increase in taxable income results in higher budgetary receipts from income taxes payable by legal persons.

In subsidies to environmental protection, indirect instruments (e.g. tax preferences, amortisation of debt, postponement of tax payment deadlines, or debt conversion), though available in multiple forms, do not have much importance. Those reduce beneficiaries' current spending, but do not affect the realisation of the investment projects. The relation of those to pollutant emission reduction or lower consumption of natural resources is debatable. However, by means of restructuring tax obligations, they alter the corporate capital structure. The shortcomings of subsidies include the fact that by lowering budgetary receipts, they increase the state's operational costs. Being scattered in the complex taxation system, their operational pattern is intricate, as tax preferences related to environmental protection are not precisely specified. Subsidies are granted when the requirements specified in the tax law are met, which concerns all types of economic activities, not only those contributing to environmental protection. It seems that partial cancellation of tax allowance relief or exemption, though restricting the scope of subsidies, would, at the same time, boost budgetary receipts and simplify the funding of environmental protection.

A greater importance, however, should be attributed to subsidies taking the form of depreciation deductions. The latter, as the current operational costs, which are not the entrepreneur's expenditure, lower the basis of taxation and contribute to funds that are then used for internal funding of investments.

An interesting example of joining public funds and the capital market are capital-investment subsidies. The purchase of company's stocks and shares by environmental funds, offers the possibility to engage public funds

in environmental protection undertakings, and then to recover financial resources by selling those fund-owned assets. Such a form of subsidies is rarely applied, and even has ceased to be used in recent years. They could, however, operate in a similar way to "business angels", where the role of an angel and guide could be played by the Fund for Environmental Protection and Water Management. Injecting own capital of the investor, the option of withdrawing public funds with profit, and monitoring subsidy used in environmental protection funding could be profitable to both the subsidised entity and subsidy-granting body.

Subsidies, when properly addressed, can generate profits for both the entrepreneurs investing in environmental protection and other market players. That means the effects produced by subsidies stretch beyond direct beneficiaries, and a portion of advantages is taken over by entities other than those to which subsidies were addressed. Advantages can result in income effect and substitution effect. The latter occurs, e.g. when subsidy from environmental funds lowers the price of credit. Improvement in the condition of the business, which benefited from such a subsidy provides a stimulus to make investment in environmental protection. It happens so because the costs covered by the entrepreneur are lower and the preference credit is repaid faster. If the advantages related to funding environmental protection on preferential basis become a stimulus to the use of subsidies more frequently, the demand for preference loans will grow, thus the income effect will be produced.

Public subsidies create the motivation (stimulus) effect, as an increase in investment funds leads to innovation growth and the introduction of new environmentally friendly technologies (multiplier effect). They also produce a mimetic effect and investment domino effect, because low costs of the servicing of the capital gained affect the attitude of business people, encouraging them to act. Non-financial outcome of subsidies concerns enhanced environmental awareness of beneficiaries.

From the standpoint of sustainable development, it is relevant that the investments and investment funding produce not only economic and environment effects, but also psychological ones. If subsidies motivate entrepreneurs to realize investments that do not always produce economic outcomes, but give environmental and social effects, such instruments play an important role, though the use of those instruments may infringe the market economy principles.

In spite of numerous advantages, public subsidies may arouse controversy due to the fact that they:

- increase the costs of running the state, since they are related to public spending, and they may lead to higher tax burdens,
- generate profits for few economic operators at the expense of many taxpayers,

- cause market defects, since they affect investment decisions and weaken the pressure of effectiveness maximization,
- may have a share in crowding out the ineffective undertakings and businesses in both public and private sectors,
- create favourable conditions for overinvestment because of the access to cheaper capital,
- cause disturbance in financial markets – diminish the attractiveness of funding environmental protection investments by commercial financial institutions,
- make it possible for fund administrators to manipulate environmental protection funds.

Due to the disadvantages mentioned above, environmental protection subsidies should be granted in the following way[182]:

- purposeful, economic and cost-effective, following the principle of the optimal selection of methods and means tooled to deliver the set objectives,
- ensuring that all the tasks involved are completed in accordance with the schedule,
- in the amounts and within the time frames specified beforehand.

When defining the target of subsidy, it is necessary to take the following aspects into account[183]:

- sustainability of expected outcomes (selected outcomes should produce long-term effects),
- predicted high rating of the effectiveness of subsidizing,
- positive impact on the natural and social environment, and on economy.

The most important, however, is compatibility of subsidies with the market economy principles.

7. Conclusion

Subsidies to environmental protection from public funds is a means of reducing market failure. To meet expectations, they need to be applied on systemic rather than discretionary basis. They should be located in the domain of specialised institutions. When using those, it is necessary to apply

[182] Ustawa z dnia 27 sierpnia 2009 o finansach publicznych, Dz. U. 2009, No. 157, item 1240 with further amendments, art. 44.

[183] I. Postuła, A. Werner, *Prawo pomocy publicznej*, Wydawnictwo LexisNexis, Warszawa 2008, p. 445.

the principle of minimisation of negative outcomes they might produce, and to apply transparent economic, social and environmental criteria.

Public subsidies provide a firm basis for environmental protection funding in Poland. The cancellation of subsidies, advocated by a number of economists, and environmental protection funding based entirely on market principles, including *the polluter pays* assumption, would lead to hampering investments in this sector of economy for years. When considering the abovementioned postulates, it is necessary to take into account low environmental awareness of business people and market instability. However, limiting the number of forms of subsidizing in environmental protection would make the process simpler, thus simplifying the whole system of funding.

Subsidy advantages consist in focusing investment efforts on specific tasks related to environmental protection, which entrepreneurs otherwise would not be inclined to take, even though those tasks were underpinned by legal rules. Advantages offered by subsidies include not only environmental but also social and economic outcomes. Social aspects concern improvements in the quality of the surroundings, better living and leisure standards. Economic effects refer to higher investment outlays, increase in employment, higher income from work, *increase in economic turnover and in tax receipts*, and in the long-term perspective, innovation boost and improved social wellbeing.

Subsidizing environmental protection, no matter what benefits it produces, is a worse alternative when compared with consistent application of *the polluter pays* principle. It should be used to protect the value of nature's resources, but only in well-justified cases. It can be treated as the second optimal solution when the market mechanisms fail. The costs of environmental protection subsidies (transactional costs and fiscal burdens) are high and are paid by the society, yet the advantages resulting from lower emission levels and halting the natural environment deterioration outweigh those costs.

THE HISTORY OF DEPARTMENT OF INDUSTRIAL POLICY AND ECOLOGY THE CRACOW UNIVERSITY OF ECONOMICS

The authors of this monograph are members of the *Department of Industrial Policy and Ecology* or cooperate with this department by participating in scientific, research and promotional projects.

The beginnings of this department are connected with prof. dr inż. Stanisław Bieńkowski from the Lvov Polytechnic, who is considered to be one of the creators of management and organizational sciences and of business economics in Poland. In 1937, he became the head of the newly established Department of Business Organization and Management at the School of Economics in Kraków. In 1950, when the School of Economics was transformed into the Economic University, the name of this Department was changed into the Department of Industrial Economics, which was then renamed as the Department of Industrial Business Economics in 1958. The Department of Industrial Economics was reestablished once again in 1963 under the managements of prof. dr Józef Gajda who later became the rector of the Economic University. This is the time when the history of the Department of Industrial Policy and Ecology started – due to the direction of scientific research, teaching and the development of the staff. In years 1969-1992, the university (since 1975, the Academy of Economics) functioned in its changed organizational structure and the Department (then the Chair) constituted part of the Institute of Industrial Economics, next to the Chair of Economy and Organization of Industrial Business, the Theory of Organization and Management, and the Economics of Construction and Investment. Prof. J. Gajda was the Head of the Institute, and was replaced by prof. dr hab. Kazimierz Górka. After another reform in 1992, the Chair of Industrial Economics was transformed into the Department of Industrial Policy and Ecology under the management of prof. K. Górka. Since 2009 the Head of the Department is prof. dr hab. Józefa Famielec.

For years, members of the Department have been dealing mostly with industrial economics. In 1975, dr K. Górka started also lectures on the economics of environmental protection, and nowadays the majority of the staff devote their work mainly to ecological issues. After establishing the Faculty of Finances in 2002, we also undertook research and teaching devoted to financing sources for business development, financing for infrastructure and

security investments, functioning of public businesses (social economy), and informal economy, that is of the so-called grey and black market.

Within the scope of industrial economics and industrial policy, the Department has elaborated important publications concerning the following issues:

- business development strategies and programming of development of industry,
- systems of cooperation in industry and cooperation with the environment,
- industrial complexes and clusters,
- materials management (logistics) in industry,
- transformation of ownership in economy,
- processes of restructuring of enterprises,
- changes in the structure of sector and region economy, and industry,
- work costs in industry,
- evolution of industrial policy and its economic instruments,
- industrial economy and reindustrialization.

Within the scope of protection of the environment and ecological policy, publications discuss i.a. the following issues:

- analyses of economic and social losses arising from polluting the environment,
- functioning and evolution of the systems of ecological charges and funds,
- costs of environmental protection in industrial companies,
- investment costs concerning protection of the environment and the sources for financing them,
- the effectiveness evaluation for infrastructure and pro-ecological investments,
- subsidies for undertakings concerning protection of the environment,
- ecological aspects of the sustainable and permanent social and economic development,
- the programmes of ecological and energy policies in Poland,
- the European ecology and energy policy,
- the ecological policy concerning water and sewage management and waste management.

The Department is well recognized by publication of handbooks that are widely used in Poland. First, it was, i.a. the book edited by prof. J. Gajda titled *Ekonomika i programowanie rozwoju przemysłu* (The Economics and Programming of Industrial Development) (II edition, PWE in 1987 with a large contribution by i.a. B. Byrski, J. Famielec, K. Górka). Moreover,

the chapter on costs of work written by K. Górka was included in the handbook edited by prof. Ferdynand Michoń titled *Ekonomika pracy* (Economics of Work), published by KiW in 1978 and PWN in 1991. Prof. K. Górka was the co-author (along with dr Bazyli Poskrobko from Białystok) of the first Polish handbook titled *Ochrona* środowiska (Protection of the Environment) published by PWE in years 1987 and 1991, as well as four different editions of the book titled *Ochrona* środowiska*. Problemy społeczne, ekonomiczne i prawne* (Protection of the Environment. The social, economic and legal issues) which were published by PWE in years 1991-2001. Among other compilations, one should highlight the study by prof. J. Famielec titled *Straty i korzyści ekologiczne w gospodarce narodowej* (The Ecological Losses and Benefits in State Economy) (PWN, 1999) and the collective publication under her editorship titled *System finansowania ochrony* środowiska *w Polsce* (The Financing System of Environmental Protection in Poland) (AE, Kraków 2005), as well as the work under the editorship of dr Piotr P. Małecki: *Ekonomia przemysłowa w warunkach kryzysu finansowego* (Industrial Economics During a Financial Crisis) (Fundacja UEK, Kraków 2012).

It should also be highlighted that the Department is a leading entity as to doctorial and habilitation dissertations.During the last 20 years, two of our members gained the title of the professor and four of them became doctor habilitatus. The most current habilitations were finished thanks to the following publications:

- Piotr P. Małecki: *System opłat i podatków ekologicznych w Polsce na tle rozwiązań w krajach OECD* (The System of Ecological Charges and Taxes in Poland Compared with Solutions in the OECD Countries) UEK, Kraków 2012,
- Małgorzata Kożuch: *Subsydiowanie ochrony środowiska w gospodarce rynkowej. Doświadczenia Polski* (Subsidies for the Protection of the Environment in Market Economy) UEK, Kraków 2013.

The doctorial dissertations of the members of the Department and Authors of this monograph are the following:

- Jolanta Stanienda: *Uwarunkowania i tendencje rozwoju przedsiębiorstw w regionie tarnowskim* (The Circumstances and Tendencies of Business Development in the Region of Tarnów) 2004,
- Renata Żaba-Nieroda: *Wpływ standardów ekologicznych na konkurencyjność w sektorze energetyki w Polsce* (The Influence of Ecological Standards on Competitiveness in the Energy Sector in Poland) 2008,
- Ksymena Rosiek: *Metody oceny skuteczności projektów ochrony środowiska w Polsce współfinansowanych ze źródeł zagranicznych na przykładzie gospodarki wodno-ściekowej* (Methods for Assess-

ing the Efficiency of Projects of Environmental Protection in Poland Co-financed with Foreign Resources on the Example of Water and Sewage Management) 2011,

- Katarzyna Cięciak: *Skuteczność ekologiczna polityki energetycznej Unii Europejskiej w Polsce na przykładzie emisji dwutlenku węgla* (The Ecological Efficiency of the EU Energy Policy in Poland on the Example of Carbon Dioxide Emissions) 2013,
- Iwan Telega: *Kapitał naturalny w koncepcji rozwoju trwałego* (The Natural Capital within the Concept of Permanent Development) 2014.

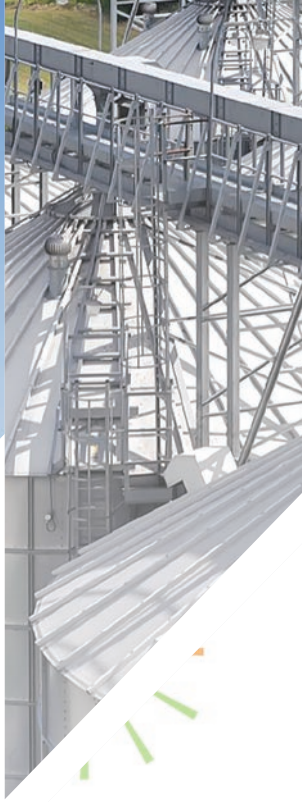
For years, the Department has been cooperating with the economic practices and public institutions, i.a. the Ministry of the Environment, the Ministry of Regional Development (now the Ministry of Infrastructure and Development), the Ministry of Economy, through execution of project works i.a. devoted to the modifications concerning ecological charges and charges development, as well as subsidies for environmental protection.

Members of the Department also conduct mutual research with the Institute for Eco-development in Warszawa. They also successfully participate in contests for grants that finance research and study. Good results are achieved thanks to the cooperation with foreign universities, especially from Germany, Japan and the USA. Employees of the Department are active members of the Polish Economic Association, the Polish Association of Environmental and Resource Economists, programme councils of journals "Ekonomia i Środowisko" and "Aura", as well as in other areas of public activities.

Recently, the Department has cooperated with economic entities and the Authorities of the City of Kraków within the scope of municipal management, with the particular focus put on integrated systems of municipal waste management. This resulted in participation in works of the Council for Municipal Waste Management to the President of the City of Kraków (prof. dr hab. Józefa Famielec is its head during this term of office of the city authorities). Moreover, the members of the Department participate in establishing programmes for environmental protection, charges for management of municipal waste in the Commune of Kraków, as well as work in supervisory entities (supervisory boards) of the companies of the Commune of Kraków.

There are also initiatives of economic activity within the private sector, including formation of companies concerning provision of construction services (e.g. mgr Krzysztof Wąsowicz is the investor of a modern service and commercial building).

Prof. dr hab. Kazimierz Górka
Prof. dr hab. Józefa Famielec

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