

DETERMINANTS OF ECO-INNOVATIONS FOR POLISH ENTERPRISES

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Abstract

Eco-innovations are defined as innovations that enable the reduction of consumption of raw materials and energy, emissions of pollution and waste, leading thereby to improvement of natural environment. The main group of such eco-innovations are environmental technologies, however such a conceptualisation does not only relate to the process or product innovations but also to organization, marketing and business models. The European Union, as well as individual countries, promote and support the development and implementation of eco-innovations, which are considered as practical implementation of sustainable development principles in business practices.

This article aims to analyse the factors affecting the development of eco-innovation in Polish companies. The analysis is conducted on the basis of primary literature, statistical data and other data. With that, the article presents the basic principles of the concept of eco-innovation, chosen external conditions and internal influences on eco-innovative companies. Also, an attempt has been undertaken to identify important factors that determine the development of eco-innovation in Poland, which is presented in the form of a SWOT analysis.

Key words: eco-innovations, enterprises, Poland.

JEL Classification: D20, O30.

1. Introduction

Current assumptions on sustainable development, including issues of protection and rational use of the environment, are increasingly being taken into account in doing business. One of the manifestations of rendering economy greener and greener is the development of eco-innovations, that is, such innovations that reduce the negative impact on environment. Their implementation does not only affect the deve-

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lopment and the level of competitiveness of enterprises but also – generally understood – it does improve the quality of life of inhabitants in those developed countries that lead in terms of environmental concerns, including product development and environmentally friendly technologies.

The aim of this article is to analyse the factors affecting the development of enterprise eco-innovation to be conducted on the basis of secondary literature, reports, statistics and data data from the ranking developed by the Eco-Innovation Observatory (EIO). The article is divided into three parts. The first presents definitions and types of eco-innovation. This is followed by a presentation of external conditions and then of internal determinants of enterprise's eco-innovation. An attempt has been undertaken to identify important factors of eco-innovativeness in Poland.

2. Essence of eco-innovation

Increasing importance in the economy is attributed to eco-innovation, that is, to such of which the effect, generally speaking, limits the negative impact on the environment and improves efficiency in the use of natural resources. This involves three major processes taking place in the contemporary world: global competition, climate change and the depletion of natural resources (Reid, Miedziński, 2008: vi; Rennings, 2000: 321; Kornecki et al., 2008: 65).

According to one of the well-known definitions developed within the ETAP framework (Environmental Technology Action Plan) in the European Union, “*eco-innovation is the production, assimilation or exploitation of a novelty in products, production processes, services or in management and business methods, which aims, throughout its lifecycle, to prevent or substantially reduce environmental risk, pollution and other negative impacts of resource use (including energy)*” (OECD, 2009: 11). On the other hand, the SYSTEMATIC panel on eco-innovation defined it as “*the creation of novel and competitively priced goods, processes, systems, services, and procedures designed to satisfy human needs and provide a better quality of life for everyone with a life-cycle minimal use of natural resources (materials including energy and surface area) per unit output, and a minimal release of toxic substances*” (cf. Reid, Miedzinski, 2008: 2).

Eco-innovation can be divided (according to the Oslo Manual methodology) into (Cichy, Szafraniec, 2015: 21–22; Reid, Miedzinski, 2008: 3–7; Łunarski, 2010: 81–88; Flis, 2010: 101–102; Ziółkowski, 2010: 118–119; Ziółko, Mróz, 2015: 75–76):

- product related – new or significantly modified products (or services), e.g. use of biodegradable materials, hybrid materials, energy-efficient products, without compounds or potentially harmful or toxic,

- process related – introduction of new methods of production and significant changes in the production process, e.g. introduction of control and/or limitation of noise and vibration, use of renewable energy sources (e.g. solar panels, geothermal installations, heat pumps), use of so-called cleaner technologies to reduce consumption of energy, of water and raw materials, weight of generated waste, emissions of carbon dioxide and other greenhouse gases, heat recovery systems, waste sorting, collection and recycling of waste, closing of water circuit,
- organisational – application of new methods of organisation, such as, introduction of environmental monitoring, energy monitoring, environmental management system and auditing (e.g. EMAS, ISO 14001), plans for prevention of pollution, energy management systems in buildings, “green” public procurements, cooperation between enterprises for achieving a closed-loop material use,
- market related – by incorporating first time the new marketing methods into the company, including e.g. the use of environmentally friendly packaging (e.g. with recycled paper or biodegradable materials), voluntary eco-labelling, modern printing techniques, products’ promotion (marketing campaign) with special emphasis on environment.

The OECD reports classify eco-innovations as according to their purpose (products, processes, marketing methods, etc.), character (technological or other), mechanisms (modification, re-design, alternatives, creation) and environmental impact. In such an approach, eco-innovation includes pollution control, cleaner production, enhancing eco-efficiency, life-cycle thinking and closer-loop production (OECD, 2009: 6, 13–15). Apart from such a classification of eco-innovation, one can also find alternatives (Tab. 1).

Table 1. Selection of classification of eco-innovations

Author	Types of eco-innovations
A. Arundel, R. Kemp	Types of eco-innovations – examples: <ul style="list-style-type: none"> – environmental technologies – monitoring, equipment, green energy technologies, technologies of cleaner production, pollution control, etc. – organisational innovation for the environment – EMAS and ISO 14001 systems, pollution prevention schemes, sustainable supply chains, etc. – product and service innovation offering environmental benefits – environmentally friendly products and services – green system innovations – biological agriculture and renewable energy sources

continued tab. 1

N. Hofstra, D. Huisingh	Types of eco-innovations – objective of introduction: – exploitative or degenerative eco-innovations – meeting legal requirements – restorative eco-innovations – minimisation of energy consumption, raw materials, waste and emissions of pollutants – cyclical eco-innovations – continuous improvement of the functioning of the entire system (including controls and providing feedback) – regenerative eco-innovations – preserving the vitality of the environment is seen as an added value (unity relation human – nature)
P. Demirel, E. Kessidou	Types of eco-innovations – output or input measures: – output measures: end-of-pipeline pollution control technologies, integrated cleaner production technologies – input measures: environmental R&D
M.M. Andersen	Types of eco-innovations – their market role: – add-on eco-innovations – pollution- and resource handling technologies and services – integrated eco-innovations – cleaner products and cleaner production technologies – alternative products eco-innovations – more environmental alternatives to existing products (new technological paths) – macro-organisational eco-innovations – new, eco-efficient structures of organising society – general purpose eco-innovations – broad spectrum eco-innovations
A. Szpor, A. Śniegocki	Types of eco-innovations – objective of introduction: – pro-efficiency – limiting the negative impact on environment – adaptive
K. Rennings	Types of eco-innovations: – technological – products and processes – organisational – social – institutional

Source: own compilation based on: Andersen (2008: 7–9); Arundel, Kemp (2009: 8); Demirel, Kessidou (2011: 1547); Hofstra, Huisingh (2014: 464); Rennings (2000: 322–323); Szpor, Śniegocki (2012: 18); Ziółko, Mróz (2015: 76)

Eco-innovation is a process. However, the eco-innovativeness is the ability to implement economic practices of new solutions (processes, products, services, ideas, etc.), which will reduce emissions, increase resource efficiency and provoke wider environmental improvements.

Official documents of the European Union highlight the potential benefits to gain by companies through the introduction of eco-innovative solutions (Bocken et

al., 2014: 45). M. E. Porter and C. van der Linde emphasise that introduction of principles of sustainable development into economic practices, including eco-innovation, contributes to improving the competitiveness of enterprises, as it increases the efficiency of their operations (Porter, van der Linde, 1995: 120–122, 129, 133–134). Such awareness about the relationship between the introduction of eco-innovation and competitiveness also exists among Polish entrepreneurs (Cichy, Szafraniec, 2015: 33; Kornecki et al., 2008: 7, 20, 62–65; Ziółko, Mróz, 2015: 80–82).

In the case of eco-innovations, the most important role plays the company. What also needs to be taken into account are the activities of authorities that support innovation, as described in such documents as the Strategy for Innovation and Efficiency Economy, National Development Strategy 2020 and Long-term National Development Strategy: Poland 2030 as well as the goals and objectives set out in the Strategy for Sustainable Development of Polish 2025² and II National Environmental Policy.

3. External determinants

External factors of eco-innovation are divided into institutional and policy determinants (including environmental policy, fiscal, institutional, legal, etc.) as well as considerations of supply and demand side (Horbach, 2016: 2; Costantini et al., 2015: 577–578; Reid, Miedzinski, 2008: 34). Enterprises opting for implementation of eco-innovation must take into account the market situation, macroeconomic policy of the government, the possibility of reducing production costs as well as the expectations of consumers (Fig. 1).

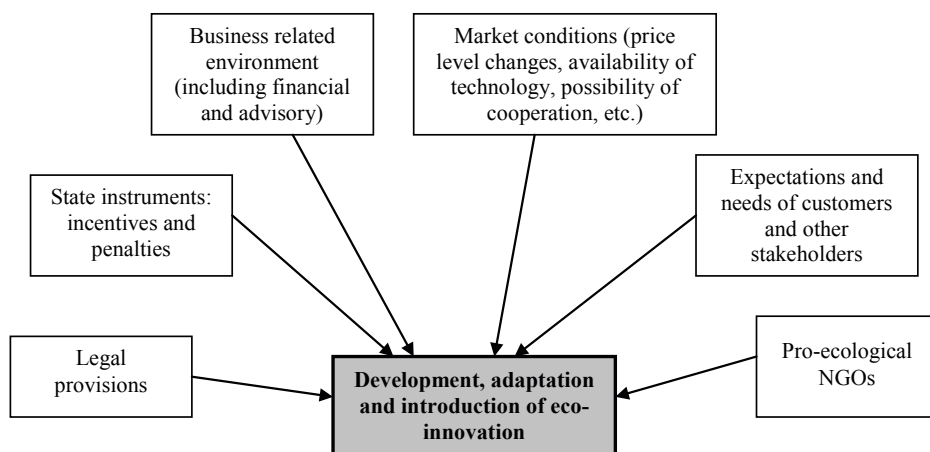


Fig. 1. External determinants for eco-innovation of enterprises

Source: own

² This document was repealed in 2007 and a new has not yet been developed.

The need to adapt business operations to current legislation is mentioned as one among the main reasons for implementation of eco-innovation (Bocken et al., 2014: 46; Bossle et al., 2016, 866, 868; Cichy, Szafraniec, 2015: 33; Kornecki et al., 2008: 5–6, 59; Ryszko, 2014: 132; Zuzek, 2015: 242), in particular the legislation with regard to the requirements of ecology and environmental technologies. In Poland, the law is relatively frequently changed and amended, which makes it necessary to adapt the economic activities to new regulations. Besides the typical legal regulations (labour law, tax, etc.), entrepreneurs have to take into account those acts or regulations that strictly relate to the environment. The most important among them are acts including: the Environmental Protection Act, Water Act, Geological and Mining Act, legislation on packaging and packaging waste, legal regulations on chemical substances and chemical mixtures, law on organic agriculture, acts on obligations of entrepreneurs in the management of certain sorts of waste as well as legal regulations on fees on products and deposit fee; Energy Law, law on energy efficiency, law on renewable energy sources, law on investments in wind power, laws on organic farming. These laws are also completed by regulations specifically governing the use of environment (including conditions to be fulfilled, fees, rates, fines, etc.). A multitude of legal regulations, their complexity and the relatively frequent changes indicates that entrepreneurs in Poland have problems with knowledge about them and with compliance (Kornecki et al., 2008: 6, 50–51, 84–89; Zuzek, 2015: 243).

Changes in law depend on policies pursued by the government. It is worth noting that entrepreneurs are willing to invest in innovation, when they are provided with a stable and predictable business conditions (Costantini *et al.*, 2015: 579). However, in conditions of uncertainty (changes to the objectives and directions in state policy, in level of interventionism, environmental law, tax, etc.), companies can restrict their spending on innovation (Kornecki et al., 2008: 61; Zuzek, 2015: 243).

A number of scholars highlight the varying effectiveness of public policy instruments used in creating market conditions for promoting eco-innovation and thereby for “greening” the economy. Quite frequently are also used different penalties (additional fees, fines) and incentives (subsidies, tax breaks). They are accompanied by permits related to the exploitation of the environment and ecological financial safeguarding (Kozuch, 2012: 333). An important element are also here the so called “green” public procurements (Kornecki et al., 2008: 63). In 2014, the green public procurements accounted for 9% of all orders in Poland (USBST, 2016: 68). The most effective state instruments, also in the case of Polish companies, are subsidies for R&D, tax incentives and environmental regulations (Costantini et al., 2015: 578; Zuzek, 2015: 242). However, some research in the field shows that the command and control instruments of public policy³ are effective in cases of solutions of the end-of-pipeline type (reduction or neutralisation of waste and pollution), while in

³ Importantly, it was found that environment taxes do not stimulate the development of eco-innovation (Demirel, Kesidou, 2011: 1553–1555).

relation to the implementation of cleaner production technologies their role is rather small; hence the postulate about the need for the state to use different instruments in order to better stimulate the eco-innovation among enterprises (Demirel, Kesidou, 2011: 1, 548).

An important issue is help (advisory, financial, promotional, etc.) provided by the central government and the local and regional authorities. To the most important strategies and programs at the EU level belong the Europe 2020 strategy and such programs as Investment Plan for Europe (the so called Juncker plan), Eco-innovation Action Plan (EcoAP), Environment Action Programme 2020, Intelligent Development, Infrastructure and Environment as well as regional programs, including earlier, e.g. Environmental Technologies Action Plan for the EU (ETAP) and the Innovative Economy program and others. At the national and regional level, support is provided by a number of institutions such as technology parks, innovation centres and technology transfer centres, Innovation Centres NOT, Innovation Relay Centres, innovation clusters and environmental funds, start-up funds and others. In Poland, support is in principle given to innovative companies, usually without distinguishing those that develop and those that implement eco-innovation⁴. In addition to these institutions, regional and local authorities organise or co-organise trade events (fairs, exhibitions, competitions, etc.), at which entrepreneurs can promote their companies and products, and can offer training and seminars for entrepreneurs (Kruk, 2013: 128–132).

Although most of the expenditure on R&D bear the companies (CSO, 2015: 66), it is them who appreciate the possibility of obtaining external assistance in the field of eco-innovation (Bocken et al., 2014: 51). It is also worth noting that Polish entrepreneurs do not always have access to information about the possibilities to benefit from aid programs. They are also discouraged from taking advantage of various subsidies due to organisational and bureaucratic requirements (Kornecki et al., 2008: 8, 109–110; Zuzek, 2015: 243).

Lack of external funding sources and high cost of implementation of eco-innovations is seen as one of the main obstacles to their development (Szpor, Śniegocki, 2012: 11; Reid, Miedziński, 2008: 35; Bartoszczuk, 2015: 133; Ryszko, 2014: 130, 132–133; Zuzek, 2015: 243). Even relatively little support from the state side is highly valued by the entrepreneurs (Kornecki et al., 2008: 7, 11).

Researchers pay attention to technological determinants, including technological potential and country's basic infrastructure, and obstacles in the implementation of new technologies (e.g. high level of complexity, lack of alternative raw materials or substances or institutional and legal solutions), access to new technologies and knowledge on eco-innovation as well as the ability of companies to adapt to

⁴ There are however exceptions such as GreenEvo – Green Technology Accelerator, GEKON – Generator of Ecological Concept, Polish Environmental Technology Platform and Polish Platform on Eco-Innovation.

their own needs and implementation (Ryszko, 2014: 129; Bartoszczuk, 2015: 113; Cichy, Szafraniec, 2015: 33). Continuous technological changes, involving inter alia shortening of products' life cycles, also force companies to look for new solutions (Bossle et al., 2016: 866). The market situation also determines the development of eco-innovation (Kornecki et al., 2008: 90). An important factor is the price of raw materials and energy. If the use of eco-innovation leads to reduction of the use of raw material, then it is one among many important factors motivating companies to implement this type of solutions (Bocken et al., 2014: 51, EIO, 2016: 13). Currently, great importance is attached to energy-saving products and technology as well as to the development of low or non-waste technologies (Bocken et al., 2014: 50–51). Such awareness also exists among entrepreneurs themselves (Cichy, Szafraniec, 2015: 31). The role of the state is also important in this case: market mechanisms sometimes fail in terms of resource allocation and therefore state intervention is accepted in stimulating innovation and increasing the level of technological advancement, mostly in the form of public expenditure on R&D (Costantini et al., 2015: 578).

Businesses also pay attention to the needs of consumers, and more specifically to their environmental expectations. Decisions and customer expectations including the lifestyle changes and with that growing demand for “green” products and services becomes as a result an increasingly important factor in the activities of pro-environmental enterprises (Bocken et al., 2014: 51; Bossle et al., 2016: 863; Cichy, Szafraniec, 2015: 33; Kornecki et al., 2008: 6, 59, 90–91; Ryszko, 2014: 132). However, insufficient demand for “green” products and services (or lack thereof) is limiting the entrepreneurial eco-innovation (Ryszko, 2014: 134). In Poland, more and more citizens believe that their decisions have an impact on the environment (CBOS, 2016: 3-4), thus their increasing environmental awareness can also translate into changes of their shopping criteria.

The Polish and foreign entrepreneurs name, among the main factors related to the implementation of ecological solutions, the requirements and expectations from the customers. Their expectations are listed among the main factors determining the level of eco-innovativeness (Kornecki et al., 2008: 6, 59–60; Reid, Miedzinski, 2008: 45–47). Besides the needs of customers, companies have also to take into account the pressure from ecological organisations (Kornecki et al., 2008: 60). In addition, they should also take into account the behaviour of competitors, suppliers and the expectations of shareholders and other interest groups (Kornecki et al., 2008: 59–60; Reid, Miedzinski, 2008: 43–44, 48).

Importantly, the government conducting environmental policy may on the one hand support eco-innovative enterprises, on the other though may also influence the demand side for such products and services. Eventually, however, an important factor in this process are instruments affecting the price level. Lower prices will encourage consumers to buy eco-innovative products and services (Costantini et al., 2015: 578–579).

Enterprises often cooperate with each other – and in terms of increasing eco-innovation, it is often pointed to creating sustainable supply chains, which lead to improved environmental performance. Such cooperation allows for greater efficiency in the use of raw materials and reduces the negative environmental effects (from cradle to grave). The effects of technological and environmental spillover do not only affect the domestic companies but also foreign cooperation (Arundel, Kemp, 2009: 8; Costantini et al., 2016: in press). An important factor is also the cooperation with other entities, including universities and research centres as well as the ability to obtain external funding (Bossle et al., 2016, 866–868; Sáez-Martínez et al., 2016, 33). However, Polish companies only rarely cooperate with each other, nor do they so with academic and other research institutions, and generally do not see the need to change this situation (Kornecki et al., 2008: 7–8; Ryszko, 2014: 132).

It has to be highlighted that R&D spending in Poland is rather low. Although gross domestic expenditures on research and experimental development (GERD) are getting higher, they however account only for 0.94% of the GDP⁵, and their total value in Poland in 2014 accounted for just 1.37% of all the expenditures directed for R&D by all 28 countries in the EU. Of the total value of expenditures spent on innovation, almost half (46.6%) were taken by enterprises, the government spending totalled 23.9%, the higher education sector 29.2% and the private sector and non-profit institutions 0.3% (GUS, 2015: 55, 59). Another significant indicator is the number of eco-innovation patents and inventions in the field of environmental technologies registered by Polish entrepreneurs to the Patent Office. In 2014, the Patent Office granted 114 such patents, but this represents only 4.0% of all the inventions⁶ (USBST, 2016: 63).

The aforementioned data indicates that there are fairly strong obstacles to increasing the level of eco-innovation of the Polish enterprises. These are mainly institutional and legal determinants and contingencies, and in particular the uncertainty of the market situation, the constant changes in legislation and the shortcomings in the development of business environment institutions.

4. Internal determinants

Discussing the eco-innovation of companies, it is impossible not to mention the internal determinants. Frequently, among factors have a motivating effect on the implementation of eco-innovation, entrepreneurs name potentially higher revenues, reduced costs as well as getting a technological advantage; however there are also personal reasons such as positive experience or improving the image of the company

⁵ The average for all EU countries equals to 2.07% of GDP (EIO, 2016: 3).

⁶ It was one of the highest numbers of patents in the field of environmental technologies as compared with the total number of patents registered since the year 2000. (USBST, 2016: 63).

(e.g. Bocken et al., 2014: 50–51; Bossle et al., 2016: 867–868). Among the most important internal determinants of eco-innovation concerning Polish enterprises are also included: human resources (particularly in the case of R&D personnel), financial aspects (potential reduction of costs and own funds for research or adaptations of eco-innovation), environmental management systems and the creation of company's image (Fig. 2).

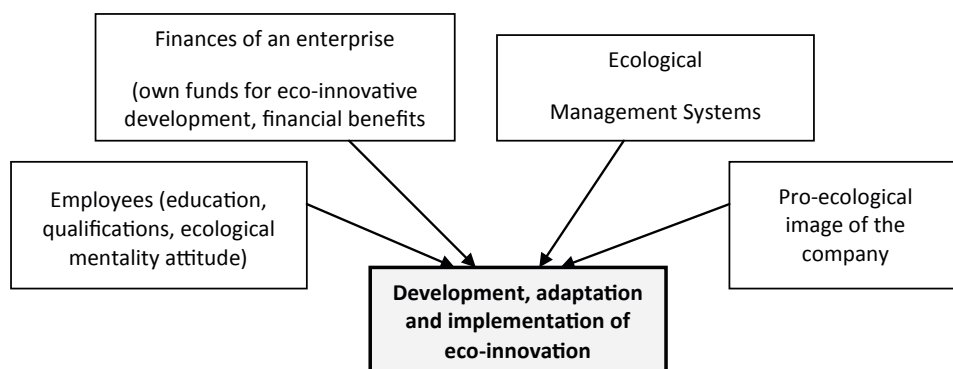


Fig. 2. Internal determinants for eco-innovation of enterprises

Source: own

Cost reduction is one of the key factors for eco-innovative companies. A number of scholars draw attention to the lower production costs associated with the implementation of eco-innovation and more precisely, with lower usage of energy and resources as well as reduced amount of generated waste contributing to increased efficiency (com. Bocken et al., 2014: 50; Demirel, Kesidou, 2011: 1548–1549). It is also an important factor for Polish entrepreneurs (Karlikowska, 2013: 93; Kornecki et al., 2008: 62–63; Ryszko, 2014: 130, 132–133; Szpor, Śniegocki, 2012: 11; Zuzek, 2015: 242). It has been proven that companies implementing eco-innovation in Poland show better financial performances (Przychodzen & Przychodzen, 2015: 259–261). On the other hand, however, it is also worth noting that some Polish entrepreneurs perceive eco-innovation not so much in terms of potential benefits and opportunities for development but rather as costs that need to be taken or lack of conviction about the necessity of implementation of eco-innovation (Szpor, Śniegocki, 2012: 12; EIO 2016, 12; Zuzek, 2015: 243).

Another important aspect are also financial constraints for enterprises. Lack of own financial resources (often in conjunction with the relatively high costs of implementation of ecological solutions and the uncertain return on investment) was mentioned as one of the main obstacles to the development of eco-innovation by Polish entrepreneurs (Karlikowska, 2013: 93–94; Kornecki et al., 2008: 87–88, 92–95; Ryszko, 2014: 132, 134; Szpor, Śniegocki, 2012: 11–12; Zuzek, 2015: 243).

Still another important factor in determining the level of innovation of enterprises are human resources, especially the qualifications of employees directly involved in the development and implementation of eco-innovation. Attention is being drawn to their knowledge (especially that concerning environmental issues and strictly engineering know-how), skills and in particular creativity of the staff. Stressed is also the importance of training that enhances the potential and skills of employees. Usually, these concerns people in various positions: from the steering personnel of a company, employees in R&D departments, engineers, designers, employees in the marketing department and sales (Bocken et al., 2014: 52; Bossle et al., 2016, 868-869; Cichy, Szafraniec, 2015: 33; Reid, Miedzinski, 2008: 45, 47). In the case of Polish micro- and small enterprises, precisely the lack of suitably qualified staff is considered as a significant obstacle to the development of eco-innovation (Kornecki et al., 2008: 7; Bartoszczuk, 2015: 133; Ryszko, 2014: 134; Cichy, Szafraniec, 2015: 33).

Besides education and qualifications of employees, also the environmental awareness of entrepreneurs and their employees is important. This element is often in the case of Polish enterprises not significant, especially in the case of micro-companies, although a slight increase has been observed here. The largest knowledge in this area, as well as the activity of pro-environmental attitude can be observed among representatives from large, industrial companies (Kornecki et al., 2008: 5–6, 9–10, 20, 47–49, 81–83; Zuzek, 2015: 242).

On a voluntary basis, enterprises may also implement environmental management systems (EMS). These have been formalised in such systems as ISO 14001 and EMAS (European Union's Environmental Management and Audit Scheme). Enterprises are also subjected to the organic certification (eco-labelling), which consists of distinguishing the products or services that meet environmental criteria (Bocken et al., 2014: 48, 50–51; Demirel, Kesidou, 2011: 1548-1549, 1551; Kobyłko (ed.), 2007: 151). In the case of technological eco-innovation, a spread of certification systems (ranging from ISO 14001, via EMAS to the industry-specific systems) has taken place, which on the one hand are linked to the requirements to be met by companies in order to obtain an ecological mark, and which on the other make up for a good method to convey a message to other actors and subjects about their ecological attitude (Bossle et al., 2016: 868). It is also a factor strongly favourable to eco-innovation (Cichy, Szafraniec, 2015: 33; Demirel, Kesidou, 2011: 1553–1554; Przychodzen, Przychodzen, 2015: 260–261). The number of organisations that implemented EMAS or ISO 14001 in Poland is steadily growing, although in comparison with other countries in the EU it is still small (EIO, 2016, 5; USBST, 2016: 67).

Another factor here is the creation of the image of a company. Generally, entrepreneurs quite often believe that eco-innovation and pro-environmental investments do have a positive effect on the image of their companies. Therefore, it can be considered as a factor strongly influencing the development of eco-innovation of Polish

enterprises (Demirel, Kesidou, 2011: 1549; Karlikowska, 2013: 93; Kornecki et al., 2008: 5, 59, 67; Ryszko, 2014: 132–133; Szpor, Śniegocki, 2012: 11; Zuzek, 2015: 242). Companies must also reckon with the fact that environmental degradation, being a result of their actions, can affect their reputation and at the same time cause the resignation of some clients from their products (Bossle et al., 2016: 862). Interestingly enough, the entrepreneurs also recognise that the purpose of the implementation of eco-innovation is not only the improvement of their image but also the environment itself in the region (Ryszko, 2014: 130; Szpor, Śniegocki, 2012: 11; Zuzek, 2015: 242). However, it is often more of a secondary effect (Kornecki et al., 2008: 90).

In summary, one can conclude that the cost factor is the most important in this group of determinants. For a number of companies, significant barriers to implementation of eco-innovation are the costs and risks associated with them. On the other hand, however, other entrepreneurs still decide to develop and implement eco-innovative solutions seeing in them the long-term opportunities to among others reducing operative costs of their companies. The second important factor is the know-how and qualifications of employees, especially those involved in research and implementation.

5. Conclusions

Relatively few enterprises from Poland implement eco-innovative solutions. The level of participation in implementing eco-innovation in Poland is in general rather is low (Kornecki et al., 2008: 92–95). This is also reflected in the international rankings. According to the eco-innovation ranking EIO, Poland is among the least resource- and energy-efficient EU countries, and this situation has not changed since 2010 (EIO, 2016: 1.3). A thorough analysis of eco-innovation of Polish companies is difficult due to the lack of statistical data on a strictly pro-environmental innovation and relatively small (e.g. in comparison with Western European countries) number of publications on this subject. However, the above analysis provides a basis for preparing a SWOT examination of assessing eco-innovation of enterprises (Tab. 2).

In conclusion, it can be assumed that enterprises deciding for development, adaptation and implementation of eco-innovative solutions face many obstacles. The most significant among them can be considered those of institutional and legal nature, although some problems are caused by internal conditions within the companies themselves. Solving the problem of low-level eco-innovation also involves the development of coherent strategies of support at the national level, creating a stable business environment, and the use of state policy instruments (including financial) aimed at creating positive incentives that encourage entrepreneurs to this type of pro-ecological solutions.

Table 2. SWOT analysis of eco-innovations of Polish enterprises

Strengths	Weaknesses
<ul style="list-style-type: none"> – increase in ecological awareness among enterprises and employees – increase of qualifications and knowledge among enterprises and employees – implementation of environmental management systems – nominal increase of expenditures on R&D for businesses – creation of environmentally friendly corporate image 	<ul style="list-style-type: none"> – high investment costs in eco-innovation with high uncertainty regarding benefit returns – lack of or insufficient own funds for the development of eco-innovation – not always sufficient knowledge of applicable law provisions on environmental protection – understanding difficulties on the role of eco-innovation and pro-environmental actions and their benefits – insufficient number of properly qualified staff – insufficient knowledge about the possibilities of obtaining outside support (advisory, financial, etc.) – low level of cooperation with other companies, universities and other R&D institutions – low number of patent applications
Opportunities	Threats
<ul style="list-style-type: none"> – development of business institutions including those supporting eco-innovation (GEKON, GreenEvo, Polish Eco-Innovation Platform, etc.) – growing environmental awareness and customer expectations – EU policies aimed at promoting pro-environmental solutions – possibility of using financial resources from EU programs – creation of favourable market conditions increasing eco-innovation – program supporting competences and earlier fields of study demanded by the state – development of innovative clusters and other forms of cooperation 	<ul style="list-style-type: none"> – complicated, unclear and often changed legal provisions and procedures, bureaucracy – uncertainty of the situation due to changes in government policy – insufficient external support (financial and advisory) for eco-innovation in enterprises – problems with the acquisition of information on possible assistance and cooperation – lack of or weak incentives from the state concerning the development of eco-innovation – maladjustment of the education system to the needs of entrepreneurs

Source: own

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UWARUNKOWANIA EKOINNOWACYJNOŚCI POLSKICH PRZEDSIĘBIORSTW

Streszczenie

Ekoinnowacje definiowane są jako takie innowacje, które umożliwiają redukcję zużycia surowców i energii, emitowanych zanieczyszczeń i wytwarzanych odpadów, a tym samym prowadzą do poprawy stanu środowiska przyrodniczego. Główną grupą ekoinnowacji są tzw. technologie środowiskowe, ale pojęcie to dotyczy nie tylko innowacji procesowych czy produktowych, ale także organizacyjnych, marketingowych i modeli biznesowych. Unia Europejska (EU), jak i poszczególne kraje, propagują i wspierają opracowywanie i implementację ekoinnowacji, które są uznawane za praktyczne wdrożenie założeń koncepcji rozwoju zrównoważonego do praktyki gospodarczej. W oficjalnych dokumentach EU zwraca się uwagę na rolę przedsiębiorstw w tym szczególnie mikro-, małych i średnich przedsiębiorstw w opracowywaniu ekoinnowacji.

Celem artykułu jest analiza czynników wpływających na rozwój ekoinnowacji w przedsiębiorstwach, przeprowadzona na podstawie badań literaturowych, danych statystycznych oraz danych z rankingu ekoinnowacyjności. W artykule przedstawiono podstawowe założenia koncepcji ekoinnowacji, wybrane uwarunkowania zewnętrzne oraz wewnętrzne wpływające na ekoinnowacyjność przedsiębiorstw. Podjęto także próbę określenia najważniejszych czynników determinujących rozwój ekoinnowacji w Polsce, które przedstawiono w formie analizy SWOT.

Słowa kluczowe: ekoinnowacje, przedsiębiorstwa, Polska.

Klasyfikacja JEL: D20, O30.