

ECONOMICS*Sociology***Maria Urbaniec,***Department of Entrepreneurship
and Innovation,**Cracow University of Economics,
Kraków, Poland,**E-mail:**maria.urbaniec@uek.krakow.pl**Received:* April, 2015*1st Revision:* July, 2015*Accepted:* November, 2015**DOI: 10.14254/2071-
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Changes in the macro- and micro-environment of enterprises, growing awareness, customer requirements and increasing environmental restrictions give rise to the need to change the current socio-economic development to one that is more sustainable. This is a priority not only for the United Nations (UN) or the Organisation for Economic Co-operation and Development (OECD), but also for the European Union (EU). The implementation of sustainable development is therefore associated with a fundamental change in economic

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**TOWARDS SUSTAINABLE
DEVELOPMENT THROUGH ECO-
INNOVATIONS: DRIVERS
AND BARRIERS IN POLAND**

ABSTRACT. Eco-innovation plays an important role in the implementation of sustainable development. The overall objective of eco-innovation is to reduce impact on the environment, as well as to create new market opportunities, products, services or processes aimed at improving environmental performance. Eco-innovation generates changes not only in companies but also in their environment, i.e. within existing socio-cultural norms and institutional structures. The aim of this article is to identify how eco-innovations can support sustainable development, as well as to analyze the possibilities and limitations of their implementation in Poland. The study shows that eco-innovations are interpreted in literature, not only – in general – as a tool for sustainable development, but also in terms of process and as a source of ecological and economic effects. The results of this analysis indicate that eco-innovation is a tool for sustainable development at the enterprise, society and state levels, which should be applied throughout the product or service life-cycle in order to contribute to the achievement of economic and environmental benefits. Its implementation is dependent on numerous drivers and barriers. In order to overcome current difficulties, significant support from the state is required because eco-innovations are associated with multiple barriers independent of companies. Eco-innovations can be supported by changes in the economic-political system.

activity, with regard to a systemic and integrated interdisciplinary approach (OECD, 2012; United Nations, 2012). Moreover, a set of participatory processes is required that enables the integration of short- and long-term goals for economic, social and environmental issues (Borys, 2011, pp. 75-81; Poskrobko, 2013, p. 21). It should be added that sustainable development is a complex and multidimensional concept, covering the interdependence of economic, social and ecological order in socio-economic development, as well as the need to preserve resources for future generations (Kates, Parris, Leiserowitz, 2005, pp. 8-21; Famielec, 2009, p. 37; Fiedor, 2013, pp. 8-12; Zielińska, 2014, p. 184).

One of the leading trends in supporting sustainable development is the concept of the “green economy”, which is characterized by an increase in human wellbeing and social equity while simultaneously reducing environmental risks and the consumption of natural resources (Allen, Clouth, 2012, p. 9; Ryszawska, 2013, p. 27; Bata, 2011, p. 265). This subject has gained in importance since 2008 when, on the initiative of the United Nations Environment Programme (UNEP), the global agreement called the “*Green New Deal*” was concluded. According to this document, governments should strengthen their cooperation to promote economic transformation towards a “green economy”. The UNEP activities resulted in the launch of the “*Green Economy Initiative*” program, and then in the publication of the report titled “*Towards a green economy*”, containing recommendations for governments on the basis of the diagnosis of developments and prospects by 2030¹.

Currently, this is one of the key topics of political debate both at the European and global levels. For this purpose, the Green Growth Knowledge Platform² has been established by leading international institutions whose aim is to promote global economic development (e.g. World Bank, OECD, UNEP, Global Green Growth Institute). In recent years, these institutions have taken measures to develop both recommendations and a coherent framework for action to move the global economy onto a sustainable path. Another strategic document is the *Green Growth Strategy*³, developed by the OECD in 2011. This strategy creates a political framework for greater economic integration and changes in consumption and production patterns that lead to the more reasonable use of limited natural resources (OECD, 2011, p. 114).

Apart from UN and OECD activities, it is also worth noting that, at the level of the European Union, various initiatives for sustainable development are being undertaken. The essence of this approach reflects not only the EU Sustainable Development Strategy (Council of the European Union, 2006), but also the “Europe 2020” strategy for smart, sustainable and inclusive growth, which replaced the renewed Lisbon Strategy in 2010 (European Commission, 2010, p. 5). The “Europe 2020” strategy explicitly confirms the need to create synergies between economic and environmental objectives, and advocates the transition towards a “green economy”. Furthermore, improving resource efficiency is a major objective of the document “Roadmap to a Resource Efficient Europe” adopted on September 20, 2011 (European Commission, 2011b). It contains a vision that, by 2050, the EU economy will grow in a way that takes into account limited access to resources, thereby contributing to global economic transformation. The green economy is therefore a framework for changes from the current global economy towards the global “green economy” (OECD, 2010, p. 38; EOI, 2013, p. 6).

A particularly important role in sustainable development and therefore in the environment-friendly or “green economy” is played by eco-innovation. Eco-innovation is regarded not only as a catalyst for these changes, but also as a key element of EU policy for sustainable development, in line with the “Europe 2020” Strategy (European Commission, 2010; Welfens, 2010; Sarkar, 2013). In general, an eco-innovation is an innovation, which is distinguished by two characteristics: 1) eco-innovation represents an innovation that leads to

¹ For more information visit: <http://www.unep.org/greeneconomy> (July 15, 2015).

² For more information visit: <http://www.greengrowthknowledge.org> (July 15, 2015).

³ For more information visit: www.oecd.org/greengrowth (July 15, 2015).

the reduction of environmental impact, regardless of whether such an effect is desired or not; 2) the scope of eco-innovation can go beyond the conventional organizational boundaries and involve the wider community that generates changes within existing socio-cultural norms and institutional structures (OECD, 2009). This definition points out that socio-cultural and institutional contexts are often the basis for the creation of standards for sustainable development. This means that eco-innovation relates not only to products, processes, marketing and organizational methods, but also to social structures and institutional issues. The main objective of eco-innovation is to reduce the impact on the environment, creating new market opportunities, products, services or processes designed to improve environmental performance (e.g. saving energy and other resources, reducing pollution and waste). Their implementation is dependent, for example, on industry, regulations or standards, as well as on consumer sensitivity and awareness (Horbach, 2008, p. 164; Jansson, 2011, pp. 206-207; Triguero, Moreno-Mondéjar, Davia, 2013, p. 26; Urbaniec, 2014, pp. 1625-1626). Eco-innovation also shows different possibilities for improving the economic situation of Polish enterprises, whilst minimizing negative impacts on the environment.

This article aims to analyze how eco-innovation can support sustainable development, as well as to identify the possibilities (drivers) and limitations (barriers) of its implementation in Poland. The research methods used will include constructive criticism, a literature review, research synthesis and qualitative analysis (Onwuegbuzie, Leech, Collins, 2012). This will enable answering the following research questions: firstly, how sustainable development can be promoted by eco-innovation and, secondly, what motives and barriers for its implementation occur in Poland. To this end, an attempt at a synthesis of different approaches in interpreting eco-innovation will be undertaken, showing the multidimensional importance of eco-innovation based on existing definitions and types. Subsequently, the key eco-innovation drivers and barriers in Poland will be analyzed, taking into account the low level of eco-innovation of the Polish economy when compared to other EU countries. On this basis, opportunities for the development of eco-innovation in enterprises will be assessed in the conclusion.

1. The multidimensional importance of eco-innovation for sustainable development

Similarly as in the case of innovation, there are numerous definitions of eco-innovation in literature and business practices, which differ in their scope and level of detail (Urbaniec, 2008, pp. 14-24; Carrillo-Hermosilla, del Río, Könnölä, 2010, p. 1074; Przychodzien, Przychodzien, 2015, p. 256). Performing this review of different definitions, available in scientific literature and in the OECD or European Commission documents, generally three groups of definitions of eco-innovation can be identified:

- 1) definitions relating to sustainable development – in general – or relating only to the environmental dimension (*eco-innovation as an instrument*),
- 2) definitions focused on the eco-innovation life-cycle (*eco-innovation as a process*),
- 3) definitions also concerning environmental benefits and/or economic benefits (*eco-innovation as a source of effects*).

This division should not be regarded in *sensu stricto*, but rather as an illustration of multi-faceted possibilities to implement eco-innovations which are mutually complementary and can occur simultaneously.

The first group contains definitions that include an instrumental approach where eco-innovations are perceived as an instrument for sustainable development, aimed at reducing negative environmental impacts (i.e. ecological dimensions of sustainable development). For instance, the following definitions can be mentioned:

- Rennings defines eco-innovation as “...all measures of relevant actors (firms, politicians, unions, associations, churches, private households) which: develop new ideas, behaviors, products and processes, apply or introduce them and which contribute to the reduction of environmental burdens or to ecologically specified sustainability targets” (Rennings, 2000, p. 322).
- Within the Competitiveness and Innovation Framework Programme, available in 2007-2013, eco-innovations were defined as “...any form of innovation aimed at significant and demonstrable progress towards the goal of sustainable development, through reducing impacts on the environment or achieving more efficient and responsible use of natural resources, including energy” (Decision 1639/2006/EC, p. 17).
- According to the Eco-Innovation Action Plan – EcoAP, eco-innovations include “... any form of innovation resulting in or aimed at significant and demonstrable progress towards the goal of sustainable development, through reducing impacts on the environment, enhancing resilience to environmental pressures, or achieving more efficient and responsible use of natural resources” (European Commission, 2011a, p. 2).

Sustainable development is emphasized in these definitions as a goal, and eco-innovation as a measure to achieve that objective. Therefore, eco-innovation can be considered as an instrument supporting the implementation of sustainable development programs at the enterprise level.

The second group includes definitions with a process character, relating to the eco-innovation life-cycle. As an example, we can mention here the definition developed for the *Eco-Innovation Observatory (EIO)*⁴, where the notion of eco-innovation should be understood as “...the introduction of any new or significantly improved product (good or service), process, organizational change or marketing solution that reduces the use of natural resources (including materials, energy, water, and land) and decreases the release of harmful substances across the life-cycle” (Eco-Innovation Observatory, 2010, p. 10). According to this definition, eco-innovations contribute both to environmental “cleaning” as well as to the “dematerialization of society” (Weizsäcker, von Lovins, 1995; Welfens, 2009). This applies not only to “cleaner technologies”, but also to any changes leading to a reduction in raw material consumption during the entire product life-cycle, regardless of whether these changes are related to environmental issues or not.

A similar definition to the EOI, taking into account the process dimension of eco-innovations, were formulated, e.g., by the Polish Agency for Enterprise Development (PARP). Eco-innovation is therefore “...any innovation developed in compliance with the applicable law that produces benefits for the natural environment – in particular in the form of reduced consumption of natural resources per unit of manufactured products and reduced emissions of hazardous substances into the environment during product manufacturing and after its use” (PARP, 2008, p. 24). These benefits can occur both during production as well as over the shelf life of the purchased product or use of the service by end users.

The third group definition is limited to environmental and/or economic benefits. For example, the definition used by the Central Statistical Office refers to environmental benefits, according to which eco-innovation is a “...a new or significantly improved product/service, process, marketing or organizational method that brings environmental benefits in comparison with alternative solutions” (GUS, 2010, p. 48). The environmental benefits may constitute a fundamental objective of innovation or may be the result of different assumptions. A similar definition concerning environmental benefits was developed by Oltra and Jean (2009): “In a broad sense, environmental innovation can be defined as innovation that consists of new or

⁴Eco-Innovation Observatory: <http://www.eco-innovation.eu>.

modified processes, practices, systems and products which benefit the environment and thus contribute to environmental sustainability”.

Another definition, highlighting the benefits in economic terms, is presented by Andersen (2010), who specified eco-innovations as innovations that are reflected in “green rents” on the market. The author pointed out two ways to achieve market benefits arising from environmentally friendly investments by eco-innovative companies – on the one hand, by designating a higher price for their “ecological reputation” or for an eco-friendly product, and on the other hand, by reducing production costs incurred to achieve greater resource efficiency (Andersen, 2010, p. 8). This definition emphasizes the fact that more efficient use of energy and resources leads to the reduction of material costs as well as motivating innovativeness.

To conclude – despite numerous and varied definitions in literature – eco-innovations have an impact not only on environmental aspects, but also on economic issues (Urbaniec, 2014). Taking into account the wide range of different interpretations, eco-innovation can be defined as a sustainable development tool used during the entire life-cycle of a product or service, contributing to numerous environmental and economic benefits.

2. Typology of eco-innovation and conditions for its development

In accordance with the general guidelines in the Oslo Manual, developed by the OECD and Eurostat, innovation may relate to product, process, organizational and marketing issues (OECD, 2005, pp. 47-52). This document also highlights that the reduction of environmental impacts or improvements in health and safety protection may be a result of product, process and organizational innovation (OECD, 2005, p. 108). In literature, there are many classifications of eco-innovation (Rennings, 2000, p. 322; Urbaniec, 2008, pp. 14-22, Przychodzien, Przychodzien, 2015, p. 256). As shown in *Table 1*, besides product, process, organizational and marketing innovation, social and system eco-innovation can also be mentioned.

Table 1. Types of eco-innovation

Types	Characteristics and examples
Product eco-innovation	<ul style="list-style-type: none"> • launching on the market a product or service that is new or significantly improved in terms of its features or uses, • producing goods in a manner that leads to decreased environmental impacts and less resource use during operation, e.g. due to eco-design, • replacing inputs with materials of improved characteristics (breathable textiles, lightweight but resistant composites, environmentally friendly plastics, etc.), • products with significantly reduced energy consumption (energy efficient refrigerators, etc.), • green financial products (e.g. eco-leases), environmental services (e.g. waste management) and less resource intensive services (e.g. car sharing).
Process eco-innovation	<ul style="list-style-type: none"> • implementation of new or significantly improved production or supply methods, which reduce material consumption and risks as well as resulting in cost savings, • substitution of harmful inputs during production (e.g. replacing toxic substances), • optimization of the production process (e.g. improving energy or resource efficiency), • reducing the negative impacts of production outputs (e.g. emissions, waste).

Types	Characteristics and examples
Organizational eco-innovation	<ul style="list-style-type: none"> introduction of organizational methods and management systems for dealing with environmental issues in production and products (e.g. pollution prevention schemes, environmental management and auditing systems, chain management⁵), various collaborative organizational forms and their potential eco-innovative qualities (e.g. business networks and clusters, advanced solutions in industrial symbiosis).
Marketing eco-innovation	<ul style="list-style-type: none"> introduction of new marketing methods or techniques, which lead to changes in product design or packaging, product placement, product promotion or pricing with particular regard to environmental principles or the shaping of ecological awareness as part of promotion (e.g. eco-labelling), introduction of green branding for better commercialization of products or services.
Social eco-innovation	<ul style="list-style-type: none"> market-based dimensions of behavioral and lifestyle change and the ensuing demand for green goods and services, user-led innovation, meaning that the functionality of new goods is developed with stakeholders, thereby minimizing the risk of superfluous product features, product sharing, which may lead to an absolute decrease of material use without diminishing the quality of the services they provide to users, innovative social concepts (e.g. green living).
System eco-innovation	<ul style="list-style-type: none"> they contribute to improving the efficiency of the whole system rather than focusing on the individual components used in systems, ranging from “complex products” (e.g. houses) to entire production and consumption systems (e.g. cities), collection of changes implemented by design (e.g. system eco-innovation related to a house is not just about insulating windows or using a better heating system: it is about innovating the overall design to improve its functionality), set of interconnected innovations that improve or create entirely new systems delivering specific functions with reduced overall environmental impact (“Green cities” as an example of the “greener” operation of the city and city life, among others, through new mobility concepts that tackle not only traditional public transportation services (e.g. buses) but also shared-bike systems (and related infrastructure such as bike stations), as well as planning to reduce the need for travel (requiring that supermarkets, daycare facilities, etc., are incorporated into new housing developments).

Source: Own compilation based on EIO (2013, p. 3); Urbaniec (2008, pp. 14-24).

Within the context of eco-innovations, the eco-industry is also highlighted in literature. The eco-industry constitutes the sectors of environmental technologies, including “green products and technologies” and “green energy” that support environmental goods and services markets. The implementation of environmental technologies is often dependent on environmental regulations. Environmental technologies are often regarded as an eco-innovative solution (Janikowski, Krupanek, Skowrońska, 2006; Preisner, Pindór, 2009). In general, eco-innovation includes all forms of innovation, both technological and non-technological, new products and services, and new business practices, etc., which reduce impact on the environment, or which ensure optimal use of resources. It should also be noted that eco-innovation is a concept that is subject to continuous development in terms of knowledge about environmental protection, as well as local legal regulations, programs and

⁵ This means cooperation between companies to close material loops and avoid environmental damage across the entire value chain.

government strategies, and international norms and standards supporting environmental protection and sustainable development.

Eco-innovation is conditioned by many interrelated factors dependent on, for example, the level of development and market position of the company. In contrast to innovation, eco-innovation is not only determined by supply and demand determinants, but is also compounded by the environmental market failure. According to the Porter hypothesis (Porter, van der Linde, 2005), the demand for innovation can result from environmental regulations, which can be beneficial for companies and have a potential for improving their business model. Nevertheless, an important factor is also qualified managers, their knowledge about green solutions and the ability to assess long-term benefits (Szpor, Śniegocki, 2012, p. 6). Based on global experience, it should be stated that the effective stimulation of innovation is dependent not only on the form of regulation, but also on the flexibility, understood as openness to unconventional solutions of environmental problems, as well as predictability (Rennings, Rexhäuser, 2010). More stringent regulations are important for less innovative companies that perform only the minimum of environmental requirements (Kesidou, Demirel, 2012).

Depending on the type of innovation, different eco-innovation drivers and barriers exist (Horbach *et al.*, 2011; OECD, 2011). This may be due to both the different stimuli for their implementation (cost reduction, consumer demand, state standards) in different areas (e.g. energy efficiency, water pollution), as well as to the various degrees of technological advancement (basic research, implementation, demonstration and diffusion). Among the general obstacles, mentioned in literature, the external effects, asymmetry of information or failure and inertia of connected markets (e.g. for the financial market eco-innovative projects are sometimes too uncertain or too long-term) are also listed (Jaffe *et al.*, 2005). It should be added that the barriers and their intensity vary according to sector (Montalvo *et al.*, 2011; EIO, 2011) and country. For example, in the UK financial barriers are less important, but the lack of priority goals and political will is more relevant. For new EU Member States, the lack of financial resources in enterprises is more significant than in the old Member States. Some countries may even directly or indirectly promote unsustainable development activities (e.g. environmentally harmful subsidies). To assess opportunities for eco-innovations in Poland, an analysis of motives and barriers will be conducted.

3. Drivers and barriers to eco-innovation in Poland

According to the EIO, Poland is a country with very low eco-innovativeness and is classified in the non-innovative group of EU countries. In a study from 2013, it was reported that Poland had reached a result significantly below of the EU average, occupying the penultimate place among EU countries (EIO, 2014). This low level of eco-innovativeness in the European ranking is due to poor results in research and development as well as investments in green technologies. Poland's low position in the European ranking of eco-innovativeness should be assessed in terms of opportunities and not lost chances, because the EIO report emphasizes that there is great eco-innovation potential in Poland, especially in industry raw materials savings. In spite of overall changes, trends point to significant economic opportunities in the modernization of production processes, particularly in the most energy- and resource-intensive sectors.

Based on empirical studies, carried out on the example of Polish enterprises, a number of eco-innovation motives and barriers can be indicated. For example, research results (carried out in 2013 on a sample of 300 enterprises, including 50 large, 100 medium and 150 small enterprises) show that the most important motives of eco-innovations include: improvement of the company's image, reduction in operating costs, as well as the existing environmental regulations (Ryszeko, 2014), whereas major barriers have been identified as

being, e.g. uncertain return on investment in eco-innovation or overly long payback periods, lack of external financing and lack of financial resources in enterprises.

Barriers in this study overlap heavily with the results of a survey conducted by the *Fundacja Partnerstwo dla Środowiska* (Environmental Partnership Foundation) in small- and medium-sized enterprises in 2010. Results show that the lack of financial resources (68% of respondents), excessive implementation costs (61% of respondents), as well as difficulties in finding partners for collaboration (21% of respondents) are the major factors hindering the implementation of eco-innovation in enterprises. Whereas, among the most important factors determining environmental efforts, the following motives are listed: cost reduction (76%), improving the environment in their neighborhood (55%), improving the company's image (55%), (*Fundacja Partnerstwo dla Środowiska*, 2010, pp. 1-8). This indicates that Polish entrepreneurs perceive some benefits of eco-innovation efficiency. The important factors also include willingness to improve the environment in their surroundings and the company's image, as well as the need to upgrade technology.

Another study, concerning the assessment of the Polish market for environmental technologies, was prepared by Wrzesiewski & Miller in 2010, commissioned by the Ministry of the Environment (within the GreenEvo – Green Technology Accelerator project). The study demonstrates that the principal barriers hindering the development of the green technology sector in Poland are not just limited access to capital, but also to the lack of adequate support for companies from the state, dispersed actions and the lack of a single platform where such information could be made available. The reason for this are poorly developed distribution networks, the lack of practical information on financial support for environmental technologies and benefits that can be gained from their use. Moreover, the bureaucracy associated with acquiring financial means is also listed among the barriers (Wrzesiewski & Miler, 2010).

Based on these findings, it should be stated that the main obstacle in the implementation of eco-innovation are financial factors. This may result from slowly evolving conditions for the development of the Polish market and from the limited possibilities of acquiring the capital necessary for eco-innovation. Moreover, difficulties also include: low demand for new technologies (habit and lack of consumer knowledge, lack of market mechanisms for new solutions) and the uncertainty concerning technology, management, etc. (Pawlak, Pitera, 2012, p. 3).

The overall list of internal and external factors that support or inhibit the development of eco-innovation in Poland is presented in the following table.

Table 2. Drivers and barriers for eco-innovation in Poland

Drivers	Barriers
<ul style="list-style-type: none"> • A large number of strategic documents refer to the significant role of eco-innovations in Poland's development, • Establishment of numerous local initiatives that can evolve into eco-innovation promotion, • Slow but steady consolidation of the scientific and technological base, • New requirements of the increasingly stringent environmental protection law, • The new EU financial perspective for 2014-2020, with a focus on innovativeness, low-carbon economy and sustainable development. 	<ul style="list-style-type: none"> • High risk level of investments in eco-innovations (market uncertainty), • Limited knowledge about economic benefits as a result of eco-innovation • Insufficient cooperation between research units and companies/financial institutions, • Lack of political and social climate for the development of eco-innovations, • Excessive EU fund support for traditional sectors and transport infrastructure – instead more funds should be allocated for R&D and implementation of innovations.

Source: Own study.

In summary, eco-innovations contribute to significant cost savings and increasing resource efficiency both in the manufacturing and services sectors. Therefore, they should be viewed as a strategic factor of the national development policy. Their impact on the economy depends on various aspects, e.g. on the novelty of solutions or the degree and pace of diffusion.

Conclusions

Eco-innovations are not only an important component of sustainable development, owing to their multifaceted nature in terms of their role (as an instrument, process or source of effects) and type (eco-innovation product, process, organizational, marketing, social and systemic). Their implementation is dependent on several factors. Based on motives and barriers, it can be concluded that the Polish eco-innovation market is at its initial stage of development. This is reflected, *inter alia*, by Poland's weak position in the European ranking of eco-innovativeness, as well as numerous barriers. The most important barriers of eco-innovations, according to various empirical studies, are market uncertainty as well as the financial constraints of enterprises. Eco-innovation financing on the Polish market is conditioned heavily by the limited time horizon of aid programs resulting from the EU budget, the lack of capital (small accumulation) and experiences in private equity or business angles, lack of clear mechanisms for innovation development, and transfer of academic knowledge to business (Pawlak, Pitera, 2012, p. 4; Cichoń, 2014, p. 202).

Generally, lack of funding in companies is also considered to be a very serious barrier to the absorption of innovation and development among small- and medium-sized European enterprises, in addition to two other factors, i.e. uncertain market demand and uncertain return on investment (European Commission, 2011a, p. 4). This results from the research carried out in 2010 within the framework of the Eurobarometer concerning the attitudes of European SMEs to eco-innovation. However, it is noted that not only Polish companies, but also research institutions, have considerable potential for environmentally friendly business strategies, and thus potential for the further development of the eco-innovation market in Poland. In order to achieve the improvement of the current situation and reduce existing barriers it is necessary to undertake intensified activities and develop strategic solutions at the political level, which will facilitate the introduction of appropriate mechanisms and instruments for the development of eco-innovation.

In order to effectively support eco-innovations, it is also important to use a variety of incentives and a diversified set of instruments to better stimulate demand for eco-innovative products and services. To this end, not only access to information on current financing sources should be provided, but also the awareness of entrepreneurs concerning the benefits of eco-innovation should be raised. In addition, cooperation with research centers and businesses, science and technology parks, as well as initiatives in the field of education and information, should be developed because eco-innovation development is a long-term process requiring the involvement of all stakeholders, as well as the adaptation of market participants to the occurring socio-business changes (Urbaniec, Gerstlberger, 2011).

Future research should involve a detailed analysis of eco-innovation motives and barriers in different sectors. This would enable the development of system strategies that could improve the weak eco-innovativeness level of the Polish economy as compared with other EU countries.

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