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Eco-innovations in the business practice of the companies traded on the Warsaw Stock Exchange – an overview of selected results.

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Eco-innovations in the business practice of the companies traded on the Warsaw Stock Exchange – an overview of selected results.

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Abstract: The main objective of our study is to identify and assess chosen aspects of eco-innovativeness of the companies listed within the indices: WIG Energy, WIG Oil & Gas, WIG Basic Materials on the Warsaw Stock Exchange. The scope of this analysis encompasses selected results which facilitate achieving environmental benefits. Our investigation, however, does not cover the expenditure on eco-innovative activities as well as the instruments measuring the influence of eco-innovation. The analysis of the investigated dilemma was based mainly on two research methods, namely survey analysis and digital and documentary source analysis. The results indicate a relatively high eco-innovativeness of the companies in terms of organizational and marketing activities, and low in product and services eco-innovativeness.

Introduction

Current sustainability research defines eco-innovation as a global challenge. The transition to Green Economy, based on the integration of economic, social and environmental factors, will depend on eco-innovation. According to the European rating of eco-innovation in 2013 (defined within Eco-Innovation Observatory - EIO), Poland is considered to be an outsider among EU countries. The research by Institute for Structural Research (ISR) attributes this situation to a relatively low awareness of eco-innovation, underestimation of cooperation in the process of eco-innovation and lack of knowledge regarding the implementation of eco-innovation.

The aim of our study is preliminary identification and evolution of eco-innovative activities (environmentally-friendly) in the business practice of the companies listed in the Warsaw Stock Exchange in the following indices: WIG Energy, WIG Oil & Gas, WIG Basic Materials, based on the methodology developed in the framework of international projects (OECD, 2005, MEI Project, 2007).

Some countries do lag behind, some do not, in terms of the development and introduction of eco-innovations. Often, the leadership in eco-innovations is accompanied by a leadership in environmental policy. Previous studies focused on examining the impact of environmental performance on the value of an enterprise, and researchers used various methods to study the effect of environmental performance on its value.

Most OECD countries have developed or improved national strategies to support eco-innovations. In the UE there are several studies analyzing and promoting eco-innovations, i.e. the EU Commission study: *Promoting Innovative Business Models with Environmental Benefits* (2008) which recommends a greater action to spread such business models which would estimate the potentials for economic and environmental benefits, and the ways in which the models can be promoted, and the *Envoronmental Technology Action Plan* (ETAP) which had invited EU members to develop eco-innovation roadmaps. “In the United States, environmental technologies are seen as a promising means of improving environmental conditions and are being promoted through various public-private partnership programmes” (OECD, 2008). Not only European countries or the United States, but also Asian countries promote eco – innovation, i.e. in Taiwan regulators, scholars, and two stock exchanges - Taiwan Stock Exchange Corporation (TSEC) and GreTai Securities Market (GTSM) – get involved in research projects (2010) and lawmaking to encourage or regulate firms to behave in socially (and environmentally) responsible ways.

Poland is at an early stage of developing environmental consciousness, however, the study on the impact of eco-innovations on the value of the company has not been carried out yet. By Eco-Innovation Observatory (EIO), Poland took second place significantly below the EU average (45 out of 100). For this reason the development and implementation of eco-innovative technologies are now supported by the key national and regional strategies. Still, some of the scholars conducted a research devoted to the effectiveness of SR investment (Socially Responsible) in which also environmental aspects were taken into account (Janik & Bartkowiak, 2013, pp. 25-33), (Janik, 2014, pp.25-36). There are also several research made about ecological activity in financial institutions (Dziawgo, 2014, pp. 9-24).

The concept of eco - innovation consists of two of separate parts: the ecology and innovation. The ecology according to the definition by Cary Institute of Ecosystem Studies is: "the scientific study of the processes influencing the distribution and abundance of organisms, the interactions among organisms, and the interactions between organisms and the transformation and flux of energy and matter" (CIES, 2015). While the innovation defined according to Oslo Manual (OECD, 2005) "is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practice". Eco-innovation can be generally defined as innovation that result in a reduction of environmental impact, no matter whether or not that effect is intended. Below are presented the main definitions of eco-innovation in chronological order.

Table 1. Definition of eco-innovation

Author	Year	Definition
Fussel and James	1996	„New products and processes which provide customer and business value but significantly decrease environmental policy"
Klemmer	1999	"Techno-economic, organizational, social and institutional changes to an improved quality of the environment"
Driessen and Hillebrand	2002	Green innovation "does not have to be developed with the goal of reducing the environmental burden" but it "does however, yield significant environmental benefits"
OECD (Oslo Manual)	2005	"is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practice".
Kemp and Pearson in MEI Report	2007	"Eco-innovation is the production, assimilation or exploitation of a product, production process, service or management or business method that is novel to the organization (developing or adopting it) and which results, throughout its life cycle, in a reduction of environmental risk, pollution and other negative impacts of resources use (including energy use) compared to relevant alternatives".
Huppes, G. et al. in ECODRIVE Report	2008	Defined eco-innovation "as the combined improvement of economic and environmental performance of society".
Oltra and Saint Jean	2009	"Innovations that consist of new or modified processes, practices, systems and products which benefit the environment and so contribute to environmental sustainability"
Eco Innovation Observatory (EIO)	2011	"Eco-innovation is any innovation that reduces the use of natural resources and decreases the release of harmful substances across the whole life-cycle".

Source: Bitat, (2013) pp. 4-5; Driessen, & Hillebrand, (2002); EIO, (2011); Fussler, & James, (1996); Huppes, G. et al. (2008) ; OECD/Eurostat, (Oslo Manual), (2005); Oltra & Saint Jean, (2009).

Based on the analysis of literature (by OECD; Eurostat, 2005; Reid & Miedzinski, 2008), eco-innovation can be considered in the context of the three planes: target, mechanism, impact.

- Target (according to *Oslo Manual*, the target of an eco-innovation can be categorized under: products, processes, marketing methods, organizations, institutions).
- Mechanism (relates to the method by which the change in the eco-innovation target takes place).
- Impact (refers to the eco-innovation's effect on environmental conditions across its live cycle).

The introductory paragraph outlines clearly state the objectives and motivation for writing the paper. The introduction should provide a context for the discussion in the body of the paper.

Methodology of the research

The research on the eco-innovativeness of companies is a relatively young discipline and the methodology used currently to measure eco-innovativeness constitute mostly the achievements of the last years. The first decade of 21th century brought along several huge international research projects on the area indicated above. One of their important result was the definition of clear typologies of eco-innovation and of adequate methods of their measurement. In the subsequent part of this article, we will concentrate on the methodology of eco-innovation measurement in order to prepare a research tool facilitating the implementation of a planned empirical research.

Though current theoretical achievements in the area of eco-innovations took place mostly due to the past decade, still the methodological basis for eco-innovations and their measurement was set up much earlier. At the beginning of the 90s of 20th c. Acs and Audretsch noticed that eco-innovation might be assessed on the basis of the three following measuring tools: *input measures*, *intermediate output measures* and *direct output meaures* (Acs & Audretsch, 1993, p.10). Within input measures they enumerated expenditure on research and development activities, personnel employed in R&D as well as expenditure on innovation. Intermediate output measures included the number of patents and academic publications concerning company's eco-innovativeness etc. whereas direct output measures encompassed the number of innovations, the description of individual innovations, the data about the sale of new products etc.

The above mentioned criteria of measurement were modified and developed with time as well as became more specified. To the above mentioned measures, *indirect impact measures* were added. They were identified by aggregate data concerning changes in the effectiveness of using the resources and productivity (based on *decomposition analysis*).

Eco-efficiency is defined as „[…] the delivery of competitively-priced goods and services that satisfy human needs and bring quality of live, while progressively reducing ecological impacts and resource intensity throughout the lifecycle to a level at least in line with the earth's estimated carrying capacity" (WBCSD, 2000, p. 9). So, it is measured at the level of a product and service. Among the main ingredients of eco-efficiency the following are enumerated (Arundel & Kemp, 2009, p. 23):

- quantity of product produced (or sold), net sales, etc, as output indicators;
- energy consumption, from renewable sources and non-renewables;
- water consumption;
- greenhouse gas emissions (GHG);
- other emissions to air;
- total waste.

Current research concerning eco-innovation seem to concentrate on effects measures. It may be well shown by the classification of eco-innovation according to the MEI Project, which is based on the criteria of innovation purpose. In this case, it is clearly visible that the attention is put on direct effects of eco-innovation process (see Table 1), however, two measures are combined together (which previously have never been joined), i.e. the measures of innovativeness and environmental ones. Among these measuring innovativeness we can find: the number of organizational innovations environmentally-friendly, the number of produced (and 'service') innovations beneficial to the environment and the number green system innovations, whereas the measure of environmental benefits was based on individual technologies used to control pollution and noise, managing waste, limiting water use, environmental monitoring etc.

Table 2.Eco-innovation measures according to MEI Project

Main measures	Detailed measures
Innovation measures	
Organizational innovation	• pollution preventions schemes • environmental management and auditing systems • chain management
Product and service innovation	• new or environmentally improved material products • green financial products • environmental services • services that are less pollution and resource intensive
Green system innovation	• alternative systems of production and consumption that are more environmentally benign than existing systems
Environmental measures	
Environmental technologies	• Pollution control technologies • Cleaning technologies • Cleaner process • Waste management equipment • Environmental monitoring • Green energy technologies • Water supply • Noise and vibration control

Source: Kemp & Pearson (2007), p.10.

Due to a limited availability of data on particular aspects of econ-innovation in selected companies, in the further part of the article we will use a modified classification of innovation OECD/Eurostat (OECD, 2005). This classification divides innovation into four basic groups:

- *product* innovations require improvements to existing goods (or services) or the development of new goods. Product innovations in machinery in one firm are often process innovations in another firm;
- *process* innovations occur when a given amount of output (goods, services) can be produced with less input;
- *organizational* innovations include new forms of management, e.g. total quality management;
- *presentational* innovations refer to the implementation of new design and marketing methods in order to increase firms' sales.

In our research were selected public companies listed on the Warsaw Stock Exchange within the following indices: WIG Energy, WIG Oil &

Gas, WIG Basic Materials were selected for the research. Such a selection was dedicated by a peculiarity of the activity, i.e. a potentially significant influence on the natural environment. Therefore, public companies operating in the above mentioned sectors should perform a relatively high level of environmental interests.

The analysis was based on the method of digital and documentary source analysis. Moreover, survey analysis method was also used, however, due to a low return of the questionnaires it was only supplementary. 20 companies were tested including nine companies listed in the WIG Energy index, seven in WIG Oil & Gas and four in WIG Basic materials. It should be emphasized that the examined sample included ten companies listed simultaneously in the RESPECT index (social responsibility index)[1], which as companies socially responsible are obliged to pro-environmental activities. The results of the analysis were presented in Table 3.

The effects of eco-innovation activities were presented in the division into 4 groups pursuant to the adopted methodology of measuring eco-innovation. The first group includes such companies which launched a new or significantly improved product and/or eco-innovation service confirmed by different certificates and distinctions onto the market. The second group encompasses such companies which introduced a new or significantly improved eco-innovative production process. It refers to modernization activities meant to introduce a process that would limit the emission of harmful gases, the liquidation of landfills both in the company area and its surroundings. The third group includes these companies which introduced new or significantly improved organizational eco-innovations such as organizational changes in environmental issues confirmed by proper certificates (ISO 14001 concerns environmental management, Eco-Management and Audit Scheme - EMAS). The fourth group lists the companies which launched new or significantly improved marketing eco-innovations such as any visible ecological activities reported on their websites and/or social responsibility reports and other forms of educational activities promoting environmental protection (e.g. the participation in educational programs and projects).

Results

The majority of the examined companies is aware that investments in innovative and ecological technologies as well as raising ecological awareness are profitable to the company. The results presented in the Table below show an uneven distribution of particular types of eco-innovation.

[1] In the 8th (current) edition of the RESPECT project, there are 23 companies listed.

Table 3. The results of eco-innovation activities

Type of eco-innovation	Companies in total	The number of companies divided by indices		
		WIG e	WIG p	WIG s
New or significantly improved eco-innovation product or service launched onto the market	2	1	-	1
New or significantly improved eco-innovation production process	9	9	-	-
New or significantly improved organizational eco-innovation	12	4	5	3
New or significantly improved marketing eco-innovation	12	5	4	3

Source: the authors' own analysis

The biggest innovativeness is visible in organizational and marketing activities. It may be due to the fact that companies are aware of the benefits resulting from this type of eco-innovation. Among 12 companies which implemented organizational and marketing eco-innovations there are as many as 10 listed in the REPSECT index (all selected for the research). Clearly, the participation in the RESPECT index facilitates the development of organizational and marketing eco-innovations.

All companies in the WIG Energy index introduced eco-innovative production process. Two companies operate only in the area of green energy and seven companies in this index produce a part of its energy from renewable sources (including wind, water and biomass energy). Similar eco-innovations have not been introduced by the remaining companies, namely companies specializing in oil and basic material. High process innovativeness in energy companies is a result of international and domestic regulations concerning the development of low-emission economy. In Poland the assumptions to develop renewable energy were defined in numerous governmental documents. The fundamental regulation concerning energy produced from renewable sources is the Energy Law Act. The law-maker imposed on energy companies the obligation to buy electrical energy and heat produced from renewable sources of energy. In practice, it obliges the companies, the producers of 'black' energy, to buy certificates of origin or to make a compensatory payment.

A significantly low eco-innovativeness is observed in products and services. Only two companies proved any activities in this area. It may be

somehow explained by lack of both market and banking incentives for the development of this type of eco-innovation.

Conclusions

The analysis of eco-innovativeness of the companies listed within selected indices showed considerable differences in terms of particular types of implemented eco-innovations. The relatively highest activity was recorded in the area of organization and marketing. It may be due to a higher awareness of the image and competition benefits which result from obeying international standards in terms of environmental management as well as initiating such activities which are socially responsible. In this respect, a particularly high activity was observed in the companies listed simultaneously in the Respect index which includes socially responsible companies. Moreover, in terms of process innovations a considerable contrast may be observed between the companies from respective indices. All selected companies listed within the WIG Energy index implement eco-innovation activities whereas the 'representatives' of the remaining indices cannot boast of any new pro-environmental processes. This crucial disproportion is justified by international and domestic regulations concerning the development of low-emission economies, which to a much greater extend and directly refer only to the energy sector. The last examined type of eco-innovation in terms of product and/or services show an extremely low innovativeness of the companies. We detected only two cases of new products in our study (realized by two companies).

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