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SMALL AND MEDIUM ENTERPRISES AND ECO-INNOVATIONS: EMPIRICAL STUDY OF SLOVAK SME´s

Abstract. *Eco-innovation and green technologies are key to Europe´s future and they are at the heart of the European Union (EU) policies. The EU´s economic prosperity and well being are linked to its natural environment and the global demand for renewable energy and resource-efficient solutions will be a source of new jobs and economic growth in the years to come. As the numerous practical examples from industry demonstrate, eco-innovation is a powerful instrument that combines reduced negative impact on the environment with a positive impact on the economy and society. Eco-innovation call attention to the positive contribution that the small and medium enterprises can make to sustainable development and a competitive economy. To step towards sustainable economic growth, there is a need for much more eco-innovations to appear in small and medium enterprises (SMEs). The aim of the paper is to present the results of empirical research aimed at SME´s involvement in eco-innovation activities in Slovakia and to compare them with the EU 28 average. Our analysis is aimed at five eco-innovation activities contributing deeply to the circular economy. That is a) waste recycling and minimizing waste generation; b) re-planned energy usage to minimize consumption; c) redesigning products and services to minimize the use of materials or using recycled materials; d) changes to the use of water to minimize consumption and to maximize water re-usage; e) usage of renewable energy sources. Identified will be the actual and perceived issues (problems, difficulties) encountered by Slovak SMEs with regard to undertaking eco-innovations. Based on the research results formulated are the implications for SMEs managers and policymakers in Slovakia concerned with the SME´s involvement in eco-innovation. Our study is qualitative and descriptive in nature and most of the data is based on secondary sources. The data used to assess the SME´s involvement in eco-innovation activities come from the survey commissioned by the EC in the year 2016 with the aim to explore SME´s activities in relation to the circular economy (including the eco-innovation activities) in the period of years 2014-2016. As to the Slovakia 383 SMEs operating in manufacturing, services and in the industry sector has been interviewed. The methods used in the paper are the methods of causal analysis, deduction, abstraction, comparison as well as synthesis.*

Keywords: Eco-innovation, small and medium enterprises, Slovak Republic.

Introduction. Europe´s economic growth over many decades has been fueled by the intensive use of resources. However, today it faces multiple challenges of stimulating the growth needed to provide jobs and well-being to its citizens while ensuring that this growth is economically and ecologically sustainable. There is a growing challenge of resource scarcity, growing prices for materials and dependence of the European economy on imported resources. Energy use, water scarcity, land shortages, the depletion of materials and the management of waste are among the most discussed issues posing sustainability challenges.

The Eco-Innovation Action Plan launched by the European Commission in December 2011, is a significant step forward for eco-innovation moving the EU beyond green technologies and fostering a comprehensive range of eco-innovative processes, products and services. Eco-innovation Action Plan efforts have been strengthened by the Green Action Plan for SMEs. The European Union «Green Action Plan for SMEs» introduced in 2014 brings together two important priorities for the European economy: supporting SMEs and promoting resource efficiency. The European Commission set the overall goal of «enabling SMEs to turn environmental challenges into business opportunities» (Green Action Plan for SMEs, 2014). In recent years, many of the Eco-innovation Action Plan and the Green Action Plan for SMEs goals have come together in the concept of the circular economy – an economy that learns from nature in that it wastes nothing. Eco-innovation is key to delivering many aspects of the circular economy.

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Literature Review. The inclusion of environmental aspects into the discussion of innovation leads to the comparably new area of environmental, green or eco-innovation. Schiedering et al. (2012) found that the first expression – environmental innovation – was favoured in the 1990s, while the latter two notions were increasingly used within the last 5 years. Furthermore, the authors compared different scientific definitions that were suggested as a terminological basis for the research area. In the following, several definitions are briefly summarized to illustrate the terminological variety.

Fussler and James (1996) define eco-innovation as «new products and processes which provide customer and business value but significantly decrease environmental impacts». Hillebrand and Driessen (2002) state that green innovation «does not have to be developed with the goal of reducing the environmental burden» but it «does, however, yield significant environmental benefits». Rennings (2000) perceives eco-innovations as new approaches that help reduce environmental burdens or achieve ecological targets and differentiate between technological, organizational, social and institutional ones.

Arundel and Kemp (2009) emphasize that eco-innovation «can be motivated by economic or environmental considerations». Including the economic perspective, Ekins (2010) considers an eco-innovation as being both economically and environmentally beneficial. These examples illustrate the broad variety of notations.

It is evident, that eco-innovations awareness has essentially broadened, particularly where the following aspects are concerned (Alzevedo, 2014):

– Eco-innovation does not only apply to clean and resource-efficient technologies that are specifically aimed at reducing environmental harm. Every product or service generating an environmental benefit (reduced use of natural resources and lower use of emissions and waste) in relation to relevant alternatives should be recognized as an eco-innovation (Kemp and Pearson, 2007).

– Eco-innovation encompasses all environmental improvements across the whole product life cycle, concerning the way they are designed, produced, used, reused, and recycled (EIO, 2011).

– Eco-innovation, from a broader perspective, also embraces environmentally-oriented organizational and marketing approaches, including eco-innovative business models, which can have effects on consumer behaviour (EIO 2013).

Concentrating on most of these aspects and with reference to the OECD general definition of innovation, the expert group of the Eco-Innovation Observatory defines eco-innovation as the following. Eco-innovation is the introduction of any new or significantly improved products (good or service), processes, organizational changes or marketing solutions that reduces the use of natural resources (including materials, energy, water and land) and decreases the release of harmful substances across the whole life-cycle (EIO, 2011).

Eco-innovations are the key to Europe´s future and they stay at the heart of the European Union´s policies. The EU´s economic prosperity and well-being are linked to its natural environment and the global demand for resource-efficient solutions will be a source of jobs and economic growth in the years to come (Zimmermanova et al., 2018, Zimmermanova, Jilkova, 2016). Eco-innovation is, therefore, a powerful instrument that combines a reduced negative impact on environment with a positive impact on the economy and society (Lobzhanidz, Mikiashvili, 2017).

Methodology and research methods. The aim of the paper is to assess the SME´s involvement in eco-innovation activities in Slovakia, to identify the actual and perceived issues (problems, difficulties) encountered by Slovak SMEs with regard to undertaking eco-innovations and to formulate the main implications for SMEs managers and policymakers concerned with the SME´s involvement in eco-innovations.

To fulfill the aim of the paper we formulated two research questions:

1. What is the proportion of Slovak SMEs undertaking eco-innovation activities and the kind of activities taken during the years 2014-2016 in comparison to EU28 average?

2. What are the actual and perceived issues (problems, difficulties) that Slovak SMEs have encountered with regard to undertaking eco-innovations?

Our study is qualitative and descriptive in nature and most of the data are based on secondary sources. The data used to assess the SME´s involvement in eco-innovation activities come from the survey commissioned by the EC in the year 2016 with the aim to explore SMEs activities in relation to the circular economy (including the eco-innovation activities) in the period of years 2014-2016. The survey was carried out in 28 EU member states. As to the Slovakia 383 SMEs operating in manufacturing, services and in the industry sector has been interviewed. Our analysis is aimed at five eco-innovation activities contributing deeply to the circular economy: a) waste recycling and minimizing waste generation; b) re-planned energy usage to minimize consumption; c) redesigning products and services to minimize the use of materials or use recycled materials; d) changes to the use of water to minimize consumption and to maximize water re-usage; e) usage of renewable energy sources.

Other sources of secondary data used in our paper represent the official documents and reports of the European Commission and the Ministry of Environment of the SR. The methods used in the paper are the method of casual analysis, deduction, abstraction, comparison as well as the synthesis.

Results. Research results confirm that during the analyzed three years (2014-2016) nearly 62% of Slovak SMEs have undertaken any of the five eco-activities, while 38% have not. That means, that four of ten SMEs didn´t undertake any of the analyzed eco-innovation activities during the years 2014-2016. In comparison to the EU average, almost 73% of surveyed SMEs in Europe have undertaken any of eco-innovation activity (that is 11% more than in Slovakia).

Figure 1 presents the share of SMEs that have implemented any of eco-innovation activities (or are underway to implement them) in comparison to EU28 average during the years 2014-2016 (own processing).

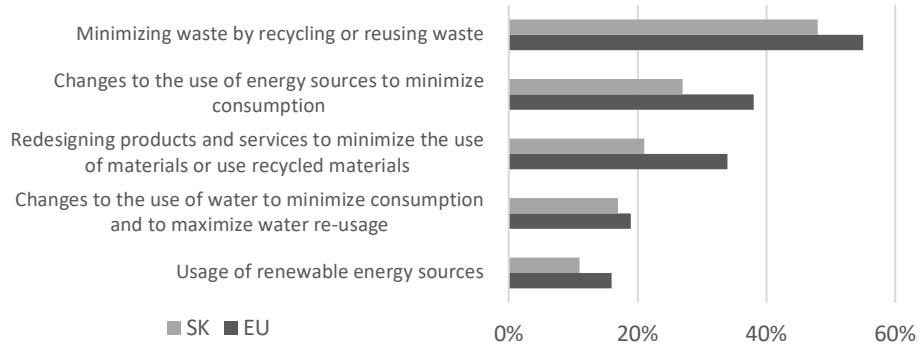

Figure 1. Implementation of selected eco-innovation activities in SMEs

Source: own processing based on Flash Euro barometer 441. European Commission, 2016.

To compare the general position of Slovakia to other EU countries resulting from these results, Slovakia is in 22th place, which is not a very favourable result. The situation calls for a more detailed analysis (Table 1).

What concerns the waste recycling and minimizing waste generation, almost a half (48%) of SMEs in Slovakia minimized within the period of previous three years or has been currently minimizing waste by its recycling or by limiting its generation. Almost 46% of SMEs do not perform these activities and are not going to do them in the future. To the average, the EU SMEs have performed these activities to a greater extent than in Slovakia (55% of SMEs in the EU).

As resulting from the survey, 27% of SMEs in Slovakia implemented changes to the use of energy sources to minimize consumption within the previous three years or has been implementing them currently. More than half of SMEs (59%) do not implement these changes and are not going to implement them in the future. In comparison to EU average, SMEs in European countries implement changes to the use of energy sources to minimize consumption to a greater extend (it is 11% more than in Slovakia).

Only two of ten SMEs in Slovakia (21%) re-designed their products or services to minimize material inputs and to use recycled materials more efficiently in the period of analyzed three years or has been re-designing them currently. Two thirds (67%) of SMEs in Slovakia do not re-design their products and services to minimize material inputs and to use recycled materials more efficiently and are not going to do that. Within EU countries, more than one third (34%) of SMEs have undertaken these activities (it is of 13% more than in Slovakia).

Almost 17% of SMEs in Slovakia (19% in EU) implemented changes to the use of water to minimize consumption and to maximize water re-use within analyzed three years or has been implementing them currently. Almost three quarters (72%) of SMEs in Slovakia (70% in the EU) are not going to implement such changes.

Every tenth SME in Slovakia (11%) used power from renewable energy sources upon the results of the survey in the period of analyzed three years or has been using its currently. Three-quarters of SMEs (75%) do not use renewable energy sources and are not going to use them in the future. As compared to EU-28 countries (16%), Slovakia is characteristic with a lower share of SMEs using renewable energy sources.

Table 1. Share of SMEs that had undertaken any of the following activities during 2014-2016

	Activities*									
	1		2		3		4		5	
	EU	SK	EU	SK	EU	SK	EU	SK	EU	SK
Yes, activities have been implemented	36	8	24	9	21	7	12	5	10	3
Yes, activities are under way	19	40	14	18	13	14	7	12	6	8
No, but we plan to do so	5	5	12	12	9	9	7	8	13	12
No, and we do not plan to do so	38	46	47	59	53	67	70	72	67	75
Don´t know	2	1	3	2	4	3	4	3	4	2

Source: own processing based on Flash Euro barometer 441. European Commission, 2016.

* Activities description:

1: Minimizing waste by recycling or reusing waste

2: Re-planed energy usage to minimize consumption

3: Redesigning products and services to minimize the use of materials or using recycled materials

4: Changes to the use of water to minimize consumption and to maximize water re-usage

5: Usage of renewable energy

SMEs that have undertaken at least one activity in the past three years have mostly self-financed these activities. Only 7% of SMEs finances these activities using a standard bank loan (to 11% of EU average). Very few used EU related funds, a government grant or an alternative source of funding (all 1% of all EU SMEs) and almost no SMEs made use of a green loan.

To the question how easy it was to access finance for these activities, the majority of Slovak SMEs answered that they didn´t use external source to finance these activities, they self-financed them. Overall, 29% of SMEs (18% as EU average) say, it was totally difficult to access finance. Just 8% say accessing finance was easy (13% in EU countries) (Table 2).

Table 2. Share of SMEs indicating easy of the access to finance

	EU 28 average	Slovakia
Total easy	13	8
Total difficult	18	29
It was self-financed; SME didn´t use external sources to finance the activities	63	55
Don´t know	6	8

Source: own processing based on Flash Eurobarometer 441. European Commission, 2016.

Amongst SMEs that have undertaken any of the analyzed eco-activities related to the circular economy, just over six in ten say they have encountered with some of the problems, difficulties (67%) (Table 3). Over one third of SMEs encountered with the problems of complex administrative or legal procedures (45%), while 31% mention the cost of meeting regulations or standards. One third of SMEs have encountered difficulties in accessing finance (33%). At least one in five SMEs has encountered a lack of expertise (18%) or a lack of human resources (21%).

Table 3. Share of SMEs that encountered any of the following issues when undertaking eco-innovation activities during the years 2014-2016

	EU 28 average	Slovakia
Lack of human resources	21	21
Lack of expertise to implement these activities	22	18
Complex administrative or legal procedure	34	45
Cost of meeting regulations or standards	32	31
Difficulties in accessing finance	27	33
Other	3	4
None	38	30
Don´t know	2	3

Source: own processing based on Flash Eurobarometer 441. European Commission, 2016.

SMEs that had not undertaken any of the analyzed activities were asked why they had not done so. Most of SMEs indicated difficulties in accessing finance (22%). Just over 20% of SMEs cite the lack of a clear idea about investment required (17%) or a lack of expertise to implement these activities (13%), while 16% mention the complexity of administrative or legal procedures or cost of meeting regulations or standards.

Research results confirm that Slovak SMEs are facing many challenges. As the main problems were indicated the low level of waste recycling and high rate of land-filling, low share of SMEs using renewable energy sources and implementing changes to the use of energy sources as well as the share of SMEs re-designing products or services with the aim to minimize material inputs and to use recycled materials more efficiently. These problems appear to be the same in the whole population of Slovak enterprises.

What concerns waste recycling and minimizing waste generation the waste management remains a great challenge. Despite of the fact that Slovakia generates comparable amount of waste per capita in comparison to similar economies, the overall situation with the municipal and industrial waste management still needs improvement. The annual generation of waste is below the EU average with 1.17 versus 1.67 ton per capita and 83.22 versus 67.87g/Eur. Eurostat statistics for 2016 stated that up to 65% of municipal waste ended up in Slovakia in the landfills and a rate of recycling of municipal waste was only 23% (EIO, 2018). Several SMEs in Slovakia claim a dedication to responsible waste management. However, most of

the SMEs implement only partial measures that save costs, but they are far away from a transition to the circular economy (SBA, 2018). Multinational companies comply mostly with policies of their parent organizations. As far as Slovak enterprises and start-ups are concerned, it is often a matter of their environmental beliefs (Lesakova, 2019). Positive may be viewed examples of SMEs that have been innovating and found economic opportunities in recycling, up cycling or reducing waste. For example, SME «SK-Tex» recycles textile waste and supplies various products to automotive and other industries. The SME «Ekoray» developed advanced recycling methods that are interesting for many electronic waste processing companies.

The waste legislation has been undergoing major changes in Slovakia since the year 2015. One of important actions contributing to improvement in this area is the legal Act on Waste, which entered into force on 1st January 2016. It covers critical aspects of waste management, including operation of the Recycling Fund. It tackles problems such as a producer responsibility, management of municipal waste or waste prevention, makes producers of specified products obliged to bear all financial costs associated with a collection, transport, preparation for re-use, recovery, recycling, processing and disposal of separately collected waste. By 2030, the municipal waste recycling rate (including the preparation for re-use) has to be increased to 60% and the land-filling rate has to be reduced to less than 25% in Slovakia (MZP, 2019).

Critical is viewed fact, that only one third of SMEs (27%) have implemented changes to the use of energy sources to minimize consumption. The energy intensity of the economy is still one of the highest in the EU, approximately 80% higher than the EU average. The most significant measure implemented in recent years (2015-2016) is the Energy Efficiency Act, which settles a framework for providing energy efficiency audits and support. The goal is to improve energy efficiency and savings and to reduce consumption. Share of renewable energy is coming closer to 14% target in Slovakia and is mostly covered by Slovakia´s traditional clean energy sector based on large hydropower plants and supplemented by a small hydro power, biomass and solar. The energy policy of the SR sets main objectives and priorities of the energy sector by 2035 (MZO, 2019). The main aim is to ensure stability of energy supply, efficient use of energy sources to minimize consumption and environmental protection.

According to the results, there is also a need for better water management in the country (namely in terms of infrastructure projects), better approaches in agricultural use and landscape management (drainage and nitrates pollution) and more advanced treatment of urban waste water. Positively are viewed several initiatives from business and non-governmental organizations that focus on promoting better water management in all business sector.

Several instruments to promote eco-innovation in business practices and sustainable production and consumption are well established in Slovakia. These instruments are the ones promoted at the EU level. These include the EU Eco-Management and Audit Scheme (EMAS) and the Environmental Management System under ISO 14001 (EMS), environmental labelling of products implemented through the European and national eco-labelling schemes, EU Eco-label and Environmentally Friendly Products. However, the results show, that the share of SMEs re-designing their products and services to minimize material inputs and to use recycled materials more efficiently is still in Slovakia low. Thought the SMEs have indicated as the main issue they encountered with regard to undertaking eco-innovation activities the financial reasons (cost of meeting regulations and standards and accessing the finance), in many cases it is a matter of their environmental beliefs (Hroncova, Vicianova, 2017).

Thought Slovakia has implemented most of EU environmental and eco-innovation policies and measures into the SR legal system (EC, 2017; Ministerstvo zivotneho prostredia SR, 2014; Ministerstvo zivotneho prostredia SR, 2019), the progress is slow. European Commission has criticized insufficient approximation of the EU directives to the SR legal system in relation to environmental protection and eco-innovations. Environmental policy stringency in Slovakia has been assessed as above average compared

to OECD countries. According to the World Bank, we lag behind other countries in the quality of regulations and law enforcement.

The need for a new, modern environmental strategy which reflects the actual situation and urgent problems of the whole system of environment has resulted at the new «Envirostrategy 2030 for Slovakia» (Strategic Environmental Policy of Slovakia up to 2030), which was approved in February 2019. The strategy identifies basic system problems, sets 2030 targets and proposes framework measures to improve the current situation. It contains also basic performance indicators for verification of achieved results. The strategy underlines the role of eco-innovations.

Main problems (difficulties) SMEs in Slovakia encountered during their eco-innovation activities may be summarized as follows.

Slovak SMEs are often confronted with a problem to implement complex administrative or legal procedures and with a lack of expertise on new processes, technologies and materials necessary to implement eco-innovation activities and to reach higher resource efficiency. This underlines the importance of highly educated persons in the field of engineering and science (Szczepanska-Woszczyna, Kurowska-Pysz (2016). Highly educated persons in the field of engineering and science present a very low share in the national workforce of population, partly due to a tendency of a «brain-drain» in Slovakia. Better conditions, international exposure, and a creation of a more competitive environment could improve this situation.

Many SMEs in Slovakia indicated difficulties in accessing finance and problems to cover high costs of meeting regulations or standards. They face a lack of financial sources. In many cases it is a question of bureaucratic difficulties in the acquisition of capital from the financial sector as well as through public funds (Lesakova, 2018).

There are also SMEs that do not have an environmental management system put in place and its introduction often materializes as a time- and cost-intensive venture. Consequently, there is often a lack of information about their internal material flows and they have only limited knowledge about the potential effects of an improvement of resource efficiency on costs and profits.

Conclusions. It can be stated that eco-innovations in SME´s sector in Slovakia face many challenges. Based on the above analysis, the main implications for policy makers and SMEs managers in Slovakia may be formulated:

– Policy makers in Slovakia should place greater emphasis on sufficient approximation of EU directions to the legal system of the SR. They have to create effective policy programs and measures supporting SME´s involvement in eco-innovation and helping to establish a stable platform for SME´s eco-innovation.

– Public funding and expenditure in the eco-research and development is still low in Slovakia. (Government environmental and energy R&D appropriations and outlays as a share of GDP were 0.01% in 2016 compared to 0.04% as the EU average.) To tackle with this issue the state, public as well as private institutions, have to be more involved in the financial support.

– Many SMEs indicated difficulties to tackle with administrative and legal procedures as well as with the lack of expertise. This underlines the importance to improve ways and opportunities for SME´s participation in knowledge transfer and in learning about best practices. The importance of skills and knowledge as well as building public-private and B2B partnerships for supporting eco-innovation in SME´s sector is evident (Sroka, Gajdzik, 2015; Kurowska-Pysz, Gregor, 2014).

– It is necessary to raise SME´s awareness about eco-innovations and green business as business with a high added value in relation to the corporate responsibility concept as well as to raise SME´s awareness about the necessity to implement stabile and continual environmental business strategy.

– In cooperation with central government authorities and professional organizations, academia and non-governmental organizations, the more efficient system of formal and informal environmental education and training for sustainable development has to be implemented.

Eco-innovations call attention to the positive contribution that the SMEs can make to sustainable development and a competitive economy. Hence, eco-innovation is understood as the combined improvement of economic and environmental performance of society.

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Еко-інновації та малий і середній бізнес: емпіричне дослідження для Словаччини

Еко-інновації та зелені технології лежать в основі політики Європейського Союзу (ЄС) та являються ключовими факторами подальшого його розвитку. Автором зазначено, що економічний розвиток ЄС залежить від стану навколишнього природного середовища (НПС) та глобального попиту на відновлювану енергію. Таким чином, прийняття ефективних рішень щодо розподілу ресурсів є джерелом створення нових робочих місць та економічного росту у майбутньому. У статті проаналізовано низку практичних прикладів у галузі енергозбереження, що підтверджують гіпотезу про позитивний вплив еко-інновацій на НПС, економічний та соціальний розвиток. При цьому автором зазначено, що впровадження еко-інновацій малими та середніми підприємствами (МСП) має позитивний вплив на їх конкурентоспроможність. Автором наголошено, що для досягнення цілей сталого розвитку, МСП повинні активніше впроваджувати еко-інновації. Головною метою даної статті є висвітлення результатів емпіричного дослідження рівня залучення МСП Словаччини до еко-інноваційної діяльності та його порівняння з середнім рівнем серед 28 країн Європи. Відповідно до поставленої мети дослідження автором проаналізовано п'ять еко-інноваційних напрямів, які мають значний вплив на розвиток циркулярної економіки, а саме: а) утилізація відходів та мінімізація їх утворення; б) перепланування енерговитрат із метою мінімізації енергоспоживання; в) модернізація товарів та послуг для мінімізації використання матеріалів чи їх рециркуляція; г) раціоналізація використання водних ресурсів та максимізація їх вторинного використання; д) використання відновних джерел енергії. Таким чином, дослідження вищезазначених видів еко-інноваційної діяльності дозволили систематизувати наявні проблем, які виникають у процесі впровадження екологічних інновацій Словацькими МСП. Якісний та кількісний аналіз даного дослідження здійснено на основі даних, отриманих із вторинних джерел. При цьому підґрунтям оцінювання участі МСП в еко-інноваційній діяльності стали дані опитування, проведеного у країнах ЄС у 2016 році щодо дослідження внеску МСП у розвиток циркулярної економіки (включаючи еко-інноваційну діяльність) у 2014-2016 роках. У свою чергу, у Словаччині опитано 383 МСП, які працюють у сфері виробництва товарів та послуг, а також промисловості. Методологія даного дослідження заснована на методах випадкового аналізу, дедукції, абстракції, порівняння, а також синтезу. Таким чином, отримані результати дослідження мають практичне значення та можуть бути корисними для менеджерів МСП та представників управлінських структур, залучених у процес впровадження еко-інновацій.

Ключові слова: еко-інновації, малі та середні підприємства, Словацька республіка.

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