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Eco-innovation, a business approach towards sustainable processes, products and services

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Abstract

Eco-innovation has been widely accepted as a method for improving the environmental performance of enterprises and for supporting them to improve their products; as well as to advance to more sustainable business models, and as a driver of business success and competitive advantage at the firm level. Implementing eco-innovation is a challenging process and will not be suitable for all organizations. Therefore understating barriers and drivers at the national and business level, as well as the main gaps in policy and education, could build a better picture of the necessary framework conditions for eco-innovation to be created in Romania. The paper reflects on existing opportunities in the country and demonstrates that eco-innovation potential needs to be addressed. Our research identified existing premises and drivers for eco-innovation that could boost the application of eco-innovation in companies, entail policy changes, and boost cooperation between stakeholders from R&D, academia, businesses, clusters and policy makers. The success of eco-innovation depends on the awareness that will be created among businesses through dissemination of strong business cases, the adjustment of the policy framework that should stimulate and reward the market for eco-innovative solutions and the capacity of experts to convince the companies' management of the financial and environmental benefits of eco-innovation, to explain the need for continuous application of eco-innovative strategies and how they can be mainstreamed in the overall enterprise strategy and overall management. Through its objectives, the ECO Partner project contributes to install a model of cooperation between main actors interested in eco-innovation and build cooperation between the main stakeholders by initiating the Romanian Eco-Innovation Network (RE-IN). The role of the RE-IN is to develop and strength the partnership and to become the main partner in Romania for policy makers, businesses, academia and experts with common interests in eco-innovation.

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1. An overview of eco-innovation general framework

The paper introduces the main arguments (the why, the what and the how) for adoption of eco-innovation at the enterprise level, as explained by international organizations and demonstrated through various business cases and examples, and present the results of the research performed to identify the context, the barriers and the drivers for eco-innovation in Romania.

1.1. Why eco-innovation?

Today, humanity uses more natural resources than the earth can sustain on the long run. The bio-capacity of the earth (including both extraction and absorptive capacity for waste and emissions) has already been exceeded by around 50% (Steffen, Broadgate, Deutsch, Gaffney & Ludwig, 2015). In 2015, the “Earth Overshoot Day” fell on August 13th, which means that humanity has exhausted the natural resources for a full year within only 8 months. In 2017, according to scientist calculations the “Earth Overshooting Day” will land on August, 2nd, meaning that we have used more ecological resources and services than nature can regenerate for us, through overharvesting the forests, overfishing and emitting more CO₂ emissions than the plants can absorb, meaning that through common efforts the humanity managed to move the Earth Overshooting Day with 11 days and demonstrating that is possible to reduce the humanity demand for ecologic resources and services by undertaking concerted actions.

Since 1950, not only the world’s population, but also every societal and economic activity has grown exponentially. The International Geosphere-Biosphere Programme and Stockholm Resilience Centre has published a dashboard of 24 indicators which depict the dramatic acceleration in human enterprise and the impacts on the Earth system over the last two centuries. What is apparent is the synchronous acceleration of trends from the 1950s to the present day – over a single human lifetime - with little sign of abatement. These trends are known as the Great Acceleration. 12 socio-economic and 12 Earth system trends from 1750 to present– are strong evidence that the Earth system has moved to a new state. The economic progress of significant countries around the world, induced more prosperity, increased the appetite for consumption and had an impact on the consumer behavior. The two sets of indicators are therefore interconnected, the earth indicators are clearly affected by the evolution of socio economic trends. Changes in human production and consumption, indicated by gross domestic product, direct foreign investment, energy consumption, transportation, paper or fertilizers use, etc., are reflected by changes in the Earth’s natural systems: climate (greenhouse gas levels, global temperature), ocean acidification, terrestrial biosphere degradation and fish capture (Steffen, Broadgate, Deutsch, Gaffney & Ludwig, 2015).

More studies have revealed in the last years the unprecedented impact of human and economic activities. According to the Millennium Ecosystem Assessment Synthesis Report, the economic development comes with price of unprecedented materials consumption and impact pollution, as a result, 60% of the benefits provided by global ecosystems to support life on Earth (such as fresh water, clean air and a relatively stable climate) are being degraded or used in an unsustainable way (Millennium Ecosystem Assessment, 2005). Maintain the status quo could have unprecedented consequences on the environment, business and welfare.

The recent sustainability challenges (climate change, resource scarcity, environmental degradation, worker welfare) give rise to drivers for change in the way that companies operate. Sticking with the ‘Business as usual’ approach will leave companies unable to respond to issues such as rising costs of resources, disruptions to supply of their raw materials or changes in legislation. Moreover, the economic, social and environmental cost of inaction has been already estimated by OECD as significant, while business financial benefits out of applying already known improvement measures are estimated at 3 trillion USD (McKinsey, 2011). There is therefore, a growing need to find alternative approaches that can help to address businesses and products sustainability, whilst at the same time offer opportunities for growth, cost reduction and competitive advantage (Steffen, Broadgate, Deutsch, Gaffney & Ludwig, 2015).

From this perspective it is widely acknowledged that innovation is a driver of economic and social progress in any country, as well as a driver of business success and competitive advantage at the firm level. Moving towards a

more ecologically sound and prosperous society, is possible by promoting innovations that are addressing the current and future environmental problems, decreasing of energy and resource consumption, while promoting sustained economic activities. This type of innovation is referred to as eco-innovation.

The business case for systemic eco-innovation is now widely accepted. The benefits for business have now been wildly estimated and the opportunities are huge. For example, the global market for low-carbon products is already estimated to be worth over USD 5 trillion and growing. In 2009, Walmart, the largest retailer in the world, introduced a worldwide sustainability index. The index will be applied to over 100 000 global suppliers to give consumers a clear environmental and social rating for every product it sells. A green reputation drives up the companies' financial value; a study by Harvard and London Business Schools found that financial analysts rate companies with a visible reputation for environmental responsibility higher than others, while poor environmental performance can be a serious risk or business. Affordable investments in new technologies and may lead to big savings; For example, the UK's Carbon Trust estimates that most businesses can cut their energy bills by up to 20% with only a small investment – a saving that could equate to as much as a 5% increase in their overall profits. (OECD Sustainable Manufacturing Toolkit, 2011)

1.2 What is eco-innovation?

Eco-innovation encompasses strategies to decouple economic growth from environmental degradation and achieve greater resource efficiency. It aims at doing more and better with less across the entire life cycle of products. At its core, eco-innovation is about reducing resource intensity of products and services and creating new business models that are both competitive, respect the environment and generates value along the entire value chain. There are many opportunities for eco-innovation, those are ranging from low carbon solutions for various economic sectors, green products and green business models to zero-waste cities, smart infrastructures or better managing ecosystems and lifestyles. (Doranova, Miedzinski & Van der Veen, 2012).

A range of examples of successfully applied eco innovation; targeting processes or products (e.g. Michelin energy saving tires), organizations and marketing methods (e.g. Xerox managed print services) or institutions (e.g. Vélib Bike sharing in Paris). Those examples are showing without equivoque what is good for the planet is good for the business also and have the role of inspiring more companies and institutions to apply eco-innovative solutions. Eco-innovation relies on various mechanisms, from interventions at the process level or simple product modification, to re-design of products based on ecological criteria, the use of alternatives or the creation or new marketing and business models. The intervention level depends very much on the companies' awareness level, capabilities and resources but also on their strategy and commitment (OECD, 2009).

1.3 What are the key success factors to boost eco-innovation at a country level?

The emergence of the systemic eco-innovation at the country level requires the creation of favourable conditions structured on two levels of interventions: the market based instruments and dedicated science, technology and innovation policy. At country level, a strong vision and awareness is a pre-requisite, with a clear strategy and targets to address societal challenges (eco-innovation macro-indicators) and a strong promotion of sustainable consumption and production practices. Moreover, general framework conditions (degree of voids, easiness to do business, easiness to innovate) are essential factors to facilitate innovation as well as eco-innovation. (Dries et al. (2005), in OECD (2005b).

According to OECD Synthesis Study on Framework, Practices and Measurement of the Sustainable Manufacturing practices the innovation policy, in most countries, has been the responsibility of ministries for trade, industry and science and technology, while environmental policy has been under the responsibility of the environment protection ministries with little efforts one for integration of these two policy domains. While environmental policies have traditionally focused on “end of pipe solutions”, rather than pollution prevention

solutions or an extended focus on the supply chain, the innovation policy is usually too broad to address specific environmental concerns appropriately. In spite of the recent introduction of some market-oriented instruments, such as green taxes and tradable permits, with very little change. In order to realize its full potential, eco-innovation will require actions to ensure that the full cycle of innovation is efficient, with policies ranging from appropriate investments in research to support for commercializing existing and breakthrough technologies. (OECD, 2009)

Both environmental and innovation policy areas would benefit from closer integration. At market level, a mix of market based instruments can be designed for eco-innovation, with demand measures (regulations and standards, public procurement and demand support, technology transfer) and supply side measures (equity support, research and development (R&D), education and training, networks and partnerships, provision of infrastructure)

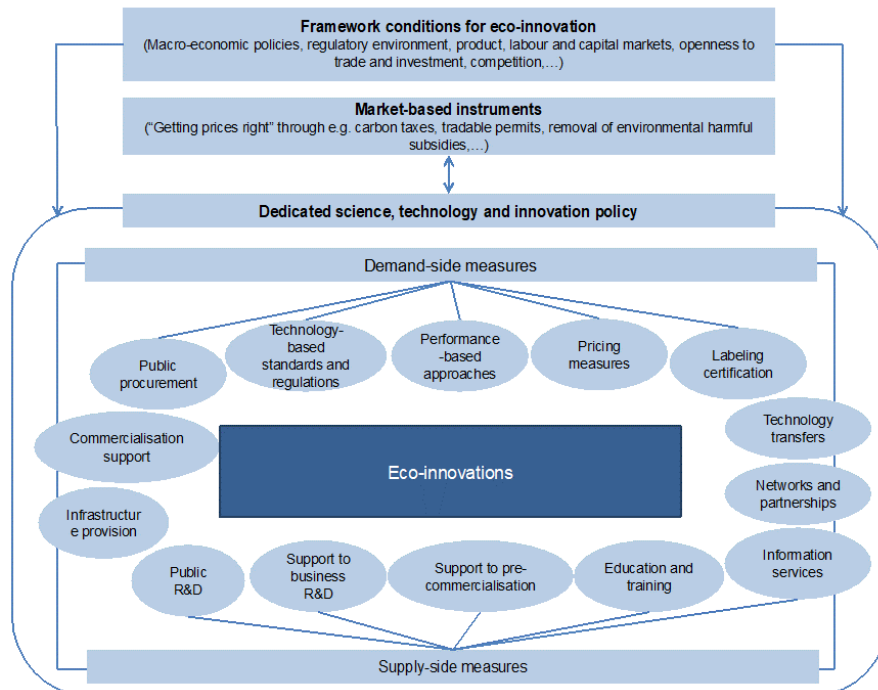


Figure 1: Mapping the primary focus of example of eco-innovation, OECD Sustainable Manufacturing and eco-innovation, Framework, Practices and Measurement, Synthesis report, 2009

1.4 Methodology

The aim of the study was to identify the enabling conditions, challenges, threats and opportunities for eco-innovation in Romania. The study was concentrated on four main parts:

- 1) analyze of the existing premises in Romania: the natural capital, the eco-innovation scoreboard, the research and innovation context and policy context.
- 2) challenges, barriers and drivers for adoption of eco-innovation in the Romanian companies
- 3) results of interviews and direct consultations with stakeholders

The study has been performed during between 2015 – 2016 based on desk research, surveys and direct consultations with relevant stakeholders. The desk research considered information provided by regional, national environmental reports of the NEPA/EPA and other institutions, describing the Romania's natural capital, sectors and markets with high environmental impact, national strategies, and international reports, national and European statistics.

The survey addressed a significant number of stakeholders from academia, public institutions, industries, clusters, NGOs, identified during promotion events, personal contacts, previous work, or based on desk research. The survey investigated the existing experience in eco-innovation and related fields, the interest of organizations in increasing their technical capacity in eco-innovation, developing their own eco-innovative businesses or intervening at the policy level. The survey questionnaire has been sent out to more than 120 organizations such as: research institutions, universities, clusters, associations, consultancies, companies and NGOs., out of which, 47 provided their responses. The response rate was rather low (only 39% responded to our questionnaire); possible reasons for this could be the poor experience in the investigated areas, or possibly eco-innovation is not yet part of their priorities.

2. The development of eco-innovation in Romanian

2.1 National context and premises for eco-innovation in Romania

In terms of impact on the natural environment, Romania is not an exception from the global picture. Comparing the availability of natural resources in Romania with the EU average, data from years 2008 - 2015 showed that the country is facing shortage of potable water sources (2.660 m³ / capita / year of usable water, compared to 4000 m³ / capita / year, the EU average); lower forest coverage due to deforestation in the latest years (23% comparing to 40-45% optimum level); 52% of soil has low or very low fertility, due to irrational agricultural exploitation, industrial pollution and waste landfilled, while the bio productive capacity of the natural capital is estimated at 2.17g ha/capita (natural productive area/ capita) below the socio-economic footprint of 2.7g ha/capita. (NSDS Romania, 2010)

Moreover, according to Eurostat data from 2015, the Romanian economy is characterized by low resource efficiency, expressed as a level of 0.327 EURO/kg GDP/domestic material consumption, compared with the EU average of 1.966 EURO/kg. The energy intensity of the Romanian economy was 235.5 kg oil equivalent/1000 EURO GDP in 2014, comparing the EU 28 average of 122 kg oil equivalent/1000 EURO GDP. As figures shows, Romania's performances are well below the EU average level, although the country is engaged towards transformation to a green economy according to the commitments of the Romanian government from 2016 (signatory of bigE Initiative, green economy as country priority since January 2016)

From the strategic perspective, eco-innovation is considered a form of innovation and is therefore discussed as a whole in the recent strategies: the National Strategy for Competitiveness 2014-2020 and the National Strategy for Research, Development and Innovation 2014-2020. The strategies are approaching the ecologic and innovation aspects in a broader social and economic context. An important step forward in supporting innovation and specialization of key sectors was made in Romania by defining the national sectors with smart specialization potential; those sectors will be further provided with more concentrated and specific support that will enhance also potential for eco-innovation.

Although there is no specific eco-innovation policy in Romania, a number of laws transposed from the European Directives are imposing more demanding requirements to companies referring to: energy efficiency of household equipment, restriction of hazardous substances in electric and electronic equipment, waste prevention and reduction, requirements for packaging, or producer's responsibility. The Waste Law for example requires the producers to redesign their products based on ecological criteria, so the products will have a longer life, will be reusable, repairable an easy recyclable, although there are no specifications for industries on how to approach the requirements, leaving the companies to decide on their measures.

2.2 Status of eco-innovation and eco-innovation scoreboard

According to the European Eco-innovation Observatory methodology, the main components of eco-innovation are based on eco-innovation inputs and outputs, eco-innovation activities, resource efficiency outcomes and socio economic outcomes. Based on the findings of the "Eco-Innovation in Romania, Country Profile 2015" , Romania is

ranked 18th in the EU Eco-innovation scoreboard with a score of 82, situated below the EU28 average score, and has advanced three positions since 2013 (Eco-Innovation Observatory Report Romania, 2014-2015). The main components of the eco-innovation composite index in Romania is represented in Figure 2, and clearly reflects the uneven situation between eco-innovation inputs and eco-innovation outputs. In the absence of inputs, the results in the field of eco-innovation outputs and resource efficiency outcomes are under the EU averages. The exception are the eco-innovation activities - well represented and above the EU average - although, analyzing the data in detail, we led to the conclusion that the major contribution in eco-innovation activities is due to the high number of companies certified according to ISO 140001 standard. Although there is no study in Romania to indicate the efficiency of the environmental management systems, the general practice in Romania, in particular for small a medium size companies, is to formally adopt the ISO 140001 standards, while the level of awareness, commitment and environmental performance of companies remains rather low. This could led us to the conclusion that the indicator referring to eco-innovation activities should have a lower representation in the eco-innovation scoreboard.

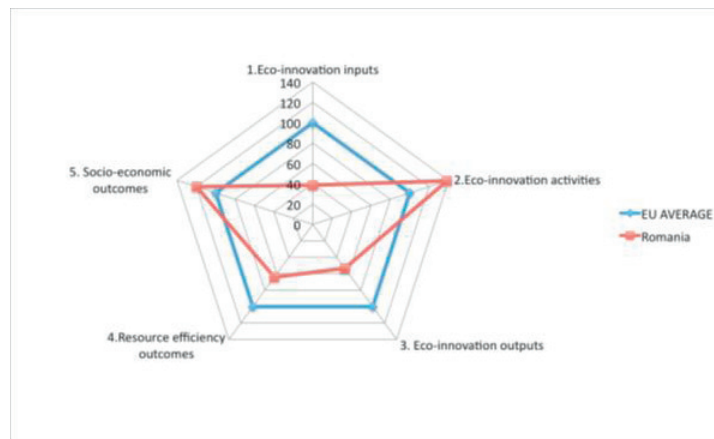


Figure 2: Components of the eco-innovation composite index for Romania, versus EU average (2015), https://ec.europa.eu/environment/ecoap/sites/ecoap_stayconnected/files/romania_eco-innovation_2015.pdf

Three possible reasons for Romania's modest performance in eco-innovation could refer to the following:

- The Romanian business sector is characterized by a short-sighted perspective on profit making;
- The R&D activities are not responding to the current economic, environmental and societal needs;
- The regulatory framework is not providing incentives for eco-innovative practices, products and services.

2.3 Research and innovation context

According to „Research and Innovation performance in the EU”, country profile Report issued by the European Commission in 2014, “the key challenge for Romania remains its low level of competitiveness, which has significant consequences for the research and innovation system. The high-tech and medium-tech sectors of the economy do not contribute sufficiently to the trade balance, the demand for knowledge remains weak, and the innovation culture continues to be underdeveloped”. Romania is ranked as a modest innovator and has one of the lowest values in the EU for both R&D intensity and business R&D investments. There are several reasons for this situation, just naming a few: structure and fragmentation of the research system, underperforming Romanian universities in all major international rankings, the low research activities in the business sector (only 29% comparing to 64% the EU average), illustrated by the low number of patents and researchers employed by business and the low level of business R&D intensity and cooperation with specialized institutes and academia

The Romanian R&I system is primarily public based, with only 29 % of research performed by the business sector (the EU average is 63 %). However, the under-financing of R&D sector since 1990s has created a brain-drain

effect, making Romania an important exporter of researchers. The country is suffering a net outflow of researchers with 15 000 Romanian researchers working abroad (roughly three-quarters of the total number of researchers). As a result, it risks being left with a pool of old researchers with limited career prospects. (European Union Report, 2014).

The poor performance of research and innovation in Romania are the result of the insufficient funding of research and innovation, the lack of a coherent long-term vision and lack of continuity in government policies, coupled with the problems of an economy in transition, poorly structured and financed. For example, in 2014 Romania has allocated only 0.38% of GDP for research and development (R&D), and ranks last in the EU in terms of share of expenditures for research and development in GDP, far below the European average Europe of 2.03% of GDP – according to European Statistical Office (Eurostat).

2.3 Challenges, barriers and drivers for adoption of eco-innovation in the Romanian companies

The Flash Eurobarometer 315 “Attitudes of European entrepreneurs towards eco-innovation” (Gallup, 2011) identifies the main concerns, barriers and drivers perceived by EU entrepreneurs regarding eco-innovation, including data from 200 Romanian SMEs. A total of 5,222 SME’s managers from 27 EU Member States were interviewed by telephone between 24 January and 1 February 2011. The survey covered SMEs from various sectors (agriculture, forestry and fishing; manufacturing, constructions, water supply and waste water, waste management and food) and focused on four main aspects:

- how cost and availability of materials affects the businesses;
- the status of eco-innovation activities and investments in the companies;
- the barriers to an accelerated uptake of eco-innovation;
- the drivers for an accelerated uptake of eco-innovation.

The main findings of the survey referring to the Romanian companies have revealed that Romanian companies are significantly dependent on cost of raw materials, those are representing more than 50% of total cost for more than 44% of interviewed managers. 60% of the Romanian managers dedicate less than 10% of their investment budget towards eco-innovation activities even if they are aware of high impact of the materials and energy cost in the overall business. The main *barriers* for the Romanian companies are: lack of capital within the enterprise (72%); insufficient access to existing subsidies and fiscal incentives (72%); uncertain demand from the market (71%); uncertain return on investment or too long a payback period for eco-innovation measures (62%); technical and technological lock-ins (e.g. old technical infrastructures) (58%); limited access to external information and knowledge, including a lack of well-developed technology support services (45%); lack of collaboration with research institutes and universities (41%); while the main *drivers* for eco-innovation have been identified as : good business partners (73%), high energy and raw materials prices and prognosis (70%), the possibility to secure or increase market shares (66%), good access to external information and knowledge, including technology support services (59%), the increased market demand for green products (51%), expected future material scarcity (50%) and supply chain limitations (46%), existing regulations and standards and expectations for an increased legal pressure (49%) and opportunities for collaboration with research institutes and universities (29%) have been.

2.3 Results of the project research

Within the ECOPartner project we aimed to improve the understanding about the existing conditions for eco-innovation in Romania and to initiate stakeholders’ partnerships for advancing with eco-innovation in Romania. For this purpose we have conducted a research by asking various eco-innovation stakeholders (companies, education and research institutions, NGOs) about their experience, interest and needs on eco-innovation.

During March 2015 and February 2016, our project initiated the survey for identification of main organizations, potential supporters of the eco-innovation process in Romania. The research activities have been performed under the framework of the ECOPartner project, as one of the first initiatives aiming to promote eco-innovation in Romania. The project was implemented by the National Centre for Sustainable Production and Consumption in cooperation with the Swiss partner, the Genevese Association for Development of Circular Economy and the Romanian Association of Clusters. (More information on www.cnpcd.ro) and was co-financed by a grant from Switzerland through the Swiss Contribution to the enlarged European Union.

The study has been performed in two parts: in the first part we identified the relevant stakeholder, built up their data basis and sent them the questionnaire by email followed by telephone call. The second part consisted on face to face discussions during four consultation meetings organized within the framework of the project. The questionnaire was structured in two parts: first part mapping the experience in eco-innovation and eco-innovation related fields, also the initiatives taken so far by the interviewed organizations. The second part asked questions whether the participants in the survey have interest in education, exchanging knowledge in eco-innovation and related fields, offering technical support to companies or contributing to eco-innovation policy. The structure of the interviewed group consisted of clusters (50%), NGOs (10%), companies (5%), institutions (5%), research institutes (15%) and universities (15%).

The results of the mapping process are presented in the above graphs (Figure. 3).



Figure 3 Results of survey: experience of interviewed stakeholders in eco-innovation and their main interest area

9 out of 47 responders claimed their experience in eco-innovation, only two out of 47 responders have experience in eco-innovation related topics while 5 responders claimed experience in research projects focused on eco-innovation. In this context was surprising to observe that 17 out of 47, mostly clusters, expressed their interest in applying eco-innovation in their organizations.

Besides the survey and desk research, the study on eco-innovation context and framework conditions in Romania was completed by direct consultations with stakeholders organized during 4 joint workshops and 28 face to face meetings. The purpose was to investigate more deeply the interests and expectations of the organizations regarding eco-innovation and to identify ways and methods to extend the application of the concept in Romania, to increase cooperation amongst stakeholders and boost adoption of eco-innovation in the private and public sector. During the consultations the main interests' categories have been identified as referring to: capacity building (28, 1%), potential technical support as a service for companies (31, 2%) and research and innovation (25, 1%). The interest for developing eco-innovation policies was lower (only 15, 6%) also due to the reduced number of policy makers responders.

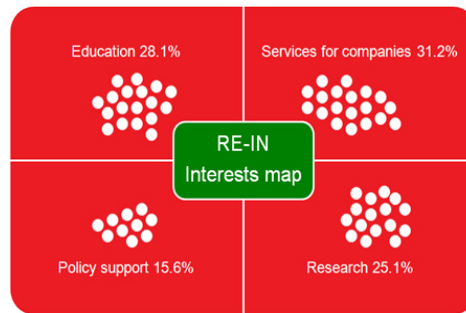


Figure 4: Results of discussions during the consultations – Stakeholders interest map and expectations

The results of the consultations confirmed particular interests for education in eco-innovation, for increased policy support and for more intense cooperation based on future common projects. All participating stakeholders were interested to cooperate for integration of eco-innovation topics into the universities' curricula, dissemination of information (articles, studies, etc.), and development of public policies that will further contribute to improve the framework conditions for eco-innovation. Only few stakeholders were interested in developing eco-innovation support services for companies and institutions.

3. Conclusions and findings

Implementing eco-innovation is a challenging process and will not be suitable for all organizations. Therefore understating barriers and drivers at the national and business level and the main gaps in policy and education, could build a better picture of the context and conditions for eco-innovation in Romania.

The paper reflects existing opportunities in the country and demonstrates that eco-innovation potential is important and needs to be addressed. Our research identified existing premises for eco-innovation and possible partnerships that could foster application of eco-innovation in companies, entail policy changes, and increase cooperation between interested stakeholders from R&D, academia, businesses, clusters and policy makers. Barriers to eco-innovation are more related to the supply side measures while the drivers are indicating an increased demand for eco-innovation products, services and solutions. In this context, fostering eco-innovation supply side measures through public policies and mechanisms, financial and educational support for both public and private sector will have a clear effect on eco-innovation activities and outputs.

Based on the experiences gained during the ECOPartner project, the success of eco-innovation depends on the awareness that will be created among businesses through dissemination of strong business cases, the adjustment of the policy framework that should stimulate and reward the market for eco-innovative solutions and the capacity of experts to convince the companies' management of the financial and environmental benefits of eco-innovation, explain the need for continuous application of eco-innovative strategies and how they can be mainstreamed in the overall enterprise strategy and overall management. For having an impact at a larger scale is essential to build cooperation and partnership within the key stakeholders and work with them to create a joint support and service offering that is more complete and compelling for the enterprises. Through its objectives, the ECOPartner project contributed to install a model of cooperation between main actors interested in eco-innovation, for supporting the enterprises and boost adoption of eco-innovation at the industry level, to build cooperation between the main stakeholders by initiating the Romanian Eco-Innovation Network (RE-IN). The role of the RE-IN is to develop and strength the partnership and to become the main partner in Romania for policy makers, businesses, academia and experts with common interests in eco-innovation.

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