

ON THE ROLE OF ECO-INNOVATION FOR A GREEN ECONOMIC GROWTH

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Abstract

In this paper we resume our research on the theoretical-conceptual issues as well as on the mechanisms and policies for increasing resource-efficiency and resource-productivity in the European Union and in Romania, as important issues of implementing the green economy. First we shall make a conceptual analysis of the eco-innovation as a superior form of technological innovation dedicated to the environmental protection. Then there are emphasized some of the main features and challenges on eco innovation in Romania. This time we also address the importance and the role of eco-innovation in sustainable economic development and the transition to a green economy. In this respect, we shall point again the positive direct correlation between eco-innovation and resource productivity revealed by recent national and international surveys as well as by own research. Conclusions and recommendations support eco-innovation as a way to promote green economic growth in Romania.

Keywords: *sustainable development; green economic growth; resource efficiency; eco-innovation; eco-innovation parks*

JEL Classification: *O44, O47, Q32*

1. Introduction

The latest developments in the global economy and society, such as the financial and economic downturn as well as the increasing environmental transformations driven by the climate change have led eventually to the development and/or the reconsidering of the sustainable development theoretical-methodological issues and concepts.

The paradigm of green economic growth presents an alternative to the conventional economic paradigm of resource exploitation and is built around a theory of growth that integrates concepts such as the sustainable

use of natural resources, including greater energy and resource efficiency and improved natural capital as drivers of growth.

We may consider that a green economy is the ultimate outcome of a sustainable economic development [Frone D.F., Frone Simona, 2015], since a green economy generates increasing prosperity while preserving the natural ecosystems that sustain our societies and our economies.

Decoupling growth from resource use and unlocking new sources of sustainable growth needs therefore coherence and integration in the policies that shape our economy and our lifestyles. A revamping of the economy to become resource-efficient is a necessary, but still not sufficient condition to achieve transition towards the green economy.

2. Conceptual background

Nowadays, sustainable development involves carrying out a green economic growth which is no longer confined to reducing pollution, but requires, among other principles and paradigms, structural changes in the processes and in manufactured products, as well as in the type and amount of resources used. This leads us to the need of a deeper analysis and understanding of the eco-innovation and eco-innovation parks, as some important concepts related to the complex changes of paradigm required by the green economy [Frone Simona, 2015]

As we switch to a more resource efficient and green economy – one in which economic growth, social equity and human development go hand-in-hand with environmental security – business and industry will be a key driving force. A green economy requires step changes in resource efficiency, investment in clean technologies, the development of alternative products, services and materials, and the ability to obtain value from unavoidable waste [UNEP, 2012].

Technological innovation could become the cornerstone of minimizing pollution and at the same time, the key to global sustainable economic development [Constantinescu A., Frone S., 2014]. Therefore, looking for a balance between aspirations towards sustainability and locally existing possibilities to implement it in practice, another concept resulted: eco-innovation.

The eco-innovation is a principle that combines economic growth, employment and sustainable development in an integrated manner as required by the Lisbon Strategy. Thus, technological innovation and eco-innovation are complementary ways to ensure sustainable economic development.

Integrating technological innovation in policy making aiming for sustainable economic development involves both integration of technological expertise and a clear understanding of the wider ramifications

that technology has in the pillars of sustainable development. Tracking the influence of technology in sustainable development base plans, enables highlighting directions that should guide the policies of green growth.

The role of innovation in developing new technologies may be perceived as an economic development based on green technology. This has not only an environmental dimension - the prominent role it plays in reducing GHG, but also a purely economic one, which directly affects key sectors such as energy (supporting exploitation of renewable resources), construction and transportation [Frone S., Constantinescu A.,2014].

In this regard, the best available technology (BAT) was developed, as an integrative concept that aims to integrate specific field measures. The Intergovernmental Panel on Climate Change (IPCC) defines BAT as the most effective and advanced system of methods and practices to prevent, limit or reduce environmental impact of pollutants that may occur in different industries. Another economically imposed concept is Best Available Technology Not Entailing Excessive Economical Costs (BATNEEC). In this respect, the European Council Directive 96/61/EC in 2006 sets emission limit values based on BAT to enrol parameters or technical measures which must rely on the best available techniques, without prescribing use of a specific technique or technology and taking into account technical characteristics of installation concerned, its geographical location and local environmental conditions, pointing out that the price of any measure and its environmental benefits should be considered in a balanced way.

All these have required by the end of 2011 the development, at European level, of an Environmental Technologies Action Plan (ETAP) which structured directions of action with specific targets and responsibilities. It is based on the belief that innovation systems enabling technologies will continue to compile the driving force of modern sustainable economic development, able to transform and extend the value of growth cycles.

Such approaches are inspired by the advent of the new theory of Industrial Ecology (IE) which subordinates economic objective to that of restoring planet resilience through a responsible behaviour of anthropogenic factor. Alignment of ecology to a key area for economic development, suggests its reorientation towards a sustainable use of resources. IE is designed to enable transformation of traditional model of industrial activity in a more comprehensive model by which regional economies can be assembled in an industrial ecosystem composition, so the residues of some companies can be used as inputs for others. In addition, industrial ecosystems can be organized around product or material supply chains and/or in defined geographical areas. The industrial ecology leaves open

development of a holistic solution that includes, besides design of integrated energy networks, recovery of their external and natural resources costs.

Technological change is not only a frontier of innovation but also a challenge on adapting existing products and processes to achieve higher levels of productivity in their local contexts. In this process, capacity of local institutions and enterprises to access technological know-how is essential for modelling their ability to provide products and services, both the kind that are essential to improve living standards and those which could promote sustainable economic growth and competitiveness.

With global resource scarcity and environmental degradation presenting growing challenges for business, along with related market and regulatory pressures, companies are facing a need to think more strategically about the sustainability of their business. According to the definition of the Competitiveness and Innovation Framework Programme of the European Union, eco-innovation is “any form of innovation aiming at significant and demonstrable progress towards the goal of sustainable development, through reducing impacts on the environment or achieving a more efficient and responsible use of natural resources, including energy” [EC COM, 2006].

Eco-innovation is any innovation that reduces the use of natural resources and decreases the release of harmful substances across the whole life-cycle. Hence eco-innovations are the introduction of any new or significantly improved product (good or service), process, organisational changes or marketing solutions that reduce the use of natural resources (including materials, energy, water, and land) and decreases the release of harmful substances across the life-cycle [EIO, 2010].

Eco-innovation covers the research and development of quality products with minor or no impact on the environment and the implementation of environmentally friendly production processes and services, moving from a linear life cycle (extract-consume waste) perspective to a closed-loop process [Wolf et al. 2012]. Eco-innovation can help transform these challenges into new market opportunities, since it is the development and application of a business model, shaped by a new business strategy, which incorporates sustainability throughout all business operations based on life cycle thinking and in cooperation with partners across the value chain [UNEP, 2014]. It entails a coordinated set of modifications or novel solutions to products (goods / services), processes, market approach and organizational structure which leads to a company’s enhanced performance and competitiveness.

3. Eco-innovation and related resource-efficiency performance

It is not resource scarcity, but rather the lack of efficient management of the available resources that poses problems to sustainable development in Romania. This is one of the main statements of a recent report of the EU Eco-Innovation Observatory on the current status and prospects of Eco-innovation in Romania [EIO, 2013a]. From this report we shall mainly highlight the issues regarding the resource-efficiency performance and recommendations in Romania.

According to the *Innovation Union Scoreboard 2011* [EIO, 2013b], Romania was still a “modest innovator” with a relatively low share of innovating enterprises and decreasing business investments in R&D. Romania’s R&D intensity is far below the EU average (the lowest R&D intensity in the EU - 0.47% of GDP in 2010), its sectoral R&D intensity declining relative to that of the EU.

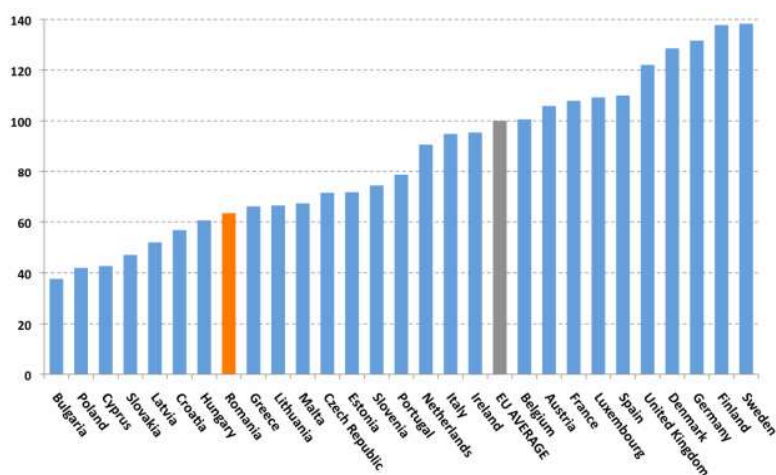
The graph in Figure 1 was based on the EU 28 Eco-innovation scoreboard (Eco-IS) for the year 2013. Eco-IS with its composite Eco-innovation index demonstrates the eco-innovation performance of a country compared with the EU average and with the EU top performers.

For instance (see Figure 1 below), Romania ranks 21st in the Eco-Innovation Scoreboard (Eco-IS), obtaining a score of 63. It is below the overall EU28 average score by 37%, and has advanced one position in the Eco-IS since 2011, from the previous rank 22. The highest ranks are obtained by Sweden and Finland with a score of around 138 each, and by Germany with a score of 132.

Eco-IS is based on 16 indicators which are aggregated into five components, for which we shall highlight the main features in Romania [EIO, 2013a]:

a) eco-innovation inputs;

Romania shows very modest inputs into the eco-innovation system, with a score of 23 out of the EU average of 100. Total green early stage investment in eco-industries was extremely low or close to zero in Romania 2010-2013 (while the EU average investments reached 12.3 USD per capita in the same period).



Source: EIO, 2013

Figure 1 EU28 Eco-innovation scoreboard 2013, composite index

b) eco-innovation activities;

Romania has a positive score in terms of eco-innovation activities, driven by the country's firms' interest in standardisation of their environmental management. The number of Romanian firms acquiring the ISO 14001 certification related to observing environmental management requirements for business reached 413.7 companies per million inhabitants in 2012, almost double the average number of firms per million inhabitants in the EU (208.3 firms per million people). Romania ranks first in this respect in the EU, followed by Spain and Sweden.

c) eco-innovation outputs;

Romania shows a moderate but below average performance in the field of eco-innovation outputs: the mean EI output index is 82. This score is however mostly explained by the relatively high performance in the field of EI media coverage, but poor scores in terms of EI patents and publications.

d) environmental (resource-efficiency) outcomes;

Romania's performance in achieving resource efficiency outcomes *is modest to moderate, as the economy is on average 40% less resource efficient than the EU level*. Material productivity and water productivity are much lower than the EU average, while energy productivity and GHG emissions intensity approach the EU average.

Material (resource) productivity amounts to 0.7 Euro/kg in 2011, which is well below the EU average of 1.7eur/kg, while water productivity is 3.7 Euro/m³, much lower than the EU average of 12.9 Euro/m³ in 1996-2005. Energy productivity shows better prospects, with a value of 7.5 Euro/toe (93% of the EU average of 8 Euro/toe) in 2011. The GHG

emissions intensity is slightly higher in comparison to EU average, amounting to 0.5 CO₂ emissions generated per unit of GDP. In contrast, the EU has a level of 0.36 CO₂ emissions per unit of GDP in 2011.

e) socioeconomic outcomes

Romania's still modest eco-innovation performance translates into low socio-economic outcomes, partly mirroring the low values of EI inputs, outputs and resource efficiency outcomes. The total score reached 37% of EU average performance. Employment in eco-industries was at 0.38% of total employment in Romania in 2012. This positions Romania at 53% of the EU average level of employment in eco-industries, of 0.71% of total employment in 2012.

Thus one significant public policy challenge hereby emerges: **supporting more and making operative the business support infrastructure (e.g. business incubators, technology transfer offices, science and technology parks and clusters).**

Our research in this paper will further testify and strengthen this policy recommendation, since we highlight the importance of eco-innovation and the eco-innovation parks (EInvP) in increasing the resource efficiency (the resource productivity) in the national economies of the European countries.

Ecoinnovation parks are mainly Eco Industrial Parks optimized from an environmental point of view (e.g., piloting installations and processes that incorporate environmental technologies and services) and open for continuous improvement (e.g., collaboration with institutions of research and development).

As we show in [Frone Simona, 2015], eco-innovation and Eco-innovation parks (EInvP) are important drivers of green economic development and resource-efficiency in the EU. The main conclusion of our approach based on a regression model was that in the 16 European countries of the analysed sample there is a **positive correlation between the number of existing eco-innovation parks EInvP and the national level of resource productivity**. Besides, the importance of creating and developing eco-industrial parks, namely eco-innovation parks EInvP is not limited on their potential on increasing the resource efficiency.

In the recent International survey on Eco innovation parks, *Learning from experiences on the spatial dimension of eco-innovation* [ERA-NET ECOINNOVERA, 2014] there are also other important economic benefits, resulting from created synergic mechanisms in the Eco-Innovation Parks since:

- resource efficiency will be generating additive revenue for economic players, providing cost savings and reducing the market dependence of non-renewable and imported resources;

- participation in eco-innovation projects give businesses a competitive edge on the growing green market, as well as more adaptability and flexibility to regulatory changes.

4. Conclusions

This paper aims to state eco - innovation as a key concept that provides economic efficiency by saving energy and resources, in a desire to ensure efficient growth in terms of environmental assets and in peoples benefit. This can create sustainable gains for society in a long-term vision regarding issues of resource and of the environment conservation and a strong support from both the public authorities and citizens.

The focus of our paper being the role of eco-innovation in promoting a green economic growth, we shall highlight here some of the most important conclusions of the above mentioned report on this topic [EIO, 2013a]:

- The Romanian business sector can be *characterised by a short-sighted perspective on profit making*. More steps need to be taken for the private sector actors to adopt a long-term, systemic view on the impact of their business on the local environment.
- R&D activities *need to be streamlined* towards responding to environmental and societal challenges.
- The regulatory framework still *needs to evolve in order to provide incentives* for eco-innovative practices, products and services. More use of green public procurement and further demand-side policies may provide a boost to more sustainable business practices. However, steps have slowly been made towards this due to the push to comply with European regulations and also driven by civil society initiatives

Therefore, Romania's priorities in eco-innovation and green economic development include:

- the greening of production and consumption processes;
- investing in RDI activities;
- enhancing the cooperation between the public and the private sectors in tackling environmental challenges.

Although the issues of sustainability, resource-efficiency and green economy are more and more raised, acknowledged and approached by specialists, strategic documents and politicians, specific measures are expected quite urgently, especially in Romania and those parts of the European Union which are still lagging behind in sustainability performances.

Sustainable development towards a green economy cannot be achieved unless a long-term vision is progressively put into practice. As we

shall stress in future research, Eco-Innovation Parks are an example of project that requires long term planning with the consideration of eco-innovation in the different steps of the project development.

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