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# Exploring Eco-innovation Trends in the European Construction Sector. Focus on Romania

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Dorel Mihai Paraschiv<sup>1</sup>  
Estera Laura Langă (Nemoianu)<sup>2</sup>  
Claudia Olaru (Langă)<sup>3</sup>

*This article has an exploratory nature and it illustrates the main eco-innovation trends existing in the European construction sector, with a special focus on the Romanian building sector. This paper finds that there are more and more companies active in the Romanian construction sector, whether multinationals or SMEs, which discovered the potential benefits of environmentally responsible innovation. The value of this research lies in approaching an innovative subject, in the context of a lack of consolidated data on eco-innovation in Romanian companies, particularly in the construction sector.*

*Keywords: eco-innovation, construction sector, innovation, sustainability, Romania*

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## 1. Introduction

Eco-innovation is a concept that plays a key role in moving industries towards sustainable development, having important potential benefits

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<sup>1</sup>**Dorel Mihai Paraschiv**, Phd, The Bucharest Academy of Economic Studies, Romania, paraschiv@inde.ro

<sup>2</sup>**Estera Laura Langă (Nemoianu)**.The Bucharest Academy of Economic Studies, Romania, estera.nemoianu@doesec.ase.ro

<sup>3</sup>**Claudia Olaru (Langă)**, The Bucharest Academy of Economic Studies, Romania, claudia\_langa@yahoo.com

for companies, sectors and entire economies. Reid and Miedzinski (2008, p.2) described eco-innovation as “the creation of novel and competitively priced goods, processes, systems, services, and procedures designed to satisfy human needs and provide a better quality of life for everyone with a whole-life-cycle minimal use of natural resources (materials including energy and surface area) per unit output, and a minimal release of toxic substances”. Eco-innovations can refer to products (goods – such as construction materials, or services – such as car sharing or environmental consulting), processes (such as production methods and procedures), marketing (methods including changes to product design, packaging, voluntary eco-labeling promotion, pricing, and distribution), organizational structures (new methods in the firm’s business practices, workplace organization or external relations), or to institutions (related to society in general, such as social norms and cultural values).

In the context of the increasing trend of overconsumption of natural resources, as well as of the volatility, growing scarcity and rising prices of materials, the eco-innovation challenge has become two-fold: the continuous improvement of resource-efficiency performance of Europe while avoiding the increase in the total consumption of natural resources (EIO, 2011, p. VII). Furthermore, eco-innovation facilitates the evolution of sustainable manufacturing initiatives from the traditional pollution control – through cleaner production and eco-efficiency initiatives, to a lifecycle view – through the establishment of closed-loop production and industrial ecology (OECD 2009, p. 14). Thus, eco-innovation goes beyond inventing green technologies, taking into consideration the way in which products are designed, produced, used, re-used and recycled.

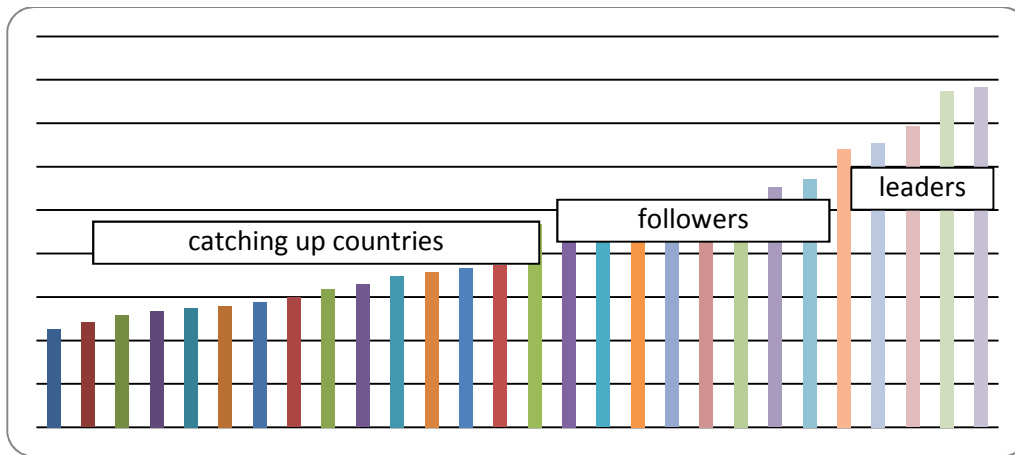
This paper has an exploratory nature, this option being the most adequate, as there is little consolidated data on eco-innovation activities in the Romanian construction sector. Thus, the article will further explore the main eco-innovation trends existing in the European construction sector, with a special focus on the Romanian building sector. The construction sector was selected as a research area due to several reasons. Firstly, the negative impact that the industry has on the environment is globally acknowledged. Secondly, the United Nations Environmental Programme 2007-2008 considers the industry as having the highest potential to reduce greenhouse gas emissions efficiently and rapidly (WBCSD Energy Efficiency in Buildings: Transforming the Market, 2009, p. 16). Furthermore, according to the EIPRO Study (2006) areas such as housing, mobility and food & drink were identified by the European Commission as having the highest environmental impact throughout their entire lifecycle, eco-innovation being essential to help reduce resource usage and environmental impacts.

## **2. Eco-innovation in Europe**

The Eco-Innovation Scoreboard (Eco-IS) is a tool developed by the Eco-innovation Observatory to assess and illustrate eco-innovation performance across the EU. As illustrated in Figure 1 below, the Member States can be grouped in three main categories, consistent with their eco-innovation performance: eco-innovation leaders (Finland, Denmark, Germany, Austria, Sweden), eco-innovation followers (Belgium, Netherlands, UK, Ireland, Spain, Italy, France, Luxembourg), and countries catching up in eco-innovation (the largest group that includes Romania as well).

Figure 1

## EU-27 Eco-Innovation Scoreboard: composite index



*Source of data: Eco-Innovation Scoreboard 2010*

Eco-innovation is considered as a relevant strategy for all countries, although the business opportunities and actions may be different. In terms of sectors and markets, two EU-wide surveys – the Community Innovation Survey (CIS 2008, Eurostat 2010), and the Eurobarometer Survey (2011) – were designed to compare the eco-innovation activities and the degree of their implementation across various European sectors.

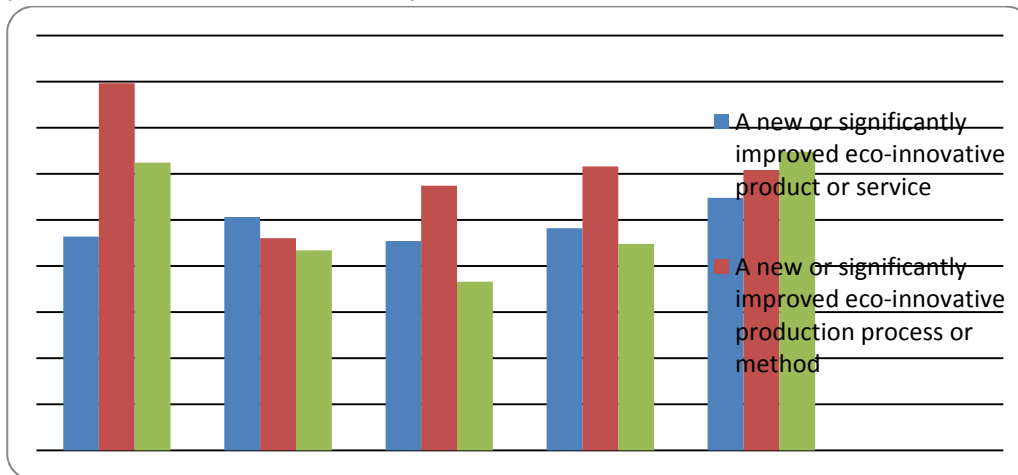
Firstly, the CIS 2008 is a survey focused on innovation performance of businesses, meant to identify the sectors that are more inclined towards implementing environmentally beneficial innovations. It shows that the manufacturing sector has the highest share of companies implementing eco-innovations to reduce material use (EIO 2011, p. 40), while the electricity, gas, steam and air conditioning supply sector has the highest share of companies implementing eco-

innovations to reduce the use of energy. The CIS 2008 report also highlights the fact that most innovations with environmental benefits are aimed at improving energy efficiency, with lower focus on increasing material use efficiency.

Secondly, the Eurobarometer survey 2011 was meant to investigate the behaviour, attitudes and expectations of entrepreneurs towards the development and incorporation of eco-innovation as a response to mounting prices of resources and resource shortage. Over 5000 managers of SMEs active in a number of sectors (agricultural, construction, manufacturing, water supply & waste management, and food services) in the 27 EU Member States were interviewed. According to the survey, a quarter of the companies interviewed stated that the share of innovation investments related to eco-innovation was between 10% and 29%, with water supply and waste management being the leading sectors.

45% of EU-27 companies introduced at least one eco-innovation in the past two years. Furthermore, approximately 30% of companies in the EU had introduced a new or significantly improved eco-innovative production process or method in the past two years, while 25% had introduced a new or significantly improved eco-innovative organizational method. A similar proportion (25%) had introduced a new or significantly improved eco-innovative product or service on the market. Figure 2 below shows the types of eco-innovations introduced by companies in the last 2 years, by sector. Companies active in the agricultural, water & waste management and manufacturing sectors preferred process innovations, while companies in the construction sector chose to invest in product innovations. Organizational innovations were popular among companies in food services.

**Figure 2**  
**Types of eco-innovation introduced by companies in the last 2 years, per sector of activity**



*Source of data: Eurobarometer survey 2011*

Also, it is interesting to note that more than 8 in 10 entrepreneurs answered that prices for materials would increase in the coming 5 to 10 years (from 82% in Spain and Romania to 97% in Luxembourg and Germany), leading to expectations regarding measures of cost and material use reduction.

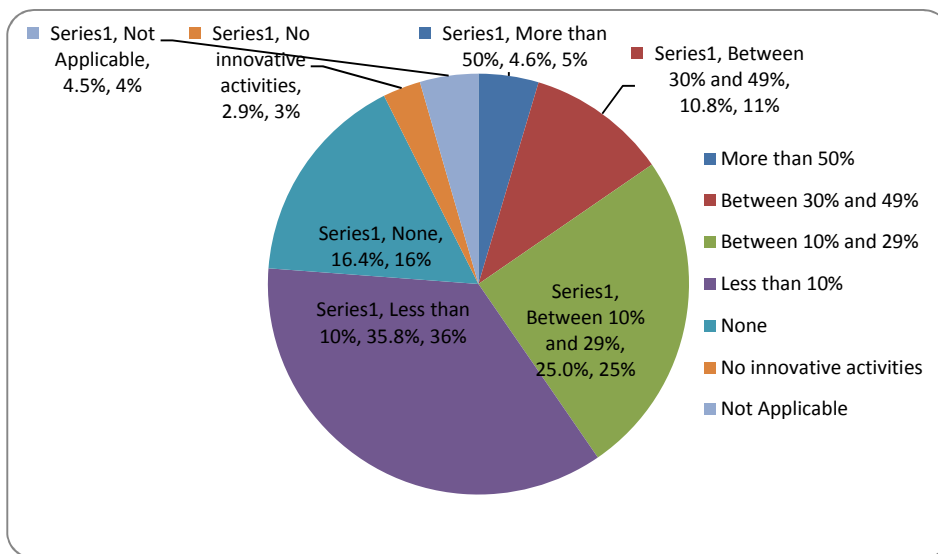
### 3. Eco-innovation trends in the European construction sector

The construction sector is considered to be one of the largest markets worldwide, contributing approximately by 10% to the GDP in most EU countries and to 7.5% to overall employment in the EU (Eurostat 2011). However, the industry suffered greatly due to the recent financial crisis and is slowly recovering. While the boom period represented for the construction industry a series of unsustainable and business practices and decisions, the crisis marked a turning point for

the European construction, focusing more on renovation and added value (EIO Thematic Report 2011, p. 7). As the biggest consumer of resources, it is critical for the construction sector to follow the resource efficiency trend – especially in the context of a high potential in this area. Furthermore, resource efficient construction can be seen as risk minimizing strategy giving buildings higher market value, while lowering environmental impact (WBCSD 2010).

The Eurobarometer survey 2011 identified that the majority of companies in the construction sector have made some kind of investments in innovation activities in the past 5 years, however very little was actually invested in eco-innovation activities. As shown in figure 3 below, more than 30% of companies reported that eco-innovation made up less than 10% of their innovation investments, and only 5% were investing more than 50% in eco-innovative activities.

**Figure 3**  
Share of eco-innovation related investments in the construction sector over the last 5 years



*Source of data: Eurobarometer survey 2011*

The Eurobarometer survey results show that the innovation efforts at company level in the construction industry are not focused on improving resource efficiency and thus, increasing efforts to reduce material costs are need to occur in the near future. As shown before, EU entrepreneurs expect material costs to grow in the future. The Eurobarometer shows that 86% of companies introduced at least one change in the past 5 years to reduce material costs. As one of the sectors with the largest material needs, increasing future costs could have a great impact on the construction sector. Many construction firms implemented changes to reduce material costs in the past five years (Eurobarometer 2011), including: purchasing more efficient technologies (56.2%), recycling (51.7%), developing new technologies



in-house (45.6%), improving material flow in the supply chain (45.5%), substituting materials for cheaper alternatives (37.7%), outsourcing production or service activities (31.8%) and changing business model (21.9%).

However, an increasing attention is given to sustainable construction, from greener construction materials and construction technologies to sustainable buildings that are more energy efficient and have a lower negative impact on the environment during their entire lifecycle. Green Building Councils across countries are working together to help the construction sector develop in a sustainable manner (World Green Building Council Europe Regional Network).

#### **4. Eco-innovation in the Romanian construction sector**

According to the Eco-IS, the overall eco-innovation performance of Romania is well under the EU-27 average, consequently belonging to the catching-up countries group. Furthermore, Romania is lagging behind EU-27 average in terms of eco-innovation activities, as well. Although the improvements have been made during the past decade, the Romanian companies are still well behind EU countries in terms of eco-innovations focused on material and energy use reduction. Thus, 32.8% of Romanian companies are reducing energy consumption through their innovations, while 22% are reducing CO<sub>2</sub> emissions. The EU Eco-Management and Audit Scheme (EMAS) is a management tool for companies and other organizations to evaluate report and improve their environmental performance and it was taken into account when creating the eco-innovation composite index of Eco-Is. It is one of the reasons that keep Romania at the bottom of the EU-27 list of eco-innovating countries, as there are only 3

Romanian organizations with EMAS certification. In addition, there are hardly any patent filling in the field of environment and energy in Romania (EIO Country Profiles Romania 2011, p. 7).

The Eurobarometer survey highlighted the main eco-innovation drivers in Romania, namely growing interest in green products and EU and national funding for eco-innovative projects, as well as the main eco-innovation barriers, including insufficient knowledge of market situation and potential of environmental technologies, and the lack of private financing sources for eco-innovative activities. Although the overall performance of our country is significantly lower than the EU average, Romanian firms recently shown a positive trend in research, development and innovation activities (Șipoș G.L., 2009). One area in which progress was made was the construction sector, namely in the area of energy efficiency and renewable energy use.

In terms of energy efficiency of buildings, a worthy initiative is considered the European Union Directive on Energy Performance of Buildings (transposed into Romanian legislation by Law no. 372/2005 on the energy performance of buildings). According to the Directive (Law no. 372/2005, Article 24, p.5), it is mandatory for every new or existing building to have an energy performance certificate, without which trading would not be possible. Furthermore, the Romanian government has been implementing a Green House program to stimulate the use of renewable energy sources for water heating and the National Thermal Rehabilitation Program to increase energy efficiency of buildings. The Ministry of Environment estimated that the Green House program would result in a 60% reduction of water heating costs and a 30% reduction in housing heating costs. Romania

also is the place to develop green buildings, that have already obtained certification or are currently under LEED or BREEAM certification, or hotels that received the European Eco-label (Nemoianu E.L., Langă C.A., 2010). Increasingly more companies and media representatives are starting to understand the need for eco-innovation in construction, while nongovernmental (such as the Romania Green Building Council and WWF Romania) and professionals associations (Association of Energy Auditors for Buildings, ROFMA - Romanian Facility Management Association) are encouraging the promotion of the concept through events, reports or other materials.

The Romania Green Building Council, a non-profit organization, is actively supporting the development of a sustainable construction sector, through training activities, pilot projects and networking opportunities to encourage collaboration and expertise sharing among Romanian companies active on the building sector. One of the pilot projects is ecoBiblioteca, having as main objective the sustainable renovation of the library of Cacica village in Suceava County, in order to promote sustainable construction principles and solutions that are easy to replicate for other communities. According to the organization, the project will utilize integrated design strategies delivering a project that will result in dramatic reductions in energy costs and improvements in the comfort and well-being of the visitors and library staff. In addition, the project will implement a variety of both modern green technologies and historical methods of reducing energy use and negative environmental impact. These include but are not limited to: natural ventilation, solar passive design, green energy, minimization of the technical space, septic tank with natural composting/filtrating system, energy efficient and improved lighting,

and repartitioning and opening the building to increase natural day lighting.

Furthermore, there are more and more examples of companies that invested in eco-innovation at various levels in the construction sector. Mainly due to the harsh EU regulations related to pollution, waste management and carbon emissions, the cement industry made significant investments in technologies to reduce the emissions of dust, greenhouse gas and noise, to comply and even exceed the current legislative requirements. New assortments of greener cement and concrete have been developed, based on the use of alternative raw materials, recycling and reuse of various waste (Nemoianu E.L, 2011). The small and medium sized enterprises in the construction sector are considering investments in eco-innovation, as well. The table below includes a brief description of 10 SMEs active in the Romanian construction industry, as a result of a pilot interview-based research conducted during January-February 2011 among SMEs active in the Romanian construction sector (Paraschiv D.M et al., 2011).

**Table 1**

**Eco-innovation activities performed by 10 Romanian construction SMEs**

Name	Activity	Eco-Innovation
A	Green building consultancy	<ul style="list-style-type: none"> <li>- Services encourage construction of more environmentally friendly buildings (efficiency in terms of energy use, water and wastewater management, waste management, etc.)</li> <li>- Involved in recycling activities</li> </ul>
B	Supplier of renewable energy solutions	<ul style="list-style-type: none"> <li>- Products and packaging with low negative environmental impact</li> <li>- Educational programs for employees</li> <li>- Consumer awareness programs</li> </ul>
C	Construction project management and consultancy	<ul style="list-style-type: none"> <li>- Services encourage construction of more environmentally friendly buildings</li> <li>- Offices obtained a Green Building Certification</li> </ul>
D	Supplier of construction materials	<ul style="list-style-type: none"> <li>- Products and packaging with low negative environmental impact</li> <li>- Measuring carbon footprint</li> </ul>
E	Architecture	<ul style="list-style-type: none"> <li>- Services encourage construction of more environmentally friendly buildings</li> <li>- Involved in recycling activities</li> </ul>
F	Supplier of ecological coatings and insulation	<ul style="list-style-type: none"> <li>- Products and packaging with low negative environmental impact</li> </ul>

G	Solutions for intelligent buildings	<ul style="list-style-type: none"> <li>- Services encourage construction of more environmentally friendly buildings</li> <li>- Intensive efforts to encourage better construction legislation</li> </ul>
H	Solutions for green roofs	<ul style="list-style-type: none"> <li>- Services encourage construction of more environmentally friendly buildings</li> </ul>
I	Modular green buildings	<ul style="list-style-type: none"> <li>- Revolutionary green building design</li> </ul>
J	Sustainable landscape design	<ul style="list-style-type: none"> <li>- Services encourage construction of more environmentally friendly buildings</li> <li>- Intensive efforts to encourage better construction legislation</li> </ul>

*Source of data: Paraschiv D.M. et al. (2011)*

As shown in Paraschiv D.M. et al. (2011), the majority of SMEs (A, B, C, D, E, F, G, H, J) chose to invest in eco-innovations at the level of processes and products they supply, with fewer examples moving forward to changes in organizational structure and marketing methods (A, E, B, C, D) and even less to changes in institutional and more profound organizational changes. For instance, only company I invested significantly to provide alternative solutions to traditional buildings and materials, by creating a revolutionary design to build affordable green homes. This is mainly due to the fact that complex and systemic changes require significant financial efforts and commitment from top management and employees to lead to a sustainable production and consumption process. Additionally, green investments are still seen with skepticism, as the social and economic benefits are not immediately visible and/or measurable.

## 5. Conclusions and future research

This paper finds that there are more and more companies active in the Romanian construction sector, whether multinationals or SMEs, which discovered the potential benefits of environmentally responsible innovation. The value of this research lies in approaching an innovative subject, in the context of a lack of consolidated data on eco-innovation in Romanian companies, particularly in the construction sector. The current paper represents a starting point for a descriptive research to explore, measure and evaluate the Romanian companies' objectives and accomplishments in terms of eco-innovation, as well as the incentives and barriers encountered on the path towards eco-innovation. Due to their interest in eco-innovation and sustainable development, the authors would like to undertake a more in-depth research on a larger scale having more generalized and industry representative results.

There is a substantial potential to eco-innovate in the construction sector in Romania, as many of the successful eco-innovative examples across Europe can be easily replicated in our country as well. The OECD Sustainable Manufacturing and Eco-Innovation Synthesis Report Framework, Practices and Measurement (2009, p. 20) emphasizes that the primary focus of eco-innovation in manufacturing industries tends to rely on technological developments (mainly related to products and processes as targets and re-design or modification as mechanisms).

While product innovation incentives are necessary, technological innovation alone is not sufficient to enable the transition of Europe into a sustainable economy; the magnitude of the challenge also calls

for systemic innovations in the way services are delivered and organizations are run. Public acceptance and social changes are key in this process (EIO 2011).

In recent years, the green building movement has overcome many technical and economic obstacles, but the adoption of green building principles into practice still remains low. A. Hoffman and R. Henn (2008) argue that progress in the implementation of ecological principles in the design and construction of buildings will be very slow if the social and psychological barriers that the authors find significant will not be removed. Most important barriers to eco-innovation are mainly related to economic and financial factors, notably to the lack of funding and the uncertain market demand. Thus, both the European Union, and the country governments have a key role to play in encouraging eco-innovation initiatives through proper regulation, economic incentives and intelligent funding mechanisms.

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