Eco-innovations in the urban regeneration projects

Green Project Funding

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Publisher's note

We're delighted to bring you the book series prepared by the Authors taking part in the "Eco-innovations in cities" Project (POKL.04.03.00-00-249/12-00). The series, which is available free of charge, consists of six books:

- "Eco-cities" by Dominika Brodowicz, Przemysław Pospieszny and Zbigniew Grzymała
- "Green Project Funding" by Hanna Godlewska-Majkowska, Katarzyna Sobiech-Grabka, Paweł Nowakowski
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- "Making the 21st Century Cities" ed. by Krzysztof Jarosiński.

The Project was designed and prepared by Professor Marek Bryx, Deputy Rector of the Warsaw School of Economics (SGH), and Doctor Dominika Brodowicz. The Project has been carried out within the Priority IV "Tertiary Education and Science", Measure 4.3 "Strengthening the didactic potential of universities in the fields of key importance for the aims of Europe 2020 Strategy". In line with the objectives, the Project is conducted from 1st July 2013 until 31st December 2015.

The main aim of this Project was to create at the Warsaw School of Economics a one-year specialisation entitled "Eco-innovations in the urban regeneration projects". What is more, the Project's aim is to develop the study offer concerning the area of green and socially responsible eco-innovations in cities regeneration. The main objective of this new specialisation is to enhance students' knowledge

about eco-cities, give them sufficient information and discuss case studies on the subject: how contemporary cities should be planned, developed and managed. As most of our communities exist within the urban environment, the provision of eco-innovations is essential for the well-being of society. This unique educational programme for M.A. students provides information on maximising the benefits of making innovative and creative cities to citizens, local authorities, planners, developers, students, researchers and non-government organisations interested in improving the quality of life in cities.

MSc Alina Modrzejewska-Kołakowska – Project Manager
Prof. Anna Szelągowska Ph.D. – Project Methodological Coordinator

Introduction

Creating modern, environmentally friendly solutions, allowing for revitalization and restructuring of post-industrial areas, and spurring new development for less developed regions for less developed regions are all gaining significance in the 21st century.

The awareness of the need to create eco-innovative solutions has become common and widespread. However, their implementation faces financial barriers resulting from the capital-intensive character of majority of eco-innovative solutions, as well as the high investment risk related to them. Therefore, knowledge in the field of financing eco-innovations is increasingly important.

This textbook is designated for students of the "Green Project Funding" course, and it complements the knowledge available in the e-learning materials prepared for this course. Our goal is to provide readers with a compendium of knowledge necessary to operate in the eco-innovations market, including the specifics of green project funding and financing options for eco-innovative projects.

After reading this textbook, the reader should understand the specifics of eco-innovative projects, and be able to identify market regulations as well as the main mechanisms and instruments of financial resources allocation for eco-innovative projects.

In the first chapter, by Hanna Godlewska-Majkowska, the nature and characteristics of eco-innovations are presented, and the demand side characteristics and main sources of financing eco-innovations are described.

The distinctive characteristics of eco-project finance and public-private partnerships are described in the second chapter, authored by Katarzyna Sobiech-Grabka.

In the third chapter, Paweł Nowakowski presents the institutional foundations of developing eco-innovations, with a special focus on the factors supporting financing of eco-innovations.

The fourth chapter, written by Katarzyna Sobiech-Grabka, extends the previous material by focusing on intermediary instruments shaping the market of eco-innovations, including penalties and charges.

The fifth chapter, by Paweł Nowakowski, presents a systematic review of various forms of support provided for eco-innovative projects with public funds. It also presents the barriers to access eco-finance, with special focus on small and medium size companies.

In the seventh chapter, Paweł Nowakowski provides examples illustrating solutions designed to overcome the barriers described in chapter sixth, including debt risk sharing instruments, business angel co-financing, and other examples such as the JESSICA financing instrument and eco-incubators.

Despite the importance of public sources – especially during crises – they should typically be secondary types of funding for eco-innovations. The leading role in securing funds arguably belongs to commercial financing. Numerous forms of these sources are demonstrated in the eighth chapter, prepared by Katarzyna Sobiech-Grabka.

Within this textbook, the authors present not only Polish, but also other European sources of financing. Examples presented in particular chapters are further detailed within the e-learning materials and workshop type classes.

Chapter 1

Framework for financing eco-innovations

Hanna Godlewska-Majkowska

Introduction

Green projects are investment projects that concern eco-innovative solutions. Thanks to these projects the leading innovations concerning sustainability, radical resource productivity, whole system design, biomimicry, green chemistry, industrial ecology, renewable energy and green nanotechnology can become important tools to build a framework for sustainable economy and influence living conditions of present and future generations.

As the range of eco-innovative solutions is wide, such projects can be financed by various types of stakeholders: companies, individuals, financial institutions, territorial government units, the state, international organizations, by means of special mechanisms that facilitate transfer of funds.

The goal of this chapter is to briefly show specificity and mechanism of financing eco-innovations, and explain why eco-innovations need combining various sources of financing.

The another aim of this chapter is to show global eco-innovation investment market and growth perspectives of this market and to point similarities and differences in attitudes towards eco-innovative solutions, depending on micro- and macroeconomic points of view. Moreover, the meaning of supporting pro-ecological attitudes with eco-labels is described.

1.1. Introduction to financing eco-innovations

Green projects are investment projects that concern eco-innovative solutions. Thanks to these projects the leading innovations concerning sustainability, radical resource productivity, whole system design, biomimicry, green chemistry, industrial ecology, renewable energy and green nanotechnology can become important tools to build a framework for sustainable economy and influence living conditions of present and future generations.

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„Defining **eco-innovation** is not an easy task although several attempts have been made in the literature. In general, these definitions emphasize that eco-innovations reduce the environmental impact caused by consumption and production activities, whether the main motivation for their development or deployment is environmental or not.[1] The concept of eco-innovations and their role in creating relations between humans and nature can be better understood by the following comparison of different approaches (Table 1.1):

Table 1.1. The humans and nature conceptual framework developed from the literature

Perspective on humans and nature	Unity	Connection	Separation	Contraction
Metaphor	Mother earth	Planet earth	Spaceship earth	Production resource
Vision of nature	Cosmos	Universe	Creation	Reservoir
	Wilderness	Landscape	Machine	
Basic attitude	Desire	Respect	Engineering	Disrespect
	Reverence	Exploring	Power	Utility
	Humility		Control	Exploiting
	Concern			
Relationship with nature	Reciprocal	Observing	Leading	Superior
Ecology	Gaia	Industrial metabolism	Design for Environment	Eco-efficiency
	Biomimicry	Cradle to cradle	End-of-pipe	
	Biodiversity	Eco-effectiveness	Cleaner Production	
	Deep Ecology			
Eco-innovation	Regenerative	Cyclical	Restorative	Exploitative

Source: prepared by author, based on: N. Hofstra, D. Huisingh, 2014, *Eco-innovations characterized: a taxonomic classification of relationships between humans and nature*, *Journal of Cleaner Production,* 66, p. 465.

[1] Boons F., Montalvo C., Quist J. and Wagner M., 2013, *Sustainable innovation, business models and economic performance: an overview,* Journal of Cleaner Production, 45(0), pp. 1-8.

In the comparison above the regeneration roles of eco-innovations and self-supporting mechanisms are emphasized. This approach is especially important nowadays, when we face new dangers to public security like cyber-attacks or the risk of proliferation of bacteriological contamination resulting from great geographical mobility of people. These are combined with dangers that have been exposed to for a long time such as lack of access to strategic energy resources, due to cultural tensions combined with politically disadvantageous geographic structure of natural resources: 2/3 of known global resources of oil are in possession of the countries of the Persian Gulf Basin and 1/3 of global resources of natural gas are in possession of Russia.

At the same time intensive urbanization processes takes place, mainly in the developing countries, which is often combined with climate conditions that pose problems to safety management (e.g. the monsoon climate), like increasing risk of floods in big cities. This creates specific challenges concerning financing eco-innovations.

Because of the fact that eco-innovation can be widely defined, we can distinguish 6 groups of eco-innovations. They are described in the following table.

Table 1.2. Types of eco-innovations

Type	Types Description
Product	Product eco-innovation includes goods and services. Eco-innovative goods are produced so that the overall impact on the environment is minimised, and eco-design is a key word in this area. Future product design will take into account resource constraints with a higher priority than it is happening today, especially if commodity prices continue to increase. Designing a product in a manner that leads to decreased environmental impacts and less resource use during operation and that allows recovery options like repairing, remanufacturing or recycling should become key business strategies not only to save costs, but also to enhance the supply security and resilience of markets. Eco-innovative services include green financial products (such as eco-leases), environmental services (such as waste management) and less resource intensive services (for instance car sharing)
Process	Process eco-innovations reduce material use, lower risk and result in cost savings. Examples include the substitution of harmful inputs during the production process (for example replacing toxic substances), optimisation of the production process and reducing the negative impacts of production outputs . In addition, reducing material inputs, so-called 'ecological rucksacks', of production and consumption processes can also be captured by process eco-innovation. Common terms linked with process eco-innovations include cleaner production, zero emissions, zero waste and material efficiency

Organisational	Organisational eco-innovation is the introduction of organisational methods and management systems for dealing with environmental issues in production and products. Such organisational changes are the socio-economic dimension of process innovation, especially as it is closely linked to learning and education. It includes pollution prevention schemes, environmental management and auditing systems and chain management (cooperation between companies to close material loops and avoid environmental damage across the whole value chain. As such, organisational eco-innovation may also include an enquiry into various collaborative organisational forms and their potential eco-innovative qualities; this can range from business networks and clusters to advanced solutions in industrial symbiosis.
Marketing	Marketing eco-innovation involves changes in product design or packaging, product placement, product promotion or pricing. It involves looking at what marketing techniques can be used to drive people to buy, use or implement eco-innovations. In marketing terms, brand (a collection of symbols, experiences and associations connected with a product or service by potential customers) is key to understanding the process of commercialisation of products or services. While green branding is important, in practice, it is not the only or best way of selling eco-innovations. Labelling is also an aspect of marketing eco-innovation, i.e. eco-labelling.
Social	Social eco-innovation considers the human element integral to any discussion on resource consumption. It includes market-based dimensions of behavioural and lifestyle change and the ensuing demand for green goods and services. Some firms are experimenting with so-called user-led innovation, meaning that the functionality of new goods is developed with stakeholders, thereby minimising the risk of superfluous product features. Another important aspect is product sharing, which may lead to an absolute decrease of material use without diminishing the quality of services they provide to users. The social dimension also involves the creative potential of society, with examples of innovative green living concepts.
System	System eco-innovation is a series of connected innovations that improve or create entirely new systems delivering specific functions with a reduced overall environmental impact. A key feature of system innovation is that it is a collection of changes implemented by design. For example, system eco-innovation related to a house is not about just insulating windows or just using a better heating system: it is about innovating the overall design to improve its functionality. “Green cities” are another example of system innovations when innovation and planning efforts lead to a combination of changes to make the functioning of the city and city life more “green”. This includes, for instance, new mobility concepts that tackle not only traditional public transportation services but also shared-bike systems as well as planning to reduce the need for travel.

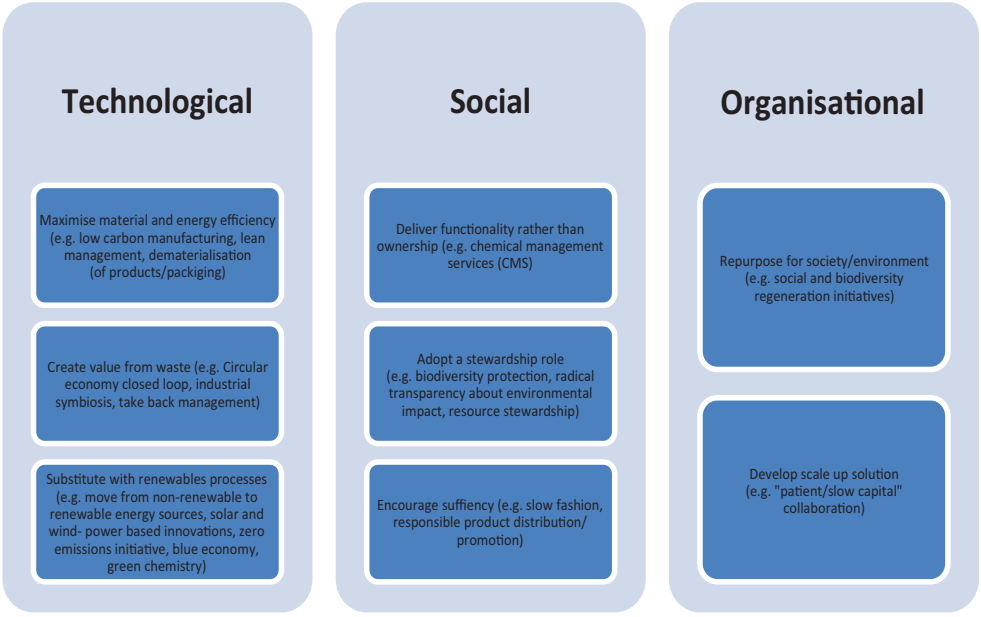
Source: prepared by author, based on: Europe in transition, Paving the way to a green economy through eco-innovations, Annual report 2012, The Eco-Innovation Observatory, p. 16.

Green projects are investment projects that concern eco-innovative solutions. Thanks to these projects the leading innovations concerning sustainability, radical resource productivity, whole system design, biomimicry, green chemistry, industrial ecology, renewable energy and green nanotechnology can become

important tools to build a framework for sustainable economy and influence living conditions of present and future generations.

They can be accomplished by various groups of stakeholders with the use of various types of projects, like these presented in Figure 1.1.

Figure 1.1. Types of eco-projects



Source: prepared by author, based on: Bocken N.M.P., Short S.W., Rana P. and Evans S., 2014, *A literature and practice review to develop sustainable business model archetypes,* Journal of Cleaner Production, 65(0), p. 48.

As the range of eco-innovative solutions is wide, such projects can be financed by various types of stakeholders: companies, individuals, financial institutions, territorial government units, the state, international organizations, by means of special mechanisms that facilitate transfer of funds.

Green projects are the element connecting both sides of the eco-innovations market, which means demand and supply. Supply of capital for financing eco-innovative solutions derives from policies of the state and international organizations as well as strategic decisions of entrepreneurs. Eco-investments are offered as a result of technological development of regions and countries and their openness to creation and absorption of eco-innovations.

In the market there are capital donors and capital recipients as well as intermediating organizations – mainly financial institutions. The investors can be divided into private and institutional investors. The institutional investors include banks and funds, especially big investment funds. They are open funds (such as securities funds) or other funds not being subject to formal regulations like venture capital and private equity funds. Thus, the financing resources and risk transfer are diversified.

Risk transfer is facilitated by derivative instruments whose value is dependent on their underlyings. They include commodity derivatives such as energy derivatives.[2] Hybrid instruments which combine characteristics of debt securities and derivatives are also available in the market. In this module, various ways of raising capital and sharing risk are shown.

From the point of view of the organizations who finance projects, the mechanisms and instruments used by them are aimed to provide capital for the needs of particular projects and, if necessary, to supply additional support for project accomplishment by decreasing investment costs and outlays (e.g. by tax exemptions or preferential loans). Thus, the amount of capital spent can be reduced, which fosters economic effectiveness of capital.

Other solutions that can be used to support project financing indirectly include:

1. granting loan guarantees required by financial institutions, instruments increasing access to financial capital,
2. project risk management e.g. by sharing risks among several participants,
3. creating additional mechanisms increasing the amount of capital allocated for eco-innovative solutions such as supplying funds with additional environmental fees,
4. creating organizational solutions that enable consolidation of funds for eco-projects or decreasing costs and investment outlays e.g. thanks to eco-parks, special ecological solutions in the special economic zones, R&D parks and eco-clusters.

In the literature we can find the term "project finance", defined as „the financing of a single, capital-intensive, long-lasting industrial initiative. This initiative is incorporated in a specially created vehicle (an SPV) whose assets are given as collateral to the creditor as the only source – together with the cash flow generated by the project – for debt service repayment."[3] The eco-innovative projects can often (but not always) be described by above-mentioned characteristics.

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[2] K. Jajuga, T. Jajuga, *Inwestycje, instrumenty finansowe, ryzyko, inżynieria finansowa*, Wydawnictwo Naukowe PWN.

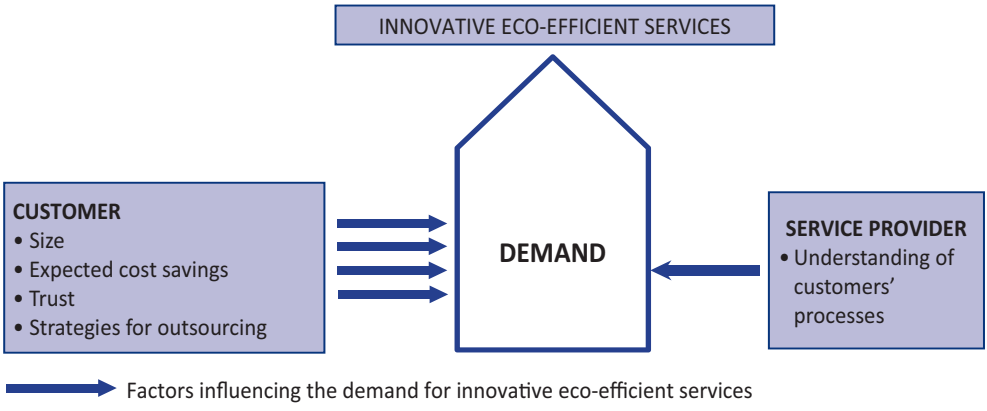
[3] S. Gatti, *Project finance in theory and practice, Designing, Structuring and Financing Private and Public Projects*, second edition, Academic Press is an Imprint of Elsevier 2012.

1.2. Demand conditioning of eco-innovations market

One of the most important factors influencing the development of eco-innovative market is demand.

Demand for eco-innovative goods and services can be analysed on micro-, mezo- and macroeconomic levels. Depending on the demand size, its dynamics and income and price elasticity, the financing possibilities for green projects are shaped. Special attention is given to the customers, especially their characteristics that influence demand for eco-efficient products or services, including e.g. size, expected cost saving, trust, and understanding of customer's processes – see Figure 1.2.

Figure 1.2. Factors influencing the demand for innovative eco-efficient services



Source: M. Anttonen, M. Halme, E. Houtbeckers, J. Nurkka, *The other side of sustainable innovation: is there a demand for innovative services?*, Journal of Cleaner Production, 45 (2013), p. 91.

It should be mentioned that **the more common the application of a particular eco-innovation, the smaller the probability of project failure**. Thus, the degree of market specialization is important. The more common the application of an eco-innovation is, the more favorable are the possibilities of its financing. Thus, it is important to recognize whether the market consists of specialized recipients (e.g. industry) or just the opposite. In the second case the eco-innovation can create universal markets, depending on population distribution and purchase power as well as economic potential of particular geographical markets.

It is also important **that the shorter the product (or service) lifecycle, the more difficult is to finance it**. This results from the fact that eco-innovations'

costs are especially high in the first phase when prototype solutions are created. This is connected with character of demand for eco-products or eco-services. The quicker the obsolence of product or service is, the more quickly the demand for new generation of products or services comes up.

When analyzing green projects financing in terms of demand, the following criteria should be taken into consideration:

- **utility** – project's influence on satisfying the needs of target groups of groups of people concerned by the project
- **effectiveness** – project's influence on realization of micro- or macroeconomic goals. The effectiveness is assessed by comparison of planned results with the real results of the project.
- **relevance** – significance of the green project's aims in comparison with the needs and macroeconomic priorities defined on the domestic and EU level. This can be assessed by comparing project aims and expected results with the aims of the EU or domestic policies.

1.2.1. Investments in eco-innovations: micro- vs macroeconomic approach

Investments in eco-innovations are aimed at meeting society's needs according to the rules of sustainable development. However, the society is not only a group of people who have common goals, needs and culture code. It is also groups of people or individuals with own various goals and values. Thus, the ways the eco-innovations are seen, are different, depending on social structures.

As the main condition of eco-innovative investment is social consensus and all members of the society should have right to take part in the decision process, we should be aware that the stakeholders of micro- and macroeconomic levels have different interests. On the microeconomic level stakeholders are citizens, consumers and entrepreneurs. On the macroeconomic level they are various social groups, representing state, international structures and global organizations.

The comparison of these groups and their goals on micro– and macroeconomic levels is presented in Table 1.3.

Table 1.3. Eco-innovations goals – micro- and macroeconomic approaches

Microeconomic level		Macroeconomic level	
Citizen	Entrepreneur	State	Group of countries (EU)
Goals of investing in eco-innovations			
Decreasing of living costs	Decreasing of costs of running business	Decreasing the amount of waste and decreasing environment pollution	Decreasing threats connected with turbulent and intensive urbanization
Better health	Building pro-competitive marketing image	Resource security	Political goals connectes with international obligations
Better living standard	Meeting consumers' expectations and creating new segments of the market	Environmental security or decreasing risk of natural disasters and their dissemination	Decreasing of political tenses resulting from the location of strategic natural resources in the world
	Decreasing of bargaining power of resources and energy suppliers	Decreasing of costs of healthcare as a result of better health of societies	
	Meeting strategic goals of a company	Better health and living conditions of societies	
Short-term character of goals		Mid-term and long-term character of goals	

Source: own work.

The goals of various groups are connected with costs both at the micro- and macroeconomic levels. At the macroeconomic level also political and social factors occur that are connected with the welfare functions of the state. In the conditions of corporate social responsibility the role of basic values like freedom and responsibility increases.

The aims (differently defined) influence investment's connections with time factor and investment risk. In the microeconomic approach the deciding role is played by short-term projects that allow gaining profits from eco-innovation implementation in a short time. People are usually not too interested in the state of natural environment in the globalizing world, which may be a result of increased people's mobility.

When it comes to the entrepreneurship, the management perspective is getting shorter and shorter. As the company's environment changes quickly and the internal environment is also not very stable, the long-term planning is getting more and more difficult. Lean or agile companies are not interested in ecological investments if they are not the source of competitive advantages within one term of office. Conflict of interests of management board (short-term goals) and owners (long-term goals) is common in big companies. The exception can be family businesses, controlled by owners' families.

When analysing micro- and macroeconomic approaches to eco-innovations, different investment risk and threat of insolvency or liquidation of the entity investing in eco-innovations should be taken into consideration. While in the microeconomic approach this risk is really high, especially at the initial levels of development, the risk of institutions representing macroeconomic levels are not burdened with the risk of bankruptcy.

However, the risk that public investment will not be completed, is connected with problems with investment financing, when the investment budgeting rules are disturbed. There are numerous examples of investments that were not finished or took a long time. A factor that disturbs economic calculations may be too rigid sticking to the project that should be corrected when there occur changes in the internal or external environment or, if during the ongoing project it appeared that there are mistakes in the approved plan.

The legal and organizational solutions in particular countries or regions (at the mezo-economic level) can prove a barrier instead of facilitation of good solutions. This should be remembered while trying to support good practices in the macro-economic scale.

In the microeconomic scale demand for eco-innovative solutions is a result of meeting consumers' needs with suppliers of eco-innovative services. This influences creation of entrepreneurs' competitive advantages. Successful development of eco-innovations market is not possible without private sector entities' commitment – both seeking for and offering capital.

„While sustainable innovations are an exciting and promising issue, the findings illustrate, perhaps paradoxically, that the needs for them are quite pragmatically-oriented. For instance, with regard to result-oriented material efficiency services, the mapped needs relate to side stream management and reuse, knowledge, and data management and their costs, as well as potential savings. Although there is indeed demand for innovative services, it seems that the step from pragmatic needs to radical industrial changes is a big one. Still, services solving these needs can create substantial material efficiency gains and open the door for more radical result-oriented services and other sustainable innovation."[4]

[4] M. Anttonen, M. Halme, E. Houtbeckers, J. Nurkka, *The other side of sustainable innovation: is there a demand for innovative services?*, Journal of Cleaner Production, 45 (2013), p. 99.

1.2.2. Consumers' demand for eco-innovative investments

Increasing ecological awareness of societies positively influences development of the eco-innovations market. The microeconomic goals described above, such as good health, living cost and quality of life are also connected with the policy of shaping the needs and consumption models by companies and by the state which creates investment needs of individuals and companies by providing public aid.

Legal regulations can be a demand engine by introducing new, more severe standards concerning CO_2 emissions, clean water, use of energy in housing and transport and emissions in manufacturing. New norms catalyse adjustment efforts in the economy and stimulate demand for eco-innovative solutions: often the producers willing to adjust their activity to new regulations create demand for a new generation of products that are more ecological. Consumers can also impact the eco-innovations market by influencing the kind of products and their characteristics. This concerns mainly eco-innovations based on their social context – the so called user-led or user-driven innovations.

On the basis of market observations and consumer behaviour observations new needs can be recognized, concerning the relation between manufacturing, after-sales service and the ecological perception of the product. Thus, new eco-innovative projects can be inspired by consumers' needs and suggestions. An example here can be the miniaturisation trend in mobile phones or hybrid supply energy solutions for appliances. Thus, a new product or service can be designed to make them less material – and energy-consuming (smaller packaging, hybrid solutions in cars) or to introduce one standard in all appliances of one kind (such as standardization of chargers for mobile phones). This is a significant factor influencing demand for innovative projects that lead to sustainable economy development as the foundation of the market economy is customer and his/her needs.

Environmental protection policy that aims to accelerate diffusion by price instruments can only be successful if it is accompanied by training and information supply (such as appropriate eco-labels)

"An eco-label identifies a product that meets a wide range of environmental performance criteria or standards. Developed by governments, manufacturers, and third-company organizations, eco-labelling is a voluntary approach to environmental certification practiced around the world. In contrast to "green" symbols or claims, an eco-label is given to products ***that have met specific environmental criteria***."[5]

[5] *An Overview of Eco-labels and Sustainability Certifications in the Global Marketplace*, Editor Jay S. Golden, PhD, Corporate Sustainability Initiative Nicholas Institute for Environmental Policy Solutions, Duke University, 2010, p. 14.