

ECO-INNOVATION AS THE DETERMINANT OF SOCIO-ECONOMIC DEVELOPMENT ON THE EXAMPLE OF THE SWEDISH ECONOMY

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Abstract. XXI century is a period of progressive processes of globalization, changing socio-economic conditions, a lot of opportunities and threats. One of the major challenges faced by the economies of the progressive degradation of the environment. It is important to develop innovations, namely eco-innovations, which on the one hand bring a lot of valuable ideas and solutions, meet the constantly changing demands of customers and, on the other hand, constantly degrade the environment.

The purpose of this article is to emphasize the essence of the eco-innovation role in the contemporary world, which serves an example of one of the most innovative, the most developed and most competitive economies in the world - Sweden, which has been regarded as a leader in eco-innovativeness.

Key words: eco-innovation, socio-economic development, Sweden

Introduction

XXI century is a period of progressive processes of globalization, changing socio-economic conditions, a lot of opportunities and threats. To persevere in this turbulent environment, the regions, the economy and the functioning of these entities must demonstrate a continuous vigilance and flexibility to what chances, and refrain from attacking from everywhere dangers. It is important to note in this case that they turn out to be innovations that generally favor capture could bring "the idea for a better tomorrow."

One of the major challenges faced by the economies is the progressive degradation of the environment. The role of innovation proves to be extremely important. Innovation can be determined as everything new, improved, or used again in another area and use. Innovation does not have to be the result of many years and advanced R&D. You could say that innovation is ubiquitous in almost all aspects of life. When currently analyzing the aspect of innovation and national economies operating in these businesses the phenomenon of eco-innovation is constantly more apparent. More and more strategic programs, as well as the budgets of public resources, take account of activities related to environmental protection, which are called an eco-innovation.

It is widely known that one of the world's innovation leaders is Sweden, which places it within walking 10 most innovative, it is also counted among the best developed and most competitive in the world.

The purpose of this article is to emphasize the role that the eco-innovation plays in the modern world, which will be based on the example of the Swedish economy, classified as one of the most innovative, developed and competitive in the world. In addition to fruits of innovative activity of Swedish companies such as Volvo, Saab, Scania, Ericsson, Electrolux, Husqvarna, Absolut, Hennes & Mauritz (H&M), Tetra - Pak or IKEA, Sweden ranks also among the leaders of eco-innovation. With this in view, the case of the Swedish economy and its pro-innovation behavior in many cases, can serve as a worthy role model for other economies struggling to persevere in today's turbulent environment.

1. The essence of eco-innovation

As already mentioned, innovations today are ubiquitous and the range of attempts to define the notion is extremely broad. It is worth of mentioning that the precursor of innovation approach, who introduced this concept into economic sciences, was J. Schumpeter. In his opinion, innovation is the introduction of a new product, modifying existing; introduction of new production methods, obtaining new sources and opportunities to use intact so far areas and markets, or new ways of organizing business.¹

Schumpeter (1932) believed that innovation is considered as both an introduction to the manufacture of new or improvement of existing products, the

¹ Source: Schumpeter, J. A. (1932). *The Theory of Economic Development*. Galaxy Book, New York, p. 66.

introduction of new or improvement of the existing production process and the introduction of a new organization of any industry, for example “create a monopoly or be broken”. Schumpeter considered innovation as the opening of a new market, in which a specific process, product or service which has not yet been known to anyone, the use of a new method for the sale or purchase or acquire and use new sources of raw materials or semi-finished products.²

The current socio–economics leads to the formation of many areas where the presence of innovative activity is irreplaceable. One of them is the environment, which involves aspect of eco-innovative activity, called the eco-innovation.

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. Eco-innovation is a progressive concept and therefore must remain responsive to changes.³

This type of innovation is also all modifications in the process and products that reduce their negative impact on the environment.⁴

Eco-innovation delivers the goals of sustainable and equitable societies and economies, including sustainable development. This is achieved through commercially viable approaches that:

- bring new business opportunities and sustainability, equitability, growth;
- achieve more efficient or responsible use of natural resources;

- address climate change concerns and deliver a low carbon economy in all sectors;
- decrease impacts on the environment;
- enhance societal, economic and technological resilience to environmental pressures⁵.

The scale of environmental problems, coupled with social inequalities and competitiveness challenges within the global economy, have raised increasing awareness of the need to change and renew existing technological production and social behavioural patterns. At best, such awareness may produce innovative responses that gradually move society along a more sustainable path. Analytical tools for such transformation have been developed in the field of environmental management, namely within frameworks such as eco-efficiency, industrial ecology and design for environment and more recently within the concept of eco-effectiveness, natural capital and biomimicry. Furthermore, the urgency for change has led to increasing application of the term ‘innovation’ in environmental management and policy. Despite the promise of eco-innovations, the term is also used in diverse contexts with different underlying connotations that may eventually diminish its practical value. Most commonly eco-innovation refers to new technologies that improve economic and environmental performance but also some definitions include organizational and social changes for improving competitiveness and sustainability and its social, economic and environmental pillars.⁶

Eco-innovation brings many positive effects as an attempt to draw them together Figure 1.

² Source: Schumpeter, J. A. (1960). *Teoria wzrostu gospodarczego*, Polskie Wydawnictwo Naukowe, Warszawa, p. 104.

³ Source: Decision No. 1639/2006/EC of the European Parliament and of the Council (2016).

⁴ Source: Drivers of environmental innovation – VINNOVA. Verket för Innovationssystem, Stockholm och Energimyndigheten, Stockholm 2001, p. 14.

⁵ Source: Centre for Global Eco-innovation, <http://www.globalecoinnovation.org/>

⁶ Source: Carrillo-Hermosilla, J., Río del González, P., Könnölä, T. (2009). *ECO-INNOVATION. When Sustainability and Competitiveness Shake Hands*. Palgrave Macmillan UK, p. 6.

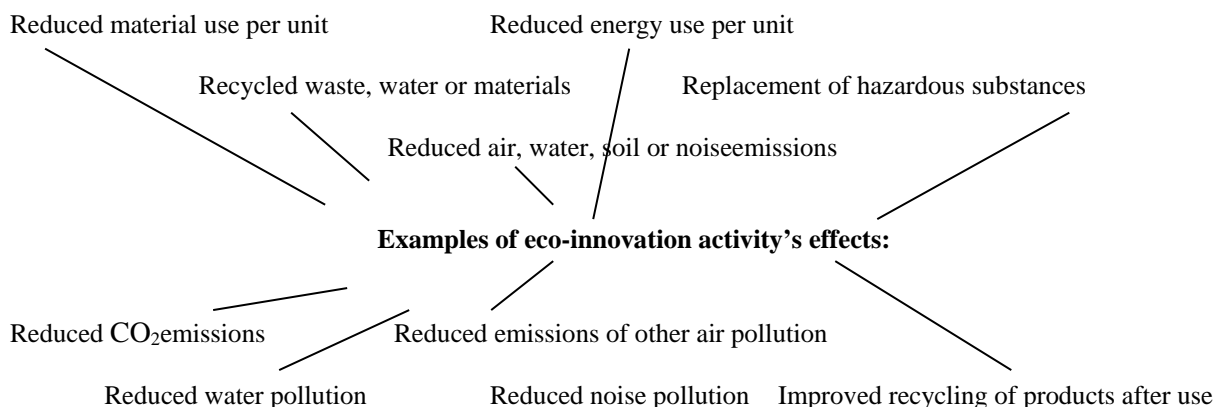


Figure 1. Examples of eco-innovation activity's effects

Source: own elaboration on the basis: Horbach J., Rammer Ch., Rennings K., *Determinants of eco-innovations by type of environmental impact. The role of regulatory push/pull, technology push and market pull*, p. 17, <https://www.econstor.eu/bitstream/10419/44979/1/65649719X.pdf>, February 23, 2017.

The examples of eco-innovation can also be measures implemented in the urban space:⁷

- creation of green jobs and the reduction of CO₂ emissions by promoting solutions in the field of energy efficiency, renewable energy and eco-innovation in the city (eg. solar city of Freiburg);
- reducing the share of private transport in favor of innovation, clean urban transport (eco-innovation and innovation to increase familiarity, comfort and attractiveness of city buses eg. Access to Wi-Fi and “green socket” energy from photovoltaic panels);
- implementation of the e-mobility “on demand”, the implementation of universal user card (cars, bikes, urban transport), charging stations for electric vehicles, the introduction of information systems for public transport in real time (including on alternative options, handicaps and environmental footprint);
- spatial planning taking into account sustainability criteria, such as the greening of public spaces, public gardens, creating picnic, projects to promote eco-innovation in urban areas (eg. Urban park for eco-innovation);
- thermo-modernization of buildings up to standard energy efficient or passive, using eco-innovative solutions, with a low carbon footprint and environmental and eco-innovative use of available financial and renewable energy sources and innovative energy management systems and other media in buildings;
- innovative systems for waste management, recovery and recycling of secondary materials (eg.

a system of chutes for different kinds of waste in Stockholm, which then goes into underground pipes and a speed of 70 km/h are sucked into the warehouse, where it is distributed to treatment or incineration plant;

- innovations in the field of environmental education, such as eco e-learning at bus stops and public transport vehicles, the vending segregation (after throwing cans, bottles, or batteries automatic segregation of thanks in the form of a cheerful song about sending ecological - attraction especially for children) , organization of events and competitions to promote eco-innovation (eg. a festival of eco-design), and involving citizens in the transformation of their own space (eg. through budget citizens).

Other examples may include portable desks obtained recycling method of unnecessary cardboard boxes, enzymes enhance the environment, Danish “Green Light” all the time or vertical farms.

2. Eco-innovation in the Swedish economy

Sweden’s reputation as an environmental pioneer began with a number of proactive moves in the 1960s and 1970s. Recognising a loss of limited natural resources, Sweden was the first country to establish an environmental protection agency⁸, in 1967. In 1972 Sweden hosted the first UN conference on the environment, which led to the creation of the United Nations Environment

⁷ Source: Ekoinnowacje motorem zmian w kierunku gospodarki niskoemisyjnej w miastach, <http://przyjaznemiastanastart.onet.pl/ekoinnowacje-motorem-zmian->

w-kierunku-gospodarki-niskoemisyjnej-w-miastach, accessed on February 23, 2017.

⁸Source: Swedish Environmental Protection Agency, <http://www.swedishepa.se/>, accessed on February 24, 2017.

Programme⁹ (UNEP), the leading global environmental authority to this day. It is worth to point, that Sweden was also one of the first nations to sign and ratify the international climate change treaty Kyoto Protocol¹⁰, in 1998 and 2002, respectively.¹¹

The Stockholm Convention¹² from 2001, a global treaty aimed at phasing out the production and use of persistent organic pollutants, was largely a Swedish initiative. Waste management, acid rain prevention, sustainable city planning and recycling are other environmental areas in which Sweden has made progressive headway and challenged the status quo. Moreover, Sweden continues to create momentum and is looking to intensify negotiations at international settings such as the annual United Nations Climate Change Conference. Sweden's stance is that a sustainable and secure energy supply is best achieved by focusing on long-term energy efficiency and a greater supply of renewable energy.¹³

For decades Sweden is known to be one of the most innovative country in the world. Thus, it is one of the best developed and most competitive economies in the international arena.

It is very important, that Sweden ranks fifth in the most recent EU Eco-Innovation Scoreboard 2015¹⁴. Sweden does not manage to translate its high eco-innovation output into higher resource efficiency and socioeconomic outcomes. Moreover, eco-innovation is a key component in Sweden's

national environmental policy strategy and is part of the long-term national objective for green structural change. Sweden continues to increase its economy without compromising on environmental issues and has managed to minimise and often eradicate any negative impact of industrial and socioeconomic growth. An ambitious and long-term generational goal is the basis for the strategy, and although most of the 16 environmental objectives set will not be met by 2020 the development is seen to be heading in a good direction. Emissions of carbon dioxide (CO₂) have been declining in Sweden for many years due to higher use of green technologies. What is very important, the strong push towards the development and implementation of green technologies enabled Sweden to become the first country in Europe to meet the renewable energy targets set by the European Union for 2020, eight years ahead of schedule.¹⁵

What is more, Sweden has promoted and implemented policies that have encouraged research and development (R&D) in water purification, sanitation, sewage and wastewater treatment, waste management and waste-to-energy, production of biofuels, as well as renewable fuels for the transport sector and renewable energy from wind, biomass and solar power. New growth areas are clean industrial production to protect and preserve the environment, and eradicate the waste of vital material and human resources.¹⁶

Table 1 Eco-innovation Scoreboard 2015

Rank	1	2	3	4	5	6	7	8	9	10
Country	Denmark	Finland	Ireland	Germany	Sweden	Luxembourg	France	Austria	Spain	Italy
Rank	11	12	13	14	15	16	17	18	19	20
Country	United Kingdom	Portugal	Czech Republic	Netherlands	Slovenia	Romania	Hungary	Estonia	Latvia	Lithuania
Rank	21	22	23	24	25	26	27			
Country	Greece	Slovakia	Croatia	Malta	Cyprus	Poland	Bulgaria			

Source: own elaboration on the basis: Eco-innovation observatory: Sweden, http://www.eco-innovation.eu/index.php?option=com_content&view=article&id=488&Itemid=75, 22.02.2017.

Like the overall innovation of the socio-economics, Sweden has many eco-innovative innovations, among which are self-sufficient city

Hammarby Sjöstad. More examples are shown in Figure 2.

⁹Source: UN environment, <http://web.unep.org/>, accessed on February 24, 2017.

¹⁰Source: Kyoto Protocol to the United Nations Framework Convention on Climate Change (1998).

¹¹Source: Sweden tackles climate change, <https://sweden.se/nature/sweden-tackles-climate-change/>, accessed on February 24, 2017.

¹²Source: Stockholm Convention, <http://chm.pops.int/TheConvention/Overview/tabid/3351>, accessed on February 24, 2017.

¹³Source: Sweden tackles climate change, <https://sweden.se/nature/sweden-tackles-climate-change/>, accessed on February 24, 2017.

¹⁴EU Eco-Innovation Scoreboard 2015 is the most current ranking.

¹⁵Source: Eco-innovation observatory: Sweden, http://www.eco-innovation.eu/index.php?option=com_content&view=article&id=488&Itemid=75, accessed on February 22, 2017.

¹⁶Source: Ibidem.

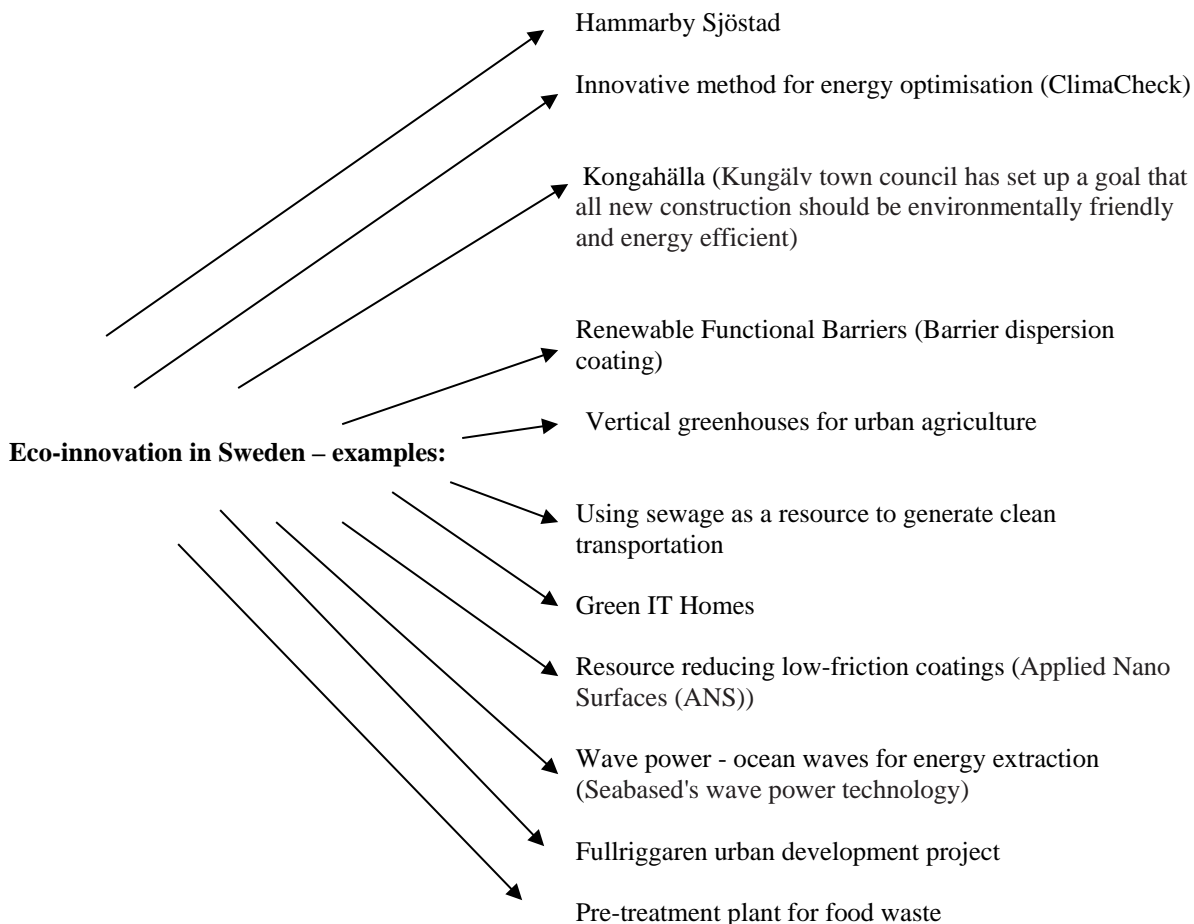


Figure 2. Eco-innovation in Sweden – examples

Source: own elaboration on the basis: Eco-innovation observatory: Sweden, http://www.eco-innovation.eu/index.php?option=com_content&view=article&id=488&Itemid=75, February 22, 2017.

Of course, there are only examples of eco-innovative activity in Sweden. In addition, it is worth to emphasize eco-innovation projects. Furthermore, it is worth of mentioning that the Swedish eco-label in particular, the Swedish Society for Nature Conservation (Naturskyddsföreningen), which first issued the label in 1988, has developed criteria for biofuels, electricity supply, district heating and insurance, as well as transport and logistics.¹⁷

3. Proeco-innovative activity in Sweden

It is obvious that any occurring pro-innovation aspirations face with many obstacles and difficulties. Among them we can distinguish the lack of financial resources, lack of knowledge about

the possibilities of obtaining relevant sources of financial support, as well as insufficient knowledge on the positive aspects of innovation and the effects they bring. The second group of activities restraining innovation and economy functioning in these businesses is excessive and harsh bureaucracy. An example of another factor that restrain innovation is the most common reluctance to undertake this type of behavior.

Eco-innovation, as well as overall innovation and efficiency is conditioned by many different factors which are presented in Figure 3. It is worth to point that there is an institution called Vinnova in Sweden which plays extremely important role for the creation of a national innovation economy. Vinnova develops Sweden's innovation capacity for sustainable growth. Vinnova is Sweden's

¹⁷Source: <http://ec.europa.eu/environment/ecoap/about-eco-innovation/policies-matters/sweden/sweden-seeks-to-support->

[international-eco-innovation-projects_it.htm_en](http://ec.europa.eu/environment/ecoap/about-eco-innovation/projects-international-eco-innovation-projects_it.htm_en), accessed on February 23, 2017.

innovation agency. Their mission is to promote sustainable growth by improving the conditions for innovation, as well as funding needs-driven research.¹⁸

In 2012 Vinnova began the International Cooperation for Eco-innovations programme. The programme aims at strengthening Swedish actors' networks for international research and development cooperation for eco-innovations. The focus is on stimulating cooperation among academia, institutes and businesses in emerging countries. The programme's goals are to:¹⁹

- strengthen Swedish actors' networks for international research, development and innovation cooperation within the area of the environment, which in the long run promotes the export of Swedish environmental engineering;
- promote innovation collaboration which contributes to increasing Swedish actors' access to information and brings them closer to future clients, needs and markets;
- promote the establishment of long-term sustainable contacts between Swedish and international consortiums by supporting development and strengthening both new and established networks;
- facilitate early concept verification and making support to demonstration projects accessible with the aim to promote the industrialisation of new information;
- stimulate the growth of ways to increase sales of services based on the competences and technology developed by public actors in Sweden;
- contribute to positive environmental effects and sustainable development.

If the benefits from eco-innovation are to be felt most widely, ways need to be found for eco-innovative companies to internationalise their products and services. VINNOVA, the Swedish Governmental Agency for Innovation Systems, is promoting Swedish eco-innovation in the world's largest emerging markets through a programme entitled International Cooperation for Eco-Innovation. The programme grew out of a Swedish government decision in 2011 to make it easier for Sweden to export its environmental technologies. It was reasoned that more knowledge about challenges around the world was needed if Swedish companies and institutes were to offer the right

solutions: thus the focus on cooperation and partnership. According to VINNOVA, the programme should help Swedish eco-innovators to "become more efficient and develop globally sought-after solutions which can address today's grand environmental challenges". It was also reasoned that growing demand in emerging economies for more environmentally friendly products could provide opportunities for innovative Swedish companies. The programme funds two types of project: cooperation-building/feasibility studies, and the implementation of international research and development projects. In both cases, the objective is to give Swedish eco-innovators a boost by helping them extend their international networks and by supporting them as they build partnerships in key emerging countries. This should lead in the long-term to the export of Swedish environmental technology, and should contribute positively to the reduction of environmental pressures and to sustainable development, according to VINNOVA.²⁰

The Government wants to further strengthen Sweden's position as a climate leader. The Budget Bill for 2017 proposes the largest investment budget in the area of climate and the environment in Sweden's history. The Government's efforts to build our society are accelerating the transition to a more sustainable society. In the budget for 2017, the Government is proposing SEK 12.9 billion in new investments in climate action, fossil-free travel and renewable energy sources for the period 2017–2020. These investments will primarily be made in four areas: the transition to renewable energy, fossil-free travel, the 'Involving all of Sweden' initiative and international climate investments. Through the Climate Leap, the Government is investing a total of SEK 3.5 billion in regional and local initiatives to reduce greenhouse gas emissions. This is being matched by at least 50 per cent co-financing by businesses, municipalities, county councils and tenant-owner associations, thus enabling SEK 7–9 billion in climate investments in Sweden during the period 2015–2020.²¹

The Government proposes increased investment in urban environment agreements. These agreements were launched to contribute to sustainable urban environments through support for public transport investments. This support will now

¹⁸Source: <http://www.vinnova.se/en/About-Vinnova/>, accessed on February 27, 2017.

¹⁹Source: International Cooperation for Eco-innovations, <http://www.vinnova.se/en/EU-and-international-co-operation/International-co-operation/International-Cooperation-for-Eco-innovations/>, accessed on February 23, 2017.

²⁰Source: ECO-INNOVATION in the heart of european policies, <http://ec.europa.eu/environment/ecoap/about-eco-innovation/policies->

[matters/sweden/sweden-seeks-to-support-international-eco-innovation-projects_it.htm_en](http://ec.europa.eu/environment/ecoap/about-eco-innovation/policies-matters/sweden/sweden-seeks-to-support-international-eco-innovation-projects_it.htm_en), accessed on February 23, 2017.

²¹ Source: Government presents historic climate and environment budget. Available at <http://www.government.se/press-releases/2016/09/government-presents-historic-climate-and-environment-budget/>

be expanded to include investments in cycling infrastructure as well. The SEK 500 million per year in 2015–2018 that previously applied will be increased by SEK 250 million in 2017 and SEK 500 million in 2018. As a step in breaking free from fossil fuels, the Government is continuing to strengthen the railways to improve the possibilities for more journeys and transports to take place by train. The Government is allocating SEK 5.9 billion to augment resources for the operation and maintenance of railways during the period 2019–2020, and intends to present an infrastructure bill to the Riksdag proposing an economic framework for a national plan during the period 2018–2020. What is more, a special investment of SEK 200 million will be implemented in 2017 to increase railway capacity and make the system more robust.²²

Sweden's goal to reduce GHG emissions compared with 1990 by 40 per cent by the year 2020, and to have a vehicle fleet completely rid of fossil fuels by 2030 are stepping stones to the overarching goal of a society with no net GHG emissions by 2050. That is Sweden's commitment under Roadmap 2050, an EU initiative whose objective is to reduce GHG emissions by at least 80% below 1990 levels for all of EU. To accomplish the 40% reduction in GHG emissions by 2020, emissions would need to decline by an additional 20 million tons. According to current projections, emissions will have decreased by about 16 million tonnes in 2020, so in order to speed up the reduction the government has to come up with more drastic measures.²³

Sweden is known for a strong eco-innovation reputation. Based Harmonization of liberal

economic policies and strict environmental regulations provide a wider and flexible ground to implement eco-innovation in Sweden. The Swedish Ministry of the Environment set the national Environmental Quality Objectives in 1999 most of them are to be achieved by 2020. On basis with the 16 set national objectives²⁴, active environmental policies and programmes have been introduced to address environmental challenges, and eco-innovation has been largely integrated in these policies and programmes. The Swedish government built various bodies and institutions to achieve environmental improvement such as the Environmental Protection Agency, The Environmental Objectives Council, Swedish Environmental Technology Council, Foundation for Strategic Environmental Research, The National Environmental Management Authority and Swedish Energy Agency. Eco-innovation in Sweden has long been supported by the government's pro-active push for environmental protection, and it is clear that the government has a holistic view on eco-innovation. Sweden is seen as one of the national best practices in the field of eco-innovation.²⁵

Conclusions

In conclusion, eco-innovation is any innovation that makes progress towards the goal of sustainable development by reducing impacts on the environment, increasing resilience to environmental pressures or using natural resources more efficiently and responsibly.²⁶

²² Source: Ibidem.

²³ Source: Sweden tackles climate change. Available at <https://sweden.se/nature/sweden-tackles-climate-change/>

²⁴ Source: Implementation of the EU Sustainable Development Strategy. Sweden's report to the European Commission (2007).

²⁵ Source: ASEM Eco-Innovation Index (ASEI) 2012 Measuring Sustainable Future for Asia and Europe, p. 70. Available at http://www.aseic.org/resources/download/ASEM_Eco_Innovation_Index_ASEI_2012.pdf, accessed on February 21, 2017.

²⁶ Source: Decision N°1639/2006/EC establishing a Competitiveness and Innovation Framework Programme (2016).

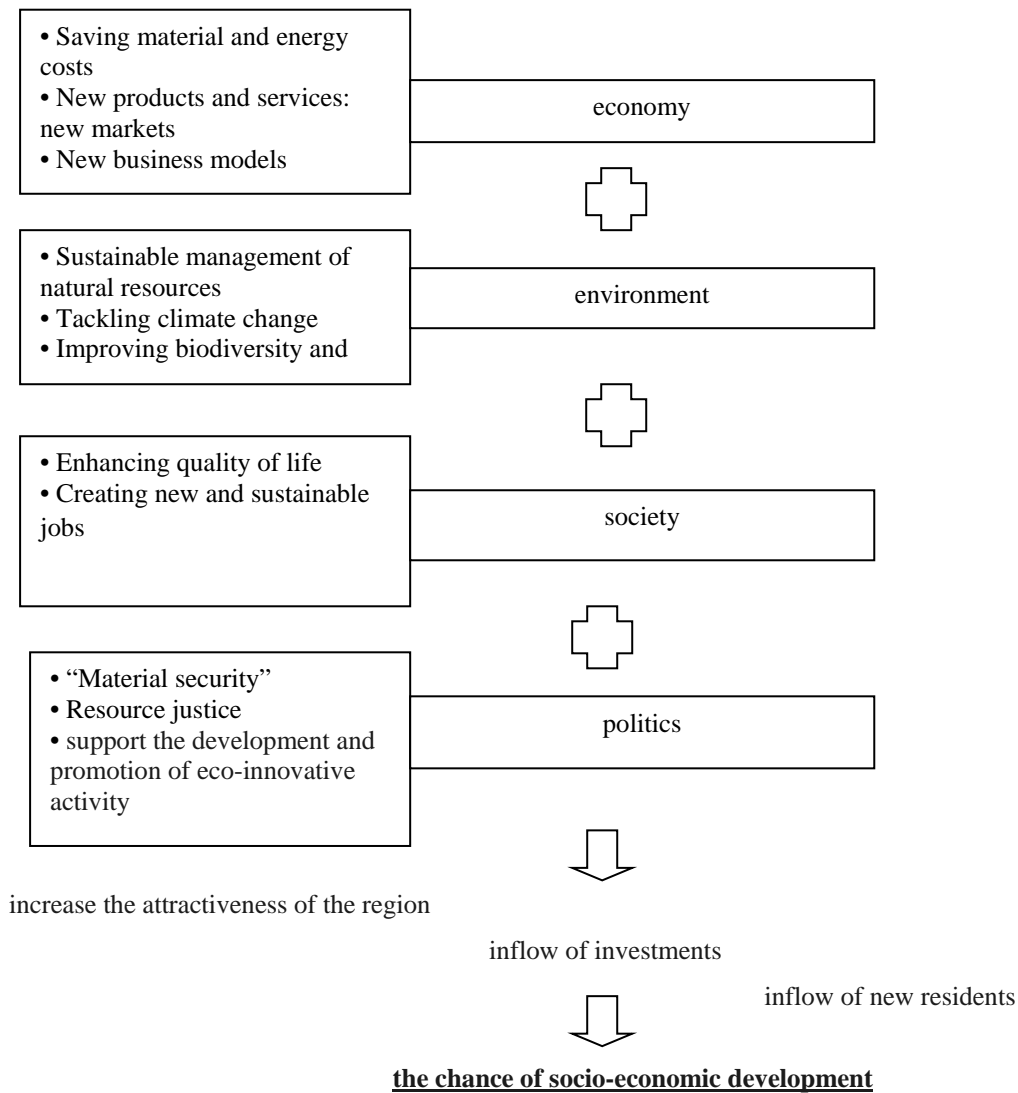


Figure 4. How eco-innovation and pro-innovation activities may affect the socio-economic condition of the region?
 Source: own elaboration on the basis: Eco-innovate! A guide to eco-innovation for SMEs and business coaches p. 8, <http://cfsd.org.uk/site-pdfs/eco-innovate-sme-guide.pdf>, February 23,2017.

Sweden’s high score in “eco-innovation capacity” is backed with high “general innovation capacity level”, strong country’s “economic competitiveness”, high “awareness level on sustainability management”, a relatively “large amount of investment capital flow in green technology” and “employees in green technology industry”. In regards to “eco-innovation activities”, the country scores average in “number of green patents” and “turnover of environmentally friendly companies”. However, the “number of green technology SMEs at early stage” is much higher than the average. In Sweden, a large number of companies have been successful in commercializing green technology solutions. In the area of “eco-

innovation supporting environment”, the country scores high in the “level of systematic environmental laws” and “government’s R&D expenditure in green industry”. Furthermore, amongst the leaders of sustainability, the country is ratified to many international environmental treaties. As an early starter of eco-innovation, there is significant evidence of high performance in “eco-innovation performance” described by the country’s high score in “energy sustainability level”, “CO₂ emission intensity”, “water consumption intensity”, “environmental impact on society” and “green market size”. In regards to “energy sustainability” and “CO₂ emission intensity”, the country performs well above the average.²⁷

²⁷Source: ASEM Eco-Innovation Index (ASEI) 2012. Measuring Sustainable Future for Asia and Europe, p. 70. Available at

http://www.aseic.org/resources/download/ASEM_Eco_Innovation_Index_ASEI_2012.pdf

As emphasized in this article, Sweden is one of the most innovative, the most developed and the most competitive countries in the world. Sweden maintains a leading position also in the group of

eco-innovators, giving the rest of the countries seeking to improve the situation in their area many valuable role models.

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