

EUROPEAN UNION EFFORTS TO CREATE GREEN GROWTH THROUGH GREEN INNOVATION

Dorota Murzyn¹, Paulina Szyja²

Abstract

Innovations connected with changes in production processes as well in products and services being more environmentally friendly represent a new approach to global challenges by giving practical dimension of implementation the principles of sustainable development. Innovation is key to foster green growth. Green innovation is a powerful instrument, combining reduced negative impact on the environment with a positive impact on the economy and society. Importantly, this kind of approach to addressing global development goals through green technologies requires support for innovation across all development contexts. Policy makers and the business community alike are experimenting with new ways to drive green innovation, while maintaining economic competitiveness. Government efforts to promote greener growth and green innovation have intensified in recent years. To face these challenges, the European Union has published inter alia an EU action plan on Eco-innovation, and allocates substantial funds to finance green innovation.

The aim of the article is on the one hand to sort out terminology related to green growth and green innovation (green innovation, eco-innovation, green growth, sustainable development), on the other – to present its role in development and actions and instruments of the EU in support of green innovation.

Keywords: green innovation, sustainable development, EU policy, EU funds

JEL Classification: F59, O10, O19, O25, O31, O38, 044

1. Introduction

Innovations connected with changes in production processes as well as in products and services being more environmentally friendly represent a new approach to global challenges by giving a practical dimension of the implementation of the principles of sustainable development.

¹ PhD, Pedagogical University of Cracow, Institute of Political Science, Department of Economics and Economic Policy, ul. Podchorążych 2, 30-084 Kraków, mdorota@up.krakow.pl.

² PhD, Pedagogical University of Cracow, Institute of Political Science, Department of Economics and Economic Policy, ul. Podchorążych 2, 30-084 Kraków, pszyja@up.krakow.pl.

Green innovation is a powerful instrument, combining reduced negative impact on the environment with a positive impact on the economy and society. Government efforts to promote greener growth and green innovation have intensified in recent years. To face these challenges, the European Union has published, inter alia, an EU action plan on Eco-innovation, and allocates substantial funds to finance green innovation.

The aim of the article is, on the one hand, to sort out terminology related to green growth and green innovation (green innovation, eco-innovation, green growth, green economy), on the other – to present its role in the development, actions and instruments of the EU in support of green innovation.

2. Green innovation and economic growth

The relationship between innovation and economic growth has been highlighted in numerous theoretical and empirical studies. Significant advances in economics in the last three decades (mainly the New Growth theory) have highlighted that creativity and innovation are very important to achieving lasting economic growth. Countries in the innovation-driven stage, according to the World's Economic Forum Global Competitiveness Index, are considered to be the most competitive ones. In the times of major economic challenges at a global scale, innovation has been perceived as a way of overcoming difficulties, ensuring and preserving economic growth and, in consequence, addressing social problems more effectively. Nowadays, policy makers in order to address the new global challenges turn toward sustainable alternatives, green innovation or eco-innovation. According to many scholars, international organisations and think tanks (e.g. The Worldwatch Institute, 2008; Moody & Nogrady, 2010; The Natural Edge Project), these kinds of innovation will probably drive the next wave of innovation. Since the First Industrial Revolution, there have been at least six waves of innovation (Fig. 1), each shifting the technologies that underpin economic prosperity.

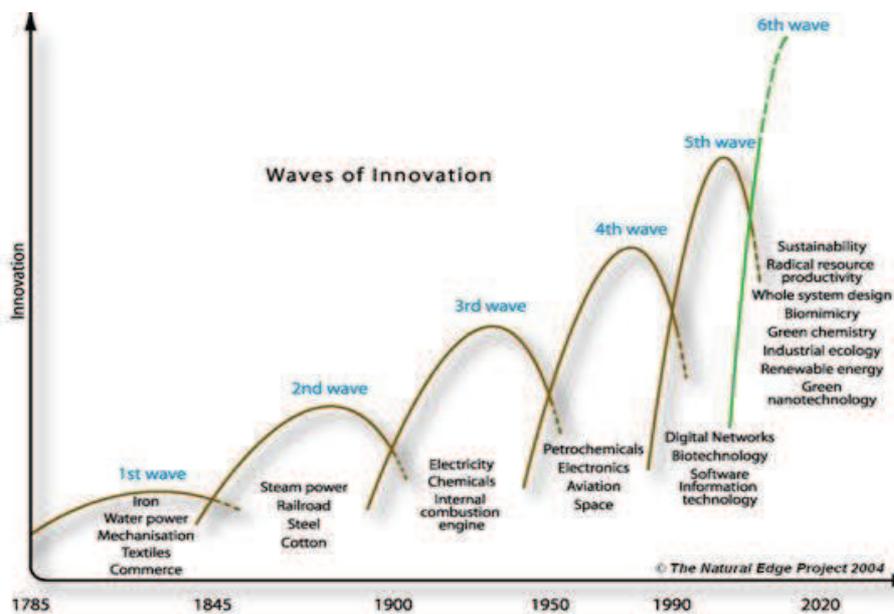


Fig. 1. Waves of innovation

Source: The Natural Edge Project, <http://www.naturaledgeproject.net/Keynote.aspx>

T. Schiedering, F. Tietze and C. Herstatt point to four terms related to innovation and environment: “green innovation”, “sustainable innovation”, “environmental innovation” and “ecological innovation”, with similar meaning (Schiedering et al., 2012). And indeed, literature provides evidence of the above by using these terms synonymously. For example, M. C. Cuerva, Á. Triguero-Cano, D. Córcoles write about the green innovation or environmental innovation, defined, inter alia, as “the introduction of new ideas, products, processes or behaviours to contribute to a reduction of environmental harms or to ecologically specified sustainability targets” (Cuerva et al., 2014). It is worth to point out that this kind of innovation may be developed with or without the explicit aim of reducing environmental harm (Beise & Rennings, 2005). In turn, the OECD points to eco-innovation, which should be connected with activities aimed at overcoming current and future environmental problems, decreasing energy and resource consumption and developing sustainable economic activity. It should be emphasised that this organisation does not distinguish between green innovation and eco-innovation (OECD, 2012). Some experts point to green innovation as “the technological innovation that ecological concept is introduced into various stages of technological innovation for entity industry, thus benefiting resource conservation and environmental protection” (Wei et al., 2015). The EU – Innovation Observatory defines eco-innovation as innovation characterised by a reduction in “the use of

natural resources and a decrease in the release of harmful substances across the whole life-cycle”, taking into account five elements: design, production, use, reuse and recycling (Eco-Innovation Observatory, 2011). T. Schiedering, F. Tietze and C. Herstatt identified six aspects (innovation object, market orientation, environmental aspect, full life cycle, impulse, new standard to firms) that are incorporated in the different definitions and found one key aspect that differentiates. According to them, eco-innovation is “the most precise and well-developed concept, whereas green innovation remains rather shallow” (Schiedering et al., 2012). The former term is concentrating more on the impact of resource consumption than the latter one. And green innovation is more strongly connected with environmental benefits than with environmental aim.

However, regardless of the clarification of definitional approach, in order to introduce this kind of innovation, one needs to simultaneously take into account activities in four areas: economy, environment, society and politics (Fig. 2).

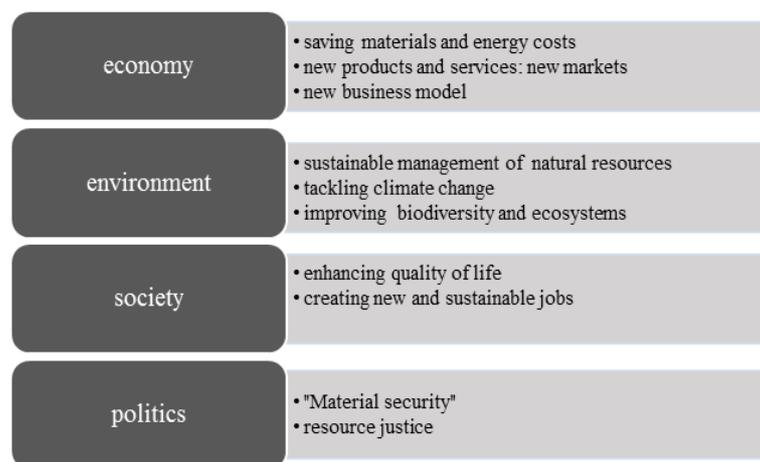


Fig. 2. The interdependence of the four areas in creating eco-innovation

Source: EIO and CfSD, 2013, Eco-innovate!, A guide to eco-innovation for SMEs and business coaches. Brussels, p. 8.

During the crisis of the real economy in 2008-2010, there have been intensified efforts to overcome the effects of the downturn and, at the same time, provide a new framework for socio-economical development. The inclusion of environmentally friendly investment projects was an important element of the anti-crisis plans adopted in many countries (Szyja, 2013). The European Economic Recovery Plan, announced at the end of 2008, stressed the need for “the shift towards a low-carbon economy”, which would enable the achievement of the following objectives: increase of energy security, research and development, mitigating the impacts of human activities

on the environment, maintenance of existing and creation of new jobs (Commission of the European Communities, 2008). A *low-carbon economy* is defined by a reduction in the emission of greenhouse gases (especially carbon dioxide), and in the energy consumption resulting from the combustion of fuels. One can also take into account the transition to less carbon-intensive operations (Levy, 2010). At the same time, literature puts emphasis on the term *green economy* (Fig. 3) – a term with broader meaning. It means not only carbon dioxide and other greenhouse gas emissions, energy efficiency but also “management of natural resources in a sustainable manner and with lower negative environmental impacts, an increase in resource efficiency and a reduction of waste” (UN, 2012). UNEP defines it as one that results in “improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities” (UNEP, 2011).

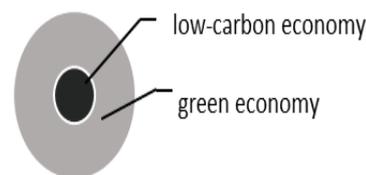


Fig. 3. Connection between green economy and low-carbon economy

Source: own work.

The following terms are related to this concept: low-carbon development, low-carbon growth and green growth (Tab. 1).

Table 1. Terms connected with green transformation in literature

Low carbon development	Development with minimal output of greenhouse gas emissions (Climate Action Network); Economy-wide decarbonisation. (Y. Mulugetta, F. Urban, 2010, p. 3)
Low carbon growth	Tends to focus on the production side of the economy in producing goods and services with lower carbon emissions through technological innovation and structural changes (Y. Mulugetta, F. Urban, 2010, p. 3)
Green growth	“Green growth is about fostering economic growth and development while ensuring that the natural assets continue to provide the resources and environmental services on which our well-being relies. To do this it must catalyse investment and innovation which will underpin sustained growth and give rise to new economic opportunities” (OECD, 2011, p. 9)

Source: own work and UNDESA, 2012.

A broader meaning should be attributed to the last concept, defined, according to the Global Green Growth Institute, as “the new revolutionary development paradigm that sustains economic growth while at the same time ensuring climatic and environmental sustainability. It focuses on addressing the root causes of these challenges while ensuring the creation of the necessary channels for resource distribution and access to basic commodities for the impoverished” (UNDESA, 2012). This concept was officially used for the first time in Europe in the Declaration on Green Growth of the Organisation for Economic Cooperation and Development: “We strengthen our efforts to pursue green growth strategies as part of our response to the current crisis and beyond, acknowledging that “green” and “growth” can go hand-in-hand” (OECD, 2009). Earlier, it was adopted in the Asia and Pacific Region, during the Fifth Ministerial Conference on Environment and Development (MCED) held in March 2005 in Seoul. Green growth involves shaping the economic growth by acknowledging the leading role of natural capital. Growth should be based on the rational use of natural resources. It is important to recognise that the environment is an asset that can serve as a basis for ensuring opportunities for economic development. According to the OECD “a key element of any green growth strategy is to set incentives that will boost innovation along a growth trajectory which diverts from inefficient patterns of the past” (OECD, 2011). In this regard, it is particularly important to develop investment projects, initiated by the state, in order to encourage enterprises to similar practices aimed at, on the one hand, environmentally friendly solutions and, on the other hand, ones that sustainably use the possibilities provided by the environment. Success in these ventures depends on the ability to seek new ways of shaping performance that would provide new competitive advantages, leading to new innovation opportunities connected with environment-related investment projects.

One of the key objectives of the green growth concept is to “improve the eco-efficiency of economic growth and enhance the synergies between environment and economy” (UNDESA, online). “Eco-efficiency can be interpreted as the ratio, or a causal relationship, between economic value creation and environmental impact added” (Möller & Schaltegger, 2005). It also highlights “a ratio between environmental impact and economic cost or value” (Huppel & Ishikawa, 2005). This term is connected with clean (or green) production through minimising the consumption of resources, reducing environmental burdens and limiting concomitant risks and liabilities (WBCSD, 1998). The issue is described more succinctly by Lu, Huang, Wang who

highlight the economic value of products and services – to environmental load ratio (Lu et al., 2014). The essence of the concept is to implement solutions, which would allow us to simultaneously obtain economic benefits and reduce human pressure on the environment – eco-innovation.

3. European Union support for eco-innovation

Government efforts to promote greener growth and green innovation have intensified in the recent years. The European Union has also moved in this direction. The Europe 2020 strategy, that is the Union's growth strategy for the coming decade, promotes structural change with a sustainability orientation. The EU 2020 strategy is about delivering growth that is: smart, through more effective investments in education, research and innovation; sustainable, thanks to a decisive move towards a green economy, resource efficient and competitive; and inclusive, with a strong emphasis on job creation and poverty reduction (EC, 2010). Moreover, the EU emphasises that the ability of the economy to adapt and become more climate change resilient and resource-efficient and, at the same time, to remain competitive, depends on high levels of eco-innovation of a societal, economic, organisational and technological nature. According to the EU, eco-innovation may provide valuable new opportunities for growth and jobs and enable the transition towards a green economy that takes into account the sustainable use of resources.

Europe's first major drive to boost eco-innovation came with the Environmental Technologies Action Plan (ETAP). Adopted in 2004, this Action Plan (Commission of the EC, 2004) focused on the further development and use of environmental technologies. This plan has created a Community framework for policies to encourage environmental technologies, including those of innovative character. The actions proposed fell into three main areas: getting from research to markets; improving market conditions for environmental technologies; and acting globally to promote sustainable development at the global level, particularly in developing countries (Commission of the EC, 2004). The Eco-innovation Action Plan – EcoAP (EC, 2011), launched by the European Commission in December 2011, is a logical successor to the ETAP. To a greater extent it focuses on issues of innovation – takes a broader approach to eco-innovation and provides more actions aimed at strengthening incentives and overcoming barriers to the implementation of innovative environmentally friendly solutions.

The EcoAP is a broad policy framework. It provides directions for eco-innovation policy and funding (Table 2). The need to support eco-innovation in the EU is emphasised in several

documents, including the Europe 2020 strategy, the flagship initiatives “Innovation Union”, “An industrial policy for the globalisation era”, and “Resource-efficient Europe”, the Eco-innovation Action Plan and the General Union Environment Action Programme to 2020. Until 2013, the eco-innovative projects were funded under the EU’s Seventh Framework Programme for Research and Technological Development; the Competitiveness and Innovation Framework Programme (CIP); and LIFE+, as well as structural and cohesion funds.

Table 2. EU support for eco-innovation 2014-2020

Action of Eco-AP	The idea	Funding
Action 1. Environment policy and regulation for promoting eco-innovation	- screening of the regulatory framework in the environmental area, identifying possible gaps; - reviewing existing rules and implementing new ones in order to provide a coherent legislative framework that promotes eco-innovation;	LIFE
Action 2. Demonstration projects and partnerships for eco-innovation	- demonstrating the market viability of eco-innovative solutions; - supporting partnerships implementing innovative technologies;	Horizon 2020, COSME
Action 3. Standards and performance targets for key goods, processes and services to reduce their environmental footprint	- labelling schemes indicating performance standards of a product to communicate the benefits of eco-innovation; - building on the standardisation package to ensure that new or revised standards result in strong incentives for innovation, and take resource efficiency, environmental and climate change concerns into account;	Horizon 2020, LIFE
Action 4. Finance and support services for SMEs	- access to finance for eco-innovative SMEs;	Horizon 2020, COSME, Cohesion policy
Action 5. International cooperation	- fostering the market for European eco-innovations abroad; - enhancing dialogue with third countries to put in place market and regulatory measures that foster eco-innovation globally;	Horizon 2020
Action 6. New skills and jobs	- matching skills supply with labour market needs, in particular in terms of newly-emerging and expanding skills such as those required by green and greener jobs;	Cohesion policy
Action 7. European Innovation Partnerships	- bridging the gap between a more resource efficient economy, ambitious environmental goals as well as business opportunities; - testing of green public and private procurement promoting eco-innovation.	Horizon 2020

Source: own work.

From 2014 to 2020, the main source of support is Horizon 2020, the framework programme for Research and Innovation for the 2014-2020 period. Horizon 2020 is the biggest EU research and innovation programme ever. Horizon 2020 is the financial tool to implement the Eco-Innovation action plan, in particular under the societal challenge “Climate Action, Resource Efficiency and Raw Materials”. It is expected that at least 60% of the overall Horizon 2020 budget (EUR 77,028.3 million) should be related to sustainable development and EUR 3,081 million was allocated for climate action, environment and resource efficiency initiatives (Regulation 1291/2013), which include eco-innovation. The aim is to foster all forms of eco-innovation that enable the transition to a green economy. Activities shall focus on “strengthening eco-innovative technologies, processes, services and products (...); supporting innovative policies, sustainable economic models and societal changes; measuring and assessing progress towards a green economy; and fostering resource efficiency through digital systems” (Regulation 1291/2013).

There are many barriers to the penetration of eco-innovative solutions to the markets. According to enterprises, the main market barriers are the uncertain demand from the market, lack of funds within the enterprise and insufficient access to existing subsidies and fiscal incentive (The Gallup Organization, 2011). The response to this challenge can be COSME – the EU programme for the Competitiveness of Enterprises and Small and Medium-sized Enterprises. It supports enterprises by improving access to finance in the form of loan guarantee and equity facilities, improving access to markets, improving framework conditions for business creation and growth, their competitiveness and sustainability (Regulation 1287/2013). COSME can encourage eco-innovation and sustainable production, help to find partners abroad to work on eco-innovative products, or to obtain support for innovation and technology transfer. The financial envelope for the implementation of the COSME programme is set at EUR 2,298.2 million for the 2014-2020 period.

Another EU programme that can be used to support eco-innovation is the LIFE programme. The general objective of LIFE is to contribute to the shift towards a resource-efficient, low-carbon and climate-resilient economy and to contribute to the implementation, updating and development of EU environmental and climate policy and legislation by co-financing projects with European added value (Reg. 1293/2013). The financial envelope for the implementation of the LIFE Programme for the period from 2014 to 2020 is set at EUR 3,456.7

million. As intended by the European Commission, LIFE should be a catalyst for changes in policy development and implementation by, among others, promoting innovative environmental and climate change technologies. The programme can contribute to the development and demonstration of innovative technologies to environmental challenges and innovative climate change mitigation and adaptation technologies, systems, methods and instruments that are suitable for being replicated, transferred or mainstreamed (Regulation 1293/2013).

Since 2014, the European Commission has mainstreamed eco-innovation in the cohesion policy, the EU's main investment policy. The cohesion policy focuses on the economic and social pillars of sustainable development by strengthening growth, competitiveness, employment and social inclusion. Some of the priorities of the cohesion policy contribute to the promotion of environmental technologies (including eco-innovations), of sustainable transport and energy systems, and also of investment project improving water, air and soil quality and addressing climate change problems. Cohesion policy has set 11 thematic objectives for the 2014-2020 period (Regulation 1303/2013), four of which may be associated with the support of eco-innovation: strengthening research, technological development and innovation; supporting the shift towards a low-carbon economy; promoting climate change adaptation, risk prevention and management; preserving and protecting the environment and promoting resource efficiency. Importantly, under the EU's 2014-2020 budget, the investments under the European Regional Development Fund should be concentrated ("thematic concentration") on four key priorities: research and innovation (including eco-innovation), the digital agenda, support for small and medium-sized enterprises and the low-carbon economy (e.g. energy efficiency, renewable energies, smart distribution grids, sustainable multimodal urban transport), depending on the category of region (less developed: 50%, transition: 60%, and more developed: 80%) (Regulation 1301/2013). Furthermore, some ERDF resources must be channelled specifically towards low-carbon economy projects (less developed regions: 12%, transition regions: 15% and more developed regions: 20%). Funding for cohesion policy in the 2014-2020 period amounts to EUR 351.8 billion. Around EUR 117.8 billion will be dedicated to thematic objectives: research and innovation, low carbon economy, climate change and risk prevention, environment and resource efficiency³.

³Own calculations based on European Commission data, Breakdown Of The Available Funds By Thematic Objective By MS For 2014-2020, <https://cohesiondata.ec.europa.eu> (2.04.2015).

In addition to financial support instruments, communication platforms (e.g. Eco-innovation Platform, Europe INNOVA, ECOPOL) also play an important role. They allow the exchange of good practices and cooperation in projects aiming at development of eco-innovation. Equally important are the activities of the Eco-Innovation Observatory – an initiative financed by the European Commission’s Directorate-General for the Environment from the Competitiveness and Innovation Framework Programme (CIP). It aims to provide a much-needed integrated information source on eco-innovation for companies and innovation service providers, as well as provide a solid decision-making basis for policy development.

4. Conclusions

In the current economic crisis, eco-innovation is gaining ground within both industry and government as an effective way to tackle climate change and to foster green growth. European Union seems to share these views, allocating substantial funds from its budget to support this kind of innovation. International comparisons of innovative and eco-innovative potential (Innovation Union Scoreboard, Eco-Innovation Scoreboard) indicate that they are closely related, so we need to remember that the development of a specific area of innovation (like eco-innovation) without support of a general base for the knowledge-based economy can be ineffective.

References

1. Beise, M., Rennings, K. (2005). Lead markets and regulation: a framework for analyzing the international diffusion of environmental innovations. *Ecological Economics*, Vol. 52, 5-17.
2. Commission of the European Communities. (2004). *Stimulating Technologies for Sustainable Development: An Environmental Technologies Action Plan for the European Union*. COM(2004) 38, Brussels.
3. Commission of the European Communities. (2008). A European Economic Recovery Plan. COM(2008) 800 final, Brussels, 26.11.2008.
4. Cuerva, M. C., Triguero-Cano, Á., Córcoles, D. (2014). Drivers of green and non-green innovation: empirical evidence in Low-Tech SMEs. *Journal of Cleaner Production*, Vol. 68.
5. Eco-Innovation Observatory. (2011). *The Eco-Innovation challenge, Pathways to a resource efficient Europe. Annual Report 2010*. Retrieved from http://www.eco-innovation.eu/media/ECO_report_2011.pdf.

6. EIO and CfSD. (2013). *Eco-innovate!, A guide to eco-innovation for SMEs and business coaches*. Brussels.
7. European Commission. (2010). *Europe 2020. A strategy for smart, sustainable and inclusive growth*. COM(2010) 2020, Brussels, 3.3.2010.
8. European Commission. (2011). *Innovation for a sustainable Future –The Eco-innovation Action Plan (Eco-AP)*, COM/2011/899 final, Brussels.
9. Huppes, G., Ishikawa, M. (2005). Eco-efficiency and Its Terminology. *Journal of Industrial Ecology*, Vol. 9, No. 4.
10. Levy, Ch. (2010). *A 2020 Low Carbon Economy*. The Work Foundation, London.
11. Lu, W., Huang, S., Wang, L. (2014). Environmental Efficiency and Regional Technology Gaps in China: A Metafrontier Non-Radial and Non-Oriental Malwquist Index Analysis. *Polish Journal of Environmental Studies*, Vol. 23, No. 1.
12. Mulugetta, Y., Urban, F. (2010). Deliberating on low carbon development, *Energy Policy*.
13. Moody, J. B., Nogrady, B. (2010). *The sixth wave. How to succeed in a resource-limited world*. Sydney: Random House Australia.
14. Möller, A., Schaltegger, S. (2005). The Sustainability Balanced Scorecard as a Framework for Eco-efficiency Analysis. *Journal of Industrial Ecology*, Vol. 9, No. 4.
15. OECD. (2009). *Declaration on Green Growth*. [C/MIN(2009)5/ADD1/FINAL], <http://www.oecd.org/env/44077822.pdf>.
16. OECD. (2011). *Towards Green Growth*, Retrieved from http://www.keepeek.com/Digital-Asset-Management/oecd/environment/towards-green-growth_9789264111318-en#page2.
17. OECD. (2011). *Towards Green Growth. Monitoring Progress. OECD Indicators*, Paris.
18. OECD. (2012). *The Future of Eco-Innovation: The Role of Business Models in Green Transformation*, OECD Background Paper.
19. Regulation (EU) No 1287/2013 of the European Parliament and of the Council of 11.12.2013 establishing a Programme for the Competitiveness of Enterprises and small and medium-sized enterprises (COSME) (2014-2020), OJ EU L 347.
20. Regulation (EU) No 1291/2013 of the European Parliament and of the Council of 11.12.2013 establishing Horizon 2020 – the Framework Programme for Research and Innovation (2014-2020), OJ EU L 347, Annex II.

21. Regulation (EU) No 1293/2013 of the European Parliament and of the Council of 11.12.2013 on the establishment of a Programme for the Environment and Climate Action (LIFE), OJ EU L 347.
22. Regulation (EU) No 1301/2013 of the European Parliament and of the Council of 17.12.2013 on the European Regional Development Fund and on specific provisions concerning the Investment for growth and jobs goal, OJ EU L 347.
23. Regulation (EU) No 1303/2013 of the European Parliament and of the Council of 17.12.2013 laying down common provisions on the European Regional Development Fund, the European Social Fund, the Cohesion Fund, the European Agricultural Fund for Rural Development and the European Maritime and Fisheries Fund, OJ EU L 347.
24. Schiedering, T., Tietze, F., Herstatt, C. (2012). Green innovation in technology and innovation management – an exploratory literature review, *R&D Management*, Vol. 42. Issue 2.
25. Szyja P. (2013). The role of Green New Deal Programs for creating socio-economic development, in K. Górka, P. Szyja (eds.) *Green New Deal and selected problems of energy market and water management*, *Library "Economics and environment"*, No 35, Cracow.
26. UN. (2012). *Report of the United Nations Conference on Sustainable Development*, A/CONF.216/16, Rio de Janeiro.
27. UNDESA. *Green growth*, Retrieved from <https://sustainabledevelopment.un.org/index.php?menu=1447>.
28. UNDESA. (2012). *A guidebook to the Green Economy*. Retrieved from <https://sustainabledevelopment.un.org/content/documents/GE%20Guidebook.pdf>.
29. UNEP. (2011). *Towards a green economy. Pathways to Sustainable Development and Poverty Eradication. A synthesis for Policy Makers*. Retrieved from http://www.unep.org/greeneconomy/Portals/88/documents/ger/GER_synthesis_en.pdf.
30. The Gallup Organization. (2011). *Attitudes of European entrepreneurs towards eco-innovation. Analytical report*, Flash Eurobarometer 315, March.
31. The Worldwatch Institute. (2008). *State of the World 2008: Innovations for a Sustainable Economy*. Washington: W.W. Norton & Company.
32. WBCSD. (1998). *Cleaner Production and Eco-efficiency. Complementary Approaches to sustainable development*.

33. Wei, Z., Yuguo, J., Jiaping, W. (2015). Greenization of venture capital and green innovation of Chinese entity industry. *Ecological Indicators*, Vol. 51.