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## **ECOLOGICAL ASPECTS OF THE ECONOMIC RECOVERY IN THE EUROPEAN UNION AFTER REAL ECONOMY CRISIS 2008–2010**

### **Abstract**

The article presents remarks about ecological aspects of attempts to overcome economic downturn by structural changes called “low-carbon economy”, aimed at decreasing emissions of greenhouse gases and transformation of energy systems. The main goal in long term is to create socio-economic development with gaining goals including overcoming problems with climate change and enhancing energy security. There are two methods to estimate current progress in transition to a low-carbon economy. However, due to the short period of time and limited data, none of them is effective and allows to answer the question about the real effects of undertaking ventures for the natural environment.

**Keywords:** economic recovery, environment, indicator, low-carbon economy, transition

### **Introduction**

Financial crisis in the United States in 2007 and then real economy downturn of 2008–2010 in USA and all member states of the European Union came as a surprise for some people, and for others it was just a confirmation of their predictions. One thing is obvious, though: years of living on credit, buying over-the-counter, policy of low interest rates, and functioning of deregulated financial markets had contributed

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to a very serious downturn. Therefore, circumstances of this situation have started to be analysed. On the other hand, a method to overcome the crisis and not to let it happen again – by implementing serious changes in economics – has been searched for. The analysis has pointed out the necessity of taking measures aimed at structural changes in the national economy, which would allow to achieve desired results in terms of: development of new technologies, implementation of innovation, maintaining and creating new jobs, increasing energy security, adaptation or/and mitigation of climate change.

The main goal of this article is to present aspects of a low-carbon transition for improving quality of environment by changes in emissions, energy systems and related components. It will present not only the issues related to terminological issues, programming aspects and governance policy, but also statistical data. The important question is whether we are actually dealing with the creation of structural changes aimed at developing a low-carbon economy in the European Union.

## 1. Development of terms related to the concept of sustainable development

In 1987 in report “Our Common Future” was presented definition of term: sustainable development (UN, 1987). During and after mentioned crisis have been appeared new terms, which we can describe as qualitatively new and related to the mentioned one. Especially the following terms gained importance: low-carbon economy, low-carbon development, green growth, green economy, and circular economy, as well as related concepts, such as eco-innovation, green innovation, green jobs, green products, green services (table 1).

Table 1. Concepts related to the operationalization of the concept *sustainable development*

Term	Definition
1	2
low-carbon economy	It create a climate-friendly and less energy-intensive economy by working in sectors such as electricity production, industry, transport, construction, agriculture, and reducing carbon dioxide and other greenhouse gases, improving energy efficiency, developing other than fossil fuels (in EC, 2016)
low-carbon development/ low-carbon development strategies	It (...) describe forward-looking national economic development plans or strategies that encompass low-emission and/or climate-resilient economic growth (Sustainable..., 2017)

1	2
green growth	It means fostering economic growth and development, while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies (OECD, 2017)
green economy	Green economy improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities (UNEP, 2011, pp. 01–02)
circular economy	A transition to a circular economy shifts the focus to reusing, repairing, refurbishing and recycling existing materials and products. What used to be regarded as ‘waste’ can be turned into a resource (EC, 2014b)
eco-innovation	An innovation that improves the environmental performance of consumption and production activities. (Del Rio, Carrillo-Hermossila, Könnölla, 2010)
green innovation	Green innovation: 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, Yuguo, Jiaping, 2015)
green jobs	Green jobs are decent jobs that contribute to preserve or restore the environment, in traditional sectors such as manufacturing and construction, or in new, emerging green sectors such as renewable energy and energy efficiency. Green jobs help: Improve energy and raw materials efficiency, Limit greenhouse gas emissions, Minimize waste and pollution, Protect and restore ecosystems, Support adaptation to the effects of climate change (ILO, 2016)
green products	A green product is a product whose design and/or attributes (and/or production and/or strategy) use recycling (renewable/toxic-free/biodegradables) resources and which improves environmental impact or reduces environmental toxic damage throughout its entire life cycle (Durif, Boivin, Julien, 2010)
green services	Definition of green product is frequently connected with green products. For example, U.S. Bureau of Labour Statistics clarifies the term as a one which benefit the environment or conserve natural resources (...) and fall into one or more of the following five categories: energy from renewable sources, energy efficiency, Pollution reduction and removal, greenhouse gas reduction, and recycling and reuse, natural resources conservation, environmental compliance, education and training, and public awareness (BLS, 2017)

Source: own works based on sources mentioned in table.

Terms which are connected with the abovementioned issues or constitute a serious constraint should be emphasized here. In the first example, highlighted issues include: green business, green cities, green transport, green cars, green (clean) technology, green (clean) energy, green investment, green public procurement. For an exception of green public procurement, all terms are named by using prefix “eco” or subject description environmental friendly. However, their meaning is not always exactly the same. In second example, the distinguished terms are eco-labeling and eco-branding, which constitute a standardization system for ecological products and services.

There are also terms which appeared earlier (in 1970s , 80s and 90s) and were identified in the context of the concept of sustainable development: sustainable production and consumption, sustainable business, sustainable transport, environmental foods and services, sustainable procurement.

In the matter of terms, we should also notice words which describe processes within the concept of green economy itself, i.a. greening up economy, or regarding one of the abovementioned terms describing the scope of the subject within green economy such as greening up business.

Another important aspect is a certain range of links to the main terms: green economy, low-carbon economy and circular economy. This distinction was made on the basis of the provisions of strategic documents and plans of the European Commission. The widest conceptual range relates to green economy, which simultaneously covers the second and the third one (Szyja, 2017).

## **2. Development of programmes and strategies**

Since 2008, the European Union's organizational entities have adopted a wide selection of documents aimed at systemic transformation for a new way of economical management in the member countries. It can be divided in three areas:

1. Green economy
  - Communication from the Commission: EUROPE 2020. A strategy for smart, sustainable and inclusive growth, Brussels, COM(2010) 2020 final.
2. Low-carbon economy
  - A European Economic Recovery Plan, COM(2008) 800 final.
  - Communication from the Commission – Energy efficiency: delivering the 20% target, COM/2008/0772 final.
  - Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions Energy 2020. A strategy for competitive, sustainable and secure energy, COM/2010/0639.
  - Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, Innovation for a sustainable Future, Energy Roadmap 2050, COM/2011/0885 final.

- Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, An EU Strategy on adaptation to climate change, COM/2013/0216 final.
  - GREEN PAPER A 2030 framework for climate and energy policies, COM/2013/0169 final.
  - Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, A policy framework for climate and energy in the period from 2020 to 2030, COM/2014/015 final.
3. Circular economy
- Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, Roadmap to a Resource Efficient Europe, COM/2011/0571 final.
  - Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, Innovation for a sustainable Future – The Eco-innovation Action Plan (Eco-AP), COM/2011/0899 final.
  - Communication Towards a circular economy: a zero waste programme for Europe, COM/2014/0398 final/2.

A European Economic Recovery Plan, which is based on two pillars: the first financial, and the second related to structural changes, directed to “*smart investment*”. “Smart investment means investing in the right skills for tomorrow’s needs; investing in energy efficiency to create jobs and save energy; investing in clean technologies to boost sectors like construction and automobiles in the low-carbon markets of the future; and investing in infrastructure and inter-connection to promote efficiency and innovation” (A European..., 2008). This was the way of proposing the idea for transition to a low-carbon economy, which shall simultaneously gain targets related to climate change, energy security and recovery in economics in short term, and creating new area for developing in long term. In turn, A strategy for smart, sustainable and inclusive growth points out on *sustainable growth*, defined as “promoting a more resource efficient, greener and more competitive economy” (EC, 2010). With reference to circular economy, there are some documents – plans to introduce *zero waste* system in economy through resource efficiency, and eco-innovation. It should be highlighted that all those documents are highly correlated due to the links between

the terms such as “green economy”, “low carbon economy”, or “circular economy”, and their common elements of structural change: energy, water and resource efficiency, efficiency of production and services based on efficiency technologies, and new professional skills.

In Poland, no documents directly aimed at transition to green economy have been adopted yet. There are a few in which the issue is highlighted: Poland 2030. The third wave of modernity. Long-term development strategy of the country (MAD, 2012), Plan for the development of electromobility (ME, 2016), Strategy for responsible development (Strategy..., 2017). Also, the ACT of 20<sup>th</sup> May 2016 Energy efficiency was adopted in 2016; however, the National Action Plan for Energy Efficiency is still in preparatory phase. This situation is a results of lack of political support, energy sector lobbying, and addiction to coal in energy system. However, in the first case the situation is slowly changing because of government’s involvement in electromobility and ecobuilding, among other things. Recently adopted EU’s documents show understanding for different conditions of implementation of a low-carbon economy in the Member States, including Poland. In A policy framework for climate and energy in the period from 2020 to 2030, emphasis is put on “providing flexibility for Member States to define a low carbon transition appropriate to their specific circumstances, preferred energy mix and needs in terms of energy security and allowing them to keep costs to a minimum” (EC, 2014a).

### **3. Practical aspects on post-crisis activities for transition to a low-carbon economy**

Recently, attempts have been taken to measure progress in transition to a low-carbon economy. They include economic, social, and environmental aspects, based on appropriate indicators. First method are complex indexes. One is prepared every year by PricewaterhouseCoopers (table 2). According to the indexes from 3 years: 2012, 2016, and 2017, there are visible changes in carbon intensity. However, the most significant changes were recorded for the period 2010–2011, immediately after the crisis. This is probably the result of high fuel prices (in 2007 and 2008) and the savings in their use. The situation changed in the following years i.a. due to lower consumption of natural resources.

The level of real GDP, which was higher in 2014 and the following years, should also be emphasized. To some extent, the European Union Member States overcame

the economic downturn i.a. by anti-crisis programmes based on investment in infrastructure, energy, and “smart” technology.

Table 2. Low-carbon Economy Index – 2012, 2016, 2017, situation in the European Union

Country	Change in carbon intensity			Annual average change in carbon intensity			Real GDP growth (PPP)		
	2010–2011	2014–2015	2015–2016	2010–2011	2000–2015	2000–2016	2010–2011	2014–2015	2015–2016
EU	-3.6%	-0.7%	-1.7%	-5.1%	-2.3%	-2.3%	1.5%	1.9%	1.9%

Source: PwC (2012), p. 5; PwC (2016); PwC (2017), p. 5.

Another example of an index is the Low-Carbon Indicators Toolkit for stakeholders from European regions, which was developed within the project Regions for Sustainable Change. It covers indicators in seven areas: GHG emissions, sustainable energy use, sustainable process in other sectors, policy framework, institutional capacity, socio-political awareness, and financial aspects (Regions..., 2017).

Second method is based on analysis of the main indicators related to energy and emissions (table 3). However this approach is based only on two elements of a low carbon economy: energy efficiency and development energy from renewable sources. This attitude does not take into account the wide spectrum of social issues. Indirectly it indicates changes in energy system. In connection with the data: the average figures for EU-28 and situation in Poland, it is worth to make some remarks. First of all, analysing detailed data, Germany has the highest primary and final energy consumption; however, the levels have decreased over years. Energy productivity and share of energy from renewable energy sources in EU is increasing, but the largest increase was recorded after 2012. The same may be applied to the emissions of CO<sub>2</sub>. Unfortunately, there are no visible changes in the scope of increasing the role of collective transport, as one of the important sources of this gas emission.

In addition to the indicators described above, it is also worth tracking the data related to environmental products and services, employment in environmental economy, and eco-innovation. This step, in turn, can throw light on changes in the area of supply for ecological products and services and innovative potential and the ability to create jobs.

Table 3. Indicator pointed to changes in low-carbon economy 2008–2015

Indicator	Average for the EU				Poland			
	2008	2010	2012	2015	2008	2010	2012	2015
Primary energy consumption (TOE)	1,692.4	1,656.7	1,585.4	1,529.6	92.8	95.7	92.7	90.0
Final energy consumption (TOE)	1,179.7	1,162.8	1,106.2	1,082.2	62.4	66.3	64.4	62.3
Final energy consumption in households per capita (kg of oil equivalent)	600	633	590	540	515	577	545	496
Energy productivity (KGOE)	7,3	7,3	7,7	8,3	3.5	3.6	4.0	4.4
Share of renewable energy in gross final energy consumption	11.0	12.9	14.4	16.7	7.7	9.3	10.9	11.8
Energy dependence (% of imports in total energy consumption)	54.5	52.6	53.4	54.0	30.2	31.3	30.6	29.3
Greenhouse gas emissions intensity of energy consumption (index (2000 = 100))	95.1	92.8	92.3	89.1	94.0	93.0	93.4	91.5
Greenhouse gases emission (in CO <sub>2</sub> equivalent, base year 1990)	90.6	85.9	82.1	77.4	87.1	87.2	85.5	82.8
Gross domestic expenditure on R&D by sector (% of GDP)	1.84	1.93	2.01	2.03	0.6	0.72	0.88	1.0
Share of collective transport modes in total passenger land transport by vehicle (% of total inland passenger-km)	17.3	16.6	17.2	16.9	28.1	23.9	23.2	21.5
Average CO <sub>2</sub> emissions per km from new passenger cars (g CO <sub>2</sub> per km)	153.6*	140.3*	132.2*	118.1**	153.1	146.2	141.3	129.3
Resource productivity and domestic material consumption (EUR per kg, chain linked values (2010))	1.5868	1.8059	1.8966	2.0189	0.5277	0.5611	0.5552	0.6527

\* for EU-27.

\*\* for EU-28.

Source: SDG 7; SDG 9; SDG 12.

Production, value added and exports in the environmental goods and services sector changed from 2008 to 2014: in 2008, their value was 571,834 mln EUR, in 2010 – 618,261 mln EUR, 2012 – 691,737 mln EUR and in 2014 – 709,543 mln EUR (Eurostat, *Production...*). Employment in environmental economy (2000 = 100) in 2008 was on the level 128, in 2010 – 141, but in 2012 – 149, and the same is the number for 2014 (Eurostat, *Development...*).



Taking into account gross value added, the data is impressive: 149 in 2008, 163 in 2010, 173 in 2012 and 175 in 2014. The largest share in the creation of value added was due to management of energy resources (Eurostat, *Gross...*).

It is worth pointing out on the European Eco-Innovation Index, which has presented indicators in five areas (inputs, activities, outputs, socio-economic outcomes, resource efficiency outcomes) since 2010. The leader country changed over seven years (2010 – Denmark, 2011 and 2012 – Finland, 2013 – Germany, 2014 – Luxembourg, 2015 – Finland, 2016 – Germany), but always scored between 136 and 151. However, in 2010–2012 maximum level of points was higher than after 2012. In 2016, Poland scored 72, far below the EU average (*The Eco-Innovations...*).

## Conclusions

Since 2008, there has been a wide progress related to implementation of elements aimed at environmental aspects to structural changes in economy. This is evidenced by the scope of adopted plans, programmes or strategies, as well as by the development of a number of concepts. However, only hard data is a tangible evidence proving the changes. Currently, there is no single effective index covering all relevant indicators. Two indexes are described above. However, they are not complete, as they do not include many indicators. This is the disadvantage of many indexes.

Taking into account available data, and bearing in mind the short time period (structural changes need more time than five years after crisis due to the complexity of system changes and ecological aspects of transition) it can be stated that some positive changes are taking place, especially in energy systems and the role of energy from renewable energy sources, resource productivity, growing role of environmental goods and services sector, and the potential of eco-innovation. The changes in energy productivity have been increasing significantly since 2012. However it have to be pointed out that essential activities, which are recognizing as related to system revision, should include changes in law, public encouragement for enterprises and society through financial instruments, changes in offer of products and services and also increase of ecological awareness of society. Complexity of changes, including subjects and areas of economy, should be directed into low-carbon economy transition. We should also remember that system changes are characterized as qualitative and for that reason bringing together all necessary data will be problematic.

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## **EKOLOGICZNE ASPEKTY OŻYWIENIA GOSPODARCZEGO W UNII EUROPEJSKIEJ PO KRYZYSIE GOSPODARKI REALNEJ W 2008–2010**

### **Streszczenie**

W artykule przedstawiono rozważania dotyczące ekologicznych aspektów prób przezwyciężenia spowolnienia gospodarczego poprzez transformację w kierunku „gospodarki niskoemisyjnej”, mającą na celu zmniejszenie emisji gazów cieplarnianych i transformację systemów energetycznych. Głównym celem podjętych działań, w dłuższej perspektywie, jest kształtowanie rozwoju społeczno-gospodarczego z zamiarem osiągnięcia celów, w tym przezwyciężania problemów związanych ze zmianą klimatu i zwiększeniem bezpieczeństwa

energetycznego. Istnieją dwie metody oceny postępu na drodze do stworzenia gospodarki niskoemisyjnej. Jednak, ze względu na krótki czas i ograniczony zakres danych, żaden z nich na obecną chwilę nie jest skuteczny i nie pozwala udzielić jednoznacznej odpowiedzi na pytanie o rzeczywiste skutki podejmowanych przedsięwzięć dla środowiska naturalnego.

**Słowa kluczowe:** gospodarka niskoemisyjna, ożywienie gospodarcze, wskaźnik, środowisko, transformacja

**Kody JEL:** O44, Q43, Q56