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THE ENERGY-CLIMATE PACKAGE AND REALISATION OF ITS OBJECTIVES WITHIN THE CONTEXT OF THE SUSTAINABLE DEVELOPMENT OF THE EUROPEAN UNION

Abstract

The climate policy of the European Union, concerning the struggle against global warming, concentrates, among others, on the realisation of the objectives of “the energy-climate package 3x20” adopted by the European Council, envisaging a 20% reduction of greenhouse gas emissions, a 20% increase in energy efficiency and a 20% share of energy produced from renewable sources in the overall energy balance by 2020. The commitment to meet these objectives has been underlined with directives aimed at promoting the use of renewable energy sources, the reduction of greenhouse gas emissions, the improvement and extension of the European Union Emission Trading Scheme (EU ETS) geologic storage of carbon dioxide and the public support for the actions aiming at environmental protection. The agreed energy-climate package means that EU member states are going to face many challenges, imposing on them the obligation to take a number of measurable steps towards implementation of these directives. On the one hand, the main objectives of the package fit very well into the concept of sustainable development, whilst, on the other, meeting these objectives is very costly and controversial, in particular for countries whose energy is based on conventional sources. What is the essence of the energy-climate package given the climate change theory and within the context of sustainable development? What has been the success of the realisation of the package so far? These are the main research questions in this paper.

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Keywords: energy and climate package, sustainable development, energy efficiency, CO₂ emissions, renewable sources of energy, theories of climate change.

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Introduction

The energy-climate package is a collection of principles and objectives which are planned to be achieved by the European Union by 2020 in the energy and climate policy. This package is a foundation for the realisation of the EU 3x20% targets in energy policy (a 20% reduction of greenhouse gas emissions, a 20% increase in the share of renewable energy, a 20% increase in energy efficiency by 2020). This is the main guideline for the creation of a low carbon economy which will counteract climatic change. The main objectives of the package seem to be the sustainable development of the EU, such as methods of carrying out commercial activities that guarantee economic growth, paralleled with minimising negative effects on the natural environment and society.

The guidelines of the energy and climate package have had a significant influence on the energy and climatic policies of the EU. The package merged these two policies, creating “the new energy policy” of the European Union, in which the key issue is to guarantee energy security, whilst underpinning the protection of the natural environment.

The package itself is a controversial document, as meeting its main objectives seems to be very costly for specific member states, in particular those whose energy production is based on hard coal. The immense financial resources designated for the realisation of the package objectives call into question the sense of such ambitious measures from the EU, given the lack of any interest in this area from China or India. Moreover, such policy is the outcome of not only concern for the environment, but also of the actions of a powerful business lobby which hopes for the export of innovative energy-saving technologies designed for the development of renewable sources of energy, such as: wind turbines, photovoltaic cells, solar thermal collectors and *Carbon Capture and Storage* clean coal technologies. These doubts are additionally heightened by intensifying scientific debate about the theories of climate change concerning both global warming and cooling. Therefore, the question whether the energy package is really an authentic tool for sustainable development must be asked. Will it bring about long-term positive outcomes for future generations or is it rather a group of overly ambitious objectives rooted in a powerful game of international interests?

The theories of climate change and the energy and climate package

Climatic changes and their impact on many spheres of life have been at the centre of a global debate for many years. Initiatives to counteract these changes have become the priority for many world countries and also for integration formations, including the European Union. However, diverse theories concerning climate change have given rise to a lot of concern. Are European Union countries confident what they are fighting against and does it make sense in the light of China’s or India’s passivity? Are the enormous sums from the EU budget designated for the counteraction of climate change appropriately allocated, given the grave problems of unemployment, poverty and exclusion?

Climate change is nothing more than a change of the weather, which might be chaotic and difficult to be predicted in the future. Climate, in turn, is defined by some kind of average weather, more or less within a period of 10 years. Changes in weather are more observable than those of climate, as they concern a longer period of time in which the fluctuations have been occurring (Archer, 2011).

The question that more and more frequently arises is whether we are now counteracting global warming or global cooling and whether the climatic changes are the effect of human activity or are they occurring by themselves?

Svante Arrhenius, a Swedish physicist and chemist, already in 1896, laid the foundations for the theory of climate change. He observed that the combustion of fossil fuels led to the emission of large quantities of CO₂, affecting the climate (Arrhenius, 1896). This theory was not treated seriously because CO₂ emissions at that time were not large and the changes were quite slow. The theory, however, found its followers, such as Thomas C. Chamberlin and E. O. Hulburt, who, in 1931, repeated Arrhenius's research, thus confirming his theory. Their studies were followed by Guy Stewart Callender, who, on the basis of his own research, confirmed the increase in temperature over a few decades. Moreover, he observed that doubling the CO₂ concentration in the air resulted in the climate warming by 2°C (Archer & Rahmstorf, 2010).

The theory defining the basis of climate change as the increase of the concentration of greenhouse gases was coined the greenhouse effect. This process comprises the temperature increase in the troposphere, caused by the emission of carbon dioxide and other greenhouse gases, such as methane, nitrogen oxides and freons. (Winiński, 2009).

The international debate on this subject has many diversified opinions concerning the theory of climate change. According to the Intergovernmental Panel on Climate Change (IPCC), further emission of greenhouse gases in the future will cause long-term changes with grave effects for people and the ecosystem. The risk of these changes could be minimised by significant and permanent curbs in emissions. The scale of the emissions will depend significantly on the climatic policy with appropriate tools for changing the scale of the emissions and on the social and economic development (IPCC, 2014).

The opposite side of this scientific discussion is represented by scientists from the Nongovernmental International Panel on Climate Change (NIPCC), founded in Vienna in 2007. This organisation unites scientists with a sceptical view on the extent of human influence on global climate change; they believe that carbon dioxide is a mild gas with an insignificant influence on the greenhouse effect. The aim of the organisation was to create an independent evaluation of available scientific evidence on the effect of global warming caused by carbon dioxide. In 2008, the panel started cooperation with the Heartland Institute, to create the report, *Nature, Not Human Activity, Rules the Climate*. This summary of their research was communicated to politicians and widely disseminated. It was the first complex alternative to the alarming reports provided by the IPCC.

From 2008 on, articles concerning global cooling have begun to appear on the Internet portals. It was already in 2008 that professor Zbigniew Jaworowski presented a paper (2008) contradicting the omnipresent theory of global warming. According to the four main systems of monitoring the Earth, January of 2008 was exceptionally cold. It was 0.75°C colder than the January of the preceding year with the stratosphere temperature lower by 0.5°C . *Polska, The Times*, in 2009, published Professor Jaworowski's statement claiming that humans have no effect on global warming. This conclusion was based on research carried out in the Norwegian Arctic. In the professor's opinion, climate warming was a natural process and the fluctuations of carbon dioxide levels were not caused by human activity, but instead by the influence of the oceans. There is fifty times more carbon dioxide in sea waters than in the atmosphere and the solubility of CO_2 in water depends on temperature, thus if water temperature is higher, the solubility is lower. This process results in the passage of carbon dioxide into the atmosphere: an ocean simply "breathes it out". The cooler the climate is the more gas is absorbed by sea waters (Kožinski & Jaworowski, 2009).

Also, according to the US National Climatic Data Center (NCDC), the temperature in January 2008 was for the first time in 26 years lower than the 20th century average.

Similarly, scientists from the European Institute for Climate and Energy (EIKE) observed in their research that by 2010, the temperature had significantly dropped. Their studies concerned the oscillation cycles of the Atlantic and Pacific Oceans and solar cycles. This opinion is shared by Professor Miko Lockwood from the University of Reading and by Habibullo Abdussamatov from the Russian Academy of Sciences. They claim that starting from 2014 there will be a profound cooling down processes following maximum solar activity. The trend for global cooling is also observed by a Japanese scientist, Mototaka Nakamura, who bases his conclusions on studies of the Greenland Sea and the cycles of the North Atlantic. He claims that from 2015 on, the Northern hemisphere will experience a period of observable cooling (Researcher predicts cooler climate in Northern Hemisphere from 2015, http://ajw.asahi.com/article/behind_news/social_affairs/AJ201306300011).

Therefore the scientific milieu does not speak with one voice about global climate change. The European Union supports its actions with the theory of global warming.

The tool which is meant to facilitate the struggle against global warming possible, and, at the same time, against greenhouse gas emissions, is the energy-climate package, which has become the chief element of EU energy policy, as energy production has the highest emissivity in the EU (cf. fig 1).

Energy production is responsible for about 30% of total emissions. This sector significantly exploits natural resources and strongly affects the natural environment, depending on the type of natural resource and the technology used in its conversion.

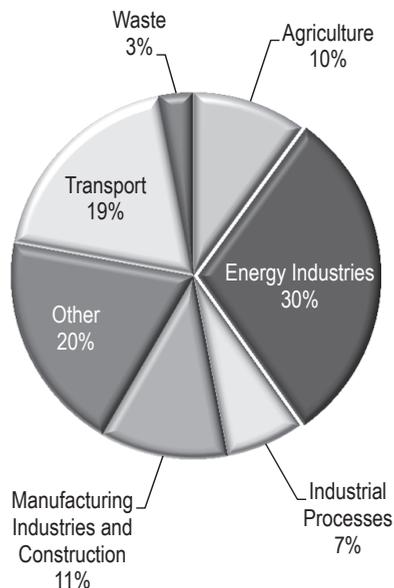


Figure 1. The emission of greenhouse gases in 2013 in EU-28 as broken down by specific sectors (million tonnes of CO₂ equivalent)

Source: The author's own study on the basis of: <http://www.eea.europa.eu/data-and-maps/data/data-viewers/greenhouse-gases-viewer>, Greenhouse gas emissions by sector, <http://ec.europa.eu/eurostat/tgm/refreshTableAction.do?tab=table&plugin=1&pcode=tsdcc210&language=en>

That is why the actions undertaken by the European Union in the field of energy policy aim at providing member states with energy produced from sources which do not have a negative impact on climate. Therefore, after 2007, climate change and global warming have become the determining factors for the development of the “new energy policy”. This new policy concentrates a strategic aim consisting in maintaining an increase of the Earth's average temperature below 2°C in comparison with the industrialisation period. (Communication from the Commission of 10 January 2007, Limiting Global Climate Change to 2 degrees Celsius – The way ahead for 2020 and beyond, COM(2007)).

The objectives and principles of the energy-climate package and its implications for the concept of the EU's sustainable development

In recent years, the concept of sustainable development has gained a lot of interest; in the light of the *Europe 2020 strategy*, it signifies:

- the creation of a more competitive low-carbon economy, which will employ natural resources in a rational and economical way;

- the protection of the natural environment, curbs on greenhouse gas emissions and prevention of the loss of biodiversity;
- the use of Europe's leading position for working out new, environment-friendly production methods;
- the introduction of effective, smart energy networks;
- the use of the Europe-wide network for guaranteeing additional market advantages for European based companies (in particular – for small production enterprises);
- the improvement of conditions for the development of entrepreneurship, especially in relation to small and medium-sized enterprises;
- assistance for consumers in making more conscious choices.

EU politicians stress that energy policy unceasingly intertwines with the concept of sustainable development. In recent years, more and more attention has been devoted to the fact that by getting dependent on conventional fuels, such as crude oil, gas or hard coal, the European Union puts consumers and entrepreneurs at risk of very painful price shocks, which can threaten economic security and negatively impact climate change.

Therefore, on 23rd January 2008, the European Commission presented the *energy-climate package*, containing, among others, proposals for counteracting climate change. The package consisted of 6 documents, listed in table 1 below.

Table 1. Energy-climate package

Title and type of document	EUR – Lex number
Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions of 23 January 2008 entitled: "Supporting early demonstration of sustainable power generation from fossil fuels"	COM (2008) 13
Directive 2009/29/EC of the European Parliament and of the Council of 23 April 2009 amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community	COM (2008) 16
European Parliament legislative resolution of 17 December 2008 on the proposal for a decision of the European Parliament and of the Council on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020	COM (2008) 17
Directive of the European Parliament and of the Council on the geological storage of carbon dioxide and amending Council Directives 85/337/EEC, 96/61/EC, Directives 2000/60/EC, 2001/80/EC, 2004/35/EC, 2006/12/EC and Regulation (EC) No 1013/2006	COM(2008)18 final
Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC	COM (2008) 19
Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions 20 20 by 2020 Europe's climate change opportunity	COM (2008) 30

Source: Author's own study

This package is known as 3x20% by 2020, with its main objectives being (Pach-Gurgul & Soliński, 2013):

- the increase of the renewable resources share in the total energy energy balance of the European Union to 20% by 2020;
- a 20% reduction in CO₂ emissions in comparison with the level of emissions from 1990;
- the 20% limitation of the use of primary energy in the European Union in comparison with the basic prognosis for 2020, presented in 2007.

Additionally, an increase of the share of biofuels as part of the EU's total fuel consumption to 10%. The package differentiates the reduction objectives for the European Union, for the sectors covered and not covered by the EU ETS (The EU Emissions Trading System), i.e.:

- 21% emission reduction by 2020 in comparison with 2005 in the sectors covered by EU ETS, which are powers stations and large industrial installations – this system encompasses about 40 % of all greenhouse gas emissions;
- 10% emission reduction by 2020 in comparison with 2005 in the sectors not covered by EU ETS, such as transport (cars and trucks), the construction industry (heating in particular), services, smaller industrial installations, the agriculture and waste sector, which are currently responsible for approximately 60 % of the aggregate greenhouse gas emissions in the EU.

In total, this makes up a 14 % reduction in emissions in comparison with 2005, which corresponds to a 20 % reduction in comparison with 1990. A larger reduction is necessary in the sectors covered by EU ETS, as a decrease in emissions in this sector is less expensive than in the majority of remaining sectors.

The impulse for the European Union to initiate actions aimed at climate projection was made by the United Nations Framework Decision on Climate Change. By adopting the energy-climate package in 2008, the European Union undertook an individual struggle for prevention of climate change. This undertaking obliged member states to take measures aimed at changing national energy policies, which are not easy, given the diversity of energy cultures in these countries².

The energy-climate package defines the general objectives for the EU: 3x20% by 2020 which is comprised of some individual aims concerning the share of renewable energy in energy mixes as well as a decrease in CO₂ emissions. These aims vary between specific member states because of the differentiation of their resource base, national energy mixes, the consumption of energy by industries, GDP per capita and their national energy policy, etc (cf. Fig 3).

²The notion of energy culture was discussed in A. Pach-Gurgul, B. Soliński, *Kultura energetyczna kraju jako czynnik determinujący „nową politykę energetyczną” Unii Europejskiej, „Zarządzanie Publiczne”* 2013,1(23) Kraków-Warszawa, pp. 17-19.

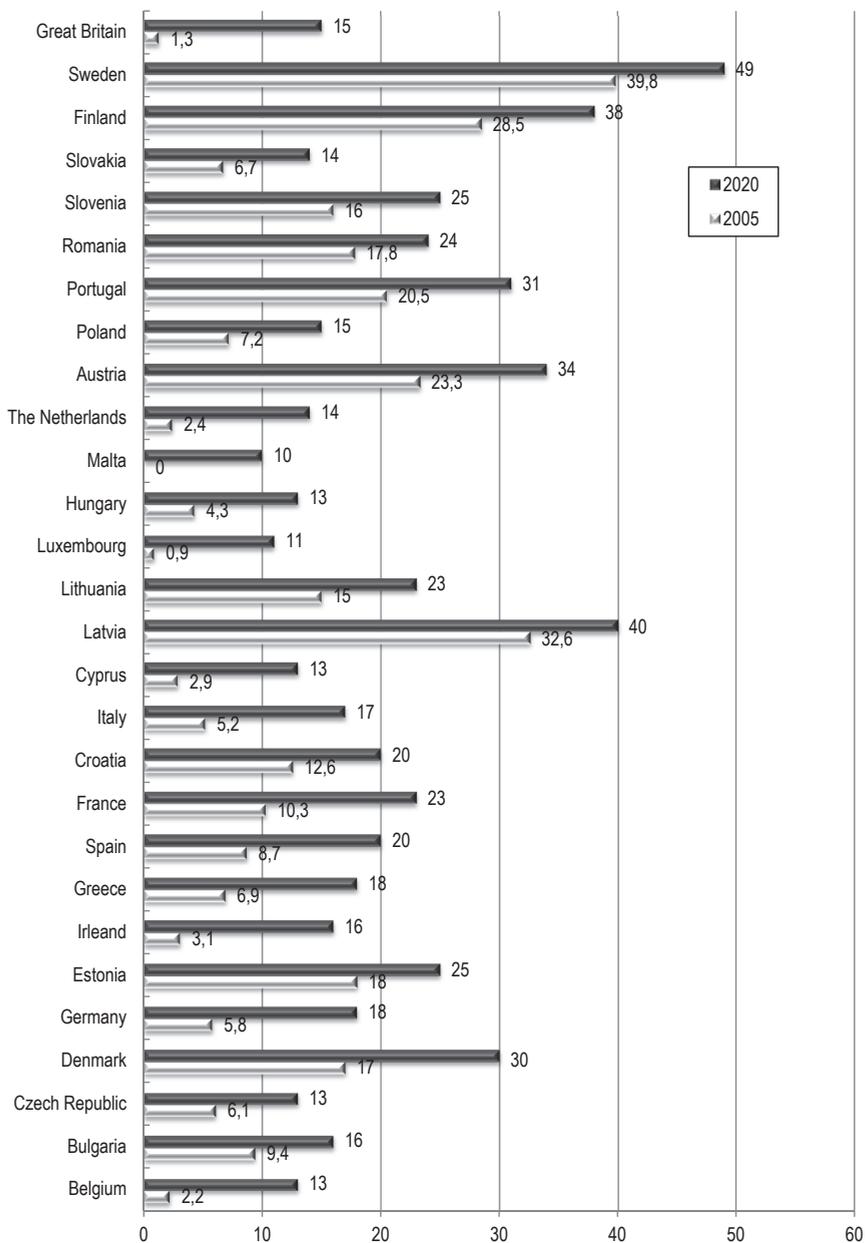


Figure 2. The share of renewable energy in the final energy consumption in 2005 versus the target share in 2020 (in %)

Source: the author's own study on the basis of: Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC (OJ L 140/16), 05.06.2009.

And thus in the case of the increase of the share of renewable energy resources in the energy mix, the highest goal was set in Sweden, where it is supposed to make up 49% of the national energy balance, as Sweden, even in 2005, had a very high share of renewable energy sources in its energy mix. In turn, for those countries which did not have any renewable sources of energy in their energy balances (Malta-0%), (Cyprus 2.9%), this goal was set at a much lower level (10% and 13% respectively). That said, this is going to be a great challenge for these countries.

The key operation included in the energy-climate package is curbs on greenhouse gas emissions, in particular, in the energy sector. This is planned to be achieved by means of the two remaining objectives of the package: an increase in energy efficiency and the use of alternative methods of obtaining energy (Sachs, 2008).

The current effects of the implementation of the energy-climate package

The energy-climate package specifies the limits of greenhouse gases emissions for the EU member states to be met by 2020 in comparison with the levels of these emissions in sectors of production not covered by the EU Emissions Trading System (EU ETS) (Decision No 406/2009/EC of the European Parliament and of the Council of 23 April 2009).

Basically, these countries were divided into two groups: those which are obliged to reduce their emissions and those which were given a threshold allowing for an increase in emissions (Poland was included in the latter group, with the allowance for the increase of the emissions by 14%). Table No. 2 presents the greenhouse gas emissions from non-ETS sectors in 2005 and 2010, the required thresholds for 2020, the required further reductions (or allowable increases) of emissions for 2011-2020, and the amount that threshold has been exceeded for 2020 as of 2010.

Currently, the largest shares in emissions of greenhouse gases in the non-ETS sector belong to: Germany (20%), France (15%), Great Britain (14%), Italy (10%) and Spain (8%).

The table shows that Germany, France, Great Britain, Finland, Luxemburg, Ireland, Austria, the Netherlands, Belgium and Estonia are the countries which must still significantly reduce emissions in the sectors not covered by the ETS system; it was for those countries that the Directive stipulated the most stringent thresholds for greenhouse gas emission. Less restrictive thresholds have been stipulated for Malta, Great Britain, Denmark and Spain. Observation of the progress in the reducing greenhouse gas emissions shows that only three countries: Sweden, Italy and Greece by 2010 had lowered their emissions below the thresholds designated for 2020. Poland belongs to those countries whose greenhouse gas emissions, in spite of an increase in 2005-2010, are significantly below the level for 2020.

In the area of energy from renewable resources some positive changes can be seen in all the member states (cf. fig. 3.). In the entire EU in 2005-2013 there was an

increase in the share of energy from renewable sources in the EU energy balance. This share increased from 8.7% in 2005 to 15% in 2013 because all member states increased their shares of renewable energy in their national energy mixes during this time period.

Table 2. The thresholds for greenhouse gas emissions for the EU member states to be attained by 2020 in comparison with the levels from 2005. [CO₂ million tonnes equivalent]

Country	2005	2010	Thresholds of greenhouse gas emissions for 2020 in comparison with the levels from 2005	The required threshold for 2020	Amount exceeding the threshold for 2020 in 2010
Denmark	43.4	35.2	-20%	34.7	0.5
Ireland	46.7	42.9	-20%	37.3	5.6
Luxembourg	10	9.5	-20%	8	1.6
Sweden	17.1	9.6	-17%	14.2	-4.7
Austria	52.1	50.1	-16%	43.8	6.3
Finland	6.9	11.2	-16%	5.8	5.4
The Netherlands	133.6	128.3	-16%	112.3	16.1
Great Britain	417.3	357.9	-16%	350.6	7.3
Belgium	87.4	84	-15%	74.3	9.7
France	400.5	380.3	-14%	344.4	35.9
Germany	538	499	-14%	462.7	36.3
Italy	295.2	253.3	-13%	256.8	-3.5
Spain	227.3	205.5	-10%	204.5	0.9
Greece	61.5	55.7	-4%	59	-3.3
Portugal	47.8	37.9	1%	48.3	-10.3
Slovenia	3.2	2.9	4%	3.3	-0.4
Malta	1	1,1	5%	1	0
Czech Republic	57.6	58.4	9%	62.8	-4.4
Hungary	49.1	41.4	10%	54	-12.5
Estonia	-3.1	2.3	11%	-3.5	5.7
Slovakia	20.7	18.3	13%	23.4	-5
Poland	150.4	159.8	14%	171.4	-11.6
Lithuania	14.4	3.4	15%	16.5	-13.1
Latvia	-9	-8.3	17%	-10.5	2.2

Source: the author's own study on the basis of Opracowanie analiz, materiałów merytorycznych i koncepcji, Krajowa Izba Gospodarcza [National Economic Chamber] Warsaw, May 2013. http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=t2020_35&plugin=1,

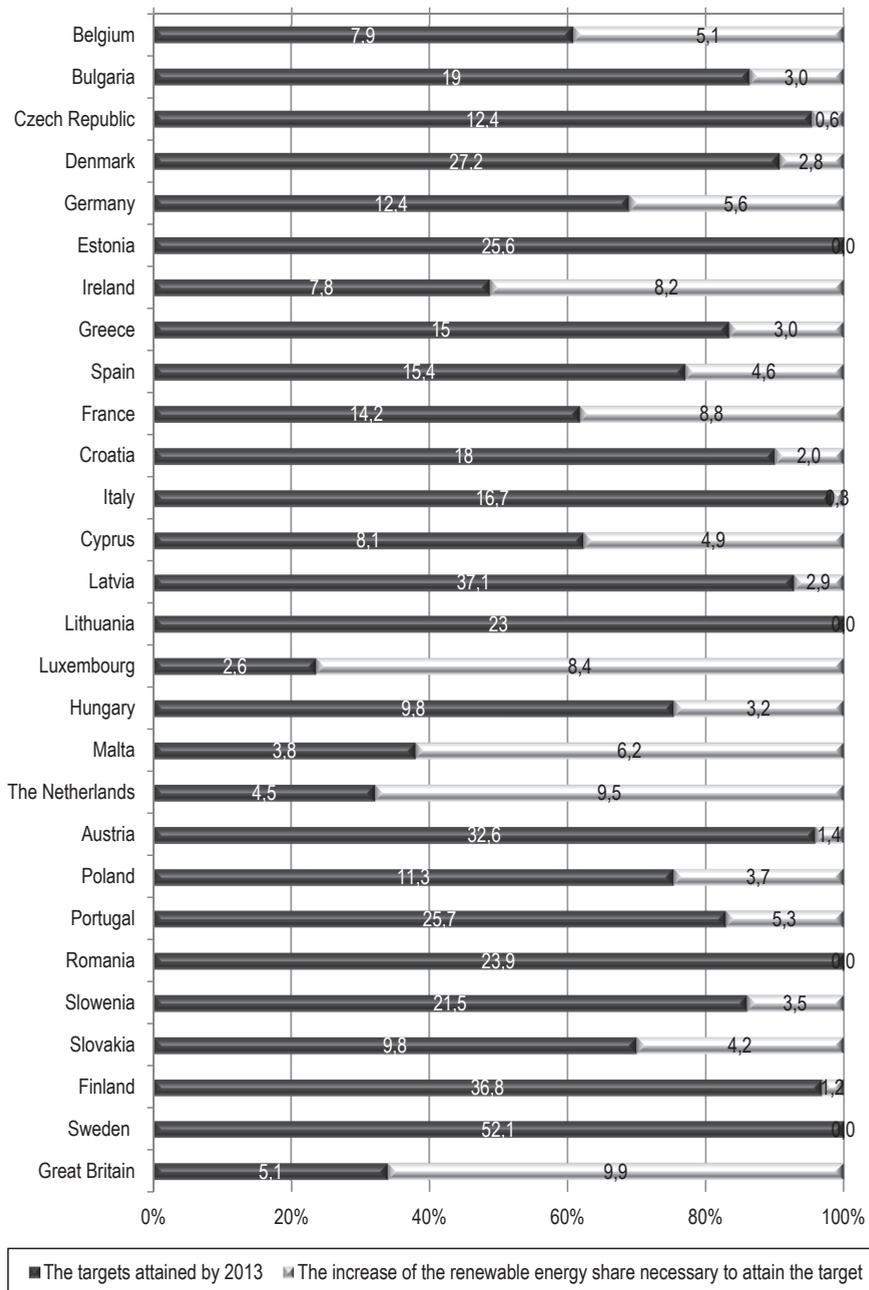


Figure 3. The share of the renewable sources of energy in 2013 and the amount necessary for attaining the target for 2020 in the EU countries (in %)

Source: the author's won study on the basis of: Eurostat, http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=t2020_31&plugin=1, [access 18.09.2015].

Among the member states presented in figure 3, the share of the energy coming from renewable resources in the final gross energy consumption ranged, in 2013, from 52.1% in Sweden to 5.1% in Great Britain. Eight countries doubled their share of renewable sources of energy. This group comprises, among others, Bulgaria, where in 2005, this share amounted to 9.4% and by 2013 had risen to 19%, Greece increased their share from 7% to 15%; the Czech Republic – from 6% to 12.4% and Hungary – from 4.5% to 9.8% (Eurostat, http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=t2020_35&plugin=1).

The European Union, in its objective to create an economy with sustainable development, which supports the environment, must learn how to use natural resources (including also energy, such as electricity or thermal energy) in an effective way. Given that goal, attaining the third objective of the energy and climate package concerning an increase in the efficiency of energy consumption seems to be of particular importance.

An analysis of statistical data shows clearly that in the entire EU primary energy consumption decreased by 8.3% and amounted to 1 566.5 Mtoe in 2013 in comparison with 2005, when it was 1 709 Mtoe.

In 2013 final energy consumption amounted to more than two thirds (70%) of the primary energy consumption in the European Union. In 2005 final energy consumption for the entire European Union was 1 186.4 Mtoe, whereas, in 2013 it decreased by 7%, amounting to 1 104.6 Mtoe (Eurostat, http://ec.europa.eu/eurostat/tgm/refreshTableAction.do?tab=table&plugin=1&pcode=t2020_34&language=en).

Figure 4 illustrates final energy consumption for selected EU member states in 2005 and 2013.

None of the countries (presented in figure 5) noted an increase in final energy consumption, yet the results were quite diverse in scope. Germany, the Netherlands, Austria, Finland, Slovenia and Latvia are all currently facing the challenge to increase the efficiency of energy consumption. Among those countries, the decrease in the final consumption of energy varies from 2% to 1%. Greece, in turn, is the country with the largest decrease in final energy consumption – by 27%, which certainly is also the outcome of a production decrease during the period of economic crisis beginning in 2008. The countries where very large decreases in such consumption were observed include: Hungary (18%), Spain (17%), Ireland (15%) and Bulgaria (14%).

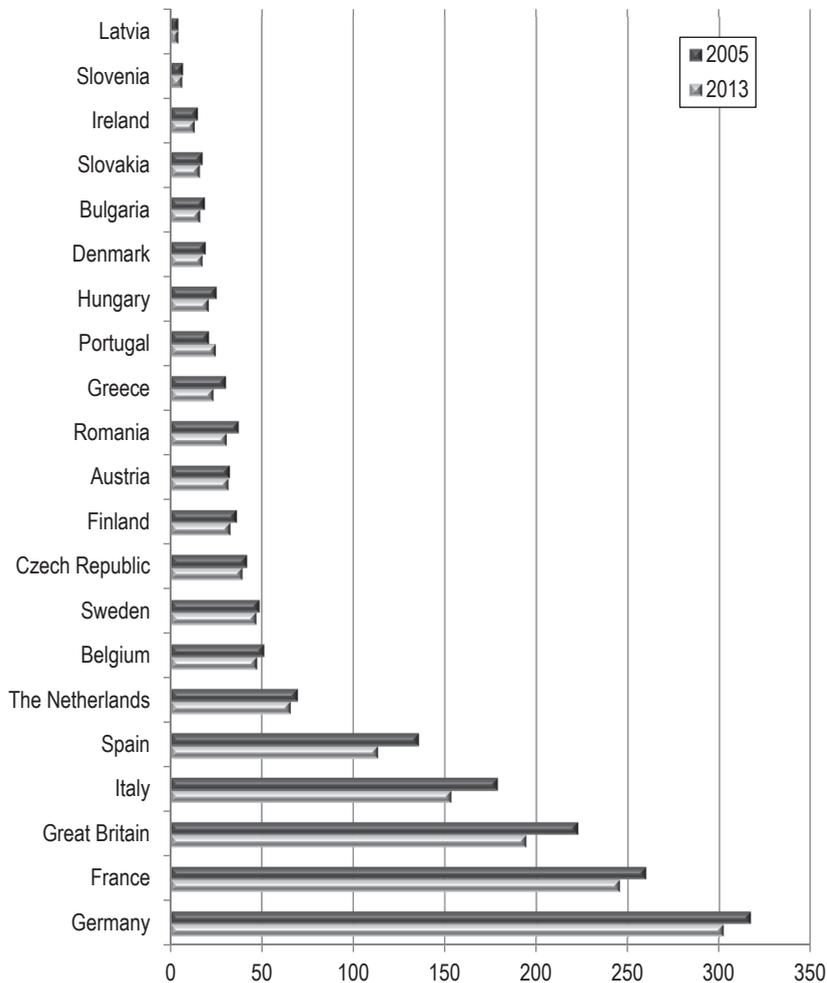


Figure 4. The amount of the primary energy consumption in selected EU member states in 2005 and 2013. (in Mtoe)

Source: author's own study on the basis of Eurostat, <<http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&pcode=tsdcc120&language=en>>, [access 30.4.2015].

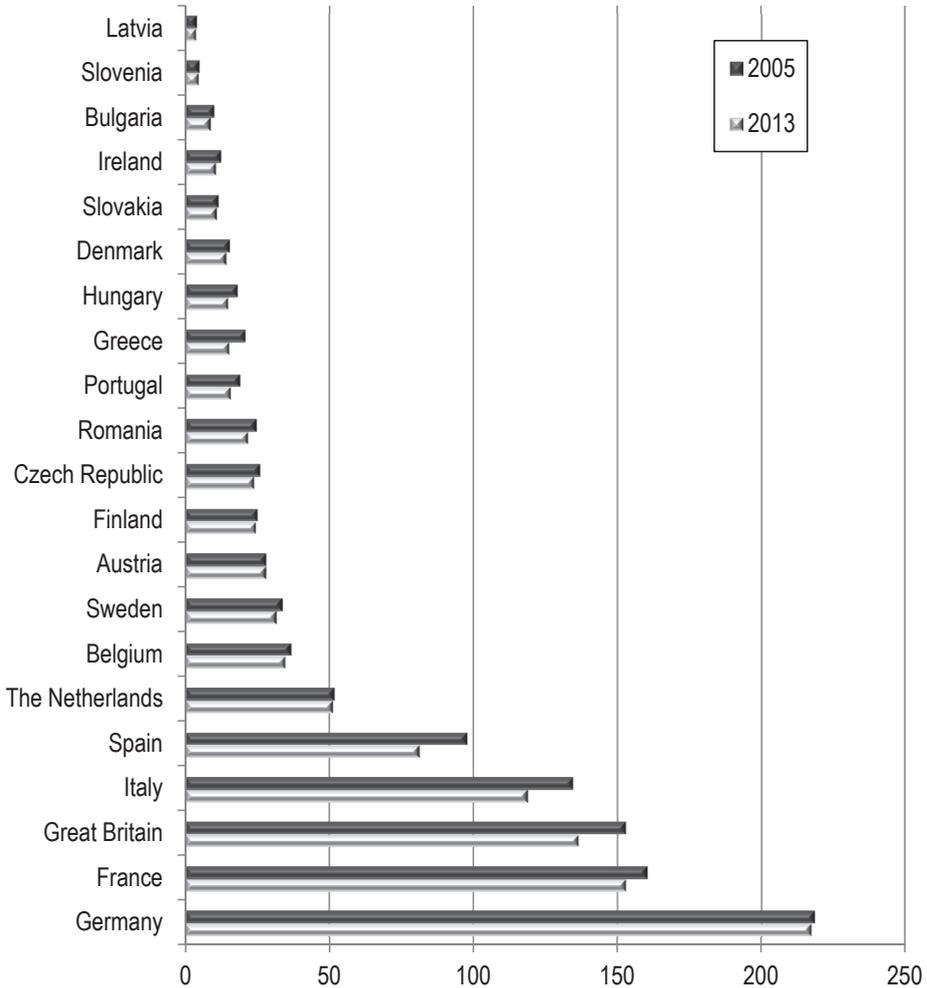


Figure 5. The amount of final energy consumption in selected EU member states in 2005 and 2013 (in Mtoe)

Source: author's own study on the basis of Eurostat, <http://ec.europa.eu/eurostat/tgm/refreshTableAction.do?tab=table&plugin=1&pcode=t2020_34&language=en>, [access 30.4.2015].

Conclusion

Sustainable development has become a global challenge, a field of political games and a trial of economic strength. The European Union treats the pursuit of a vision of carrying out commercial activity in a way that guarantees economic growth with minimal negative impact on the environment and society with utmost seriousness.

Each year it spends billions of Euro on their very costly climate policy, including the objectives of the energy-climate package. Its main targets, 3x20%, a 20% decrease of emissions of CO₂ in general energy balance by 2020, a 20% increase of energy efficiency (in comparison with 1990), and a simultaneous increase of the share of energy from renewable resources, fit very well into the concept of sustainable development. However, a significant part of the energy-climate package is the subject of international debate due to the lack of certainty over climate change theories, which sometimes refer to global warming and, at other times, cooling.

Awareness of the question, “what we are struggling against?” is essential, as the pursuit of such lofty aims generates immense costs, and wasting money on an international lobby is unthinkable given the grave economic and social problems facing the EU, such as: high unemployment rate, counteracting the economic depression, the crisis of the Euro zone, the necessity to increase the competitiveness of the EU's economy, and the demographic crisis. What seems significant is the reconciliation of such ambitious climate objectives with economic targets, so important in these times, which fit into the concept of sustainable development.

Therefore it seems that EU climate policy (including the realisation of the energy-climate package) should encompass the following elements (Instytut Kościuszki, 2012):

- Connecting climate objectives with the economic possibilities of individual EU member states – a detailed analysis of such possibilities should precede the decision-making process for setting targets in climate policy;
- Connecting those obligations concerning the climate adopted by the EU with obligations on a global scale;
- The conclusions of the monitoring of “carbon leakage” and the level of competitiveness of the EU economy and its member states on global markets;
- A compensation mechanism on the EU level, which should guarantee socio-economic cohesion in the spirit of solidarity.
- An extremely significant aspect in this context seems to be the ability to provide stability in economic development for those member states whose energy mix diversification varies greatly.

References

- Archer, D.(2011). *Globalne ocieplenie. Zrozumieć prognozę*. Wydawnictwo Naukowe PWN, Warszawa.
- Archer, D.; Rahmstorf, S. (2010). *The Climate Crisis: An Introductory Guide to Climate Change*. Cambridge University Press.

- Arrhenius S. (1896), *On the Influence of Carbonic Acid in the Air upon the Temperature of the Ground*. Philosophical Magazine and Journal of Science, 41.
- Communication from the Commission of 10 January 2007, *Limiting Global Climate Change to 2 degrees Celsius – The way ahead for 2020 and beyond*, COM(2007)).
- Decision No 406/2009/EC of the European Parliament and of the council of 23 April 2009 on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020 (OJ L 140/136), 06.2009.
- Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC (OJ L 140/16), 05.06.2009.
- Instytut Kościuszki (2012). *W kierunku nowego porozumienia klimatycznego dla europejskiej konkurencyjności gospodarczej -- szanse i wyzwania Pakietu Energetyczno-Klimatycznego Unii Europejskiej*. Krakow.
- IPCC, (2014). *Climate Change 2013. The Physical Science Basis*.
- IPCC, (2014). *Climate Change 2014. Synthesis Report. Summary for Policymakers*.
- Jaworowski, Z.(2008). *Idzie zimno. Czy globalne ocieplenie to tylko chwyt biznesowy*. „Polityka”, 15.
- Koziński, A., Jaworowski, Z. (2009, kwiecień 24). *Ekolodzy oszukują ludzi w sprawie zmian klimatu*, Polska The Times.
- Pach-Gurgul, A. & Soliński, B. (2013). *Kultura energetyczna kraju jako czynnik determinujący „nową politykę energetyczną” Unii Europejskiej*. „Zarządzanie Publiczne”. Kraków-Warszawa, 1(23), pp. 17-19.
- Sachs, J.D.(2008). *Common Wealth: Economics for a Crowded Planet*, Penguin Books, New York, p. 102.
- Winiecki, J. (2009). *Kryzys globalny. Początek czy koniec?*, Towarzystwo Ekonomistów Polskich, Gdańsk, p. 111.
- Internet sources Europe 2020,http://ec.europa.eu/europe2020/europe-2020-in-a-nutshell/priorities/sustainable-growth/index_pl.htmlEurostat, <http://ec.europa.eu/eurostat/tgm/refreshTableAction.do?tab=table&plugin=1&pcode=t2020_34&language=en>, [dostęp 30.4.2015].
- Eurostat, <http://ec.europa.eu/eurostat/tgm/refreshTableAction.do?tab=table&plugin=1&pcode=t2020_34&language=en>, [dostęp 30.4.2015].
- Eurostat, http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=t2020_31&plugin=1, [dostęp 18.09.2015].
- <http://www.eea.europa.eu/data-and-maps/data/data-viewers/greenhouse-gases-viewer>, *Greenhouse gas emissions by sector*, <http://ec.europa.eu/eurostat/tgm/refreshTableAction.do?tab=table&plugin=1&pcode=tsdcc210&language=en>
- Researcher predicts cooler climate in Northern Hemisphere from 2015*, <http://ajw.asahi.com/article/behind_news/social_affairs/AJ201306300011>, [access: 19.2.2015].