Towards a New Climate Consensus for European Economic Competitiveness – Opportunities and Challenges of the EU Climate and Energy Package

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Introduction contributed by Prof. Władysław Mielczarski

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Introduction

Prof. Władysław Mielczarski

The European climate policy is in the transitional stage. Two main ideas: vast implementation of Renewable Energy Resources (RES) and the reduction of CO_2 emissions, being the basis for such a policy, have not been adequately implemented. The average share of RES reached 12.4% in the middle of 2012 increasing only by 1.9% since 2008. Optimistic forecasts indicate the possible growth of 6.3% until 2020 and the very small increase of 1.1% annually between 2020-2050. Some Member States start implementing the measures aimed at limitation of the growth of RES by the reduction of subsidies.

The European Union Emissions Trading System (EU ETS) caused increase of costs of energy produced from fossil fuels by imposing an obligation on the power supply industry to purchase allowances for CO_2 emissions. However, this system does not work correctly, or at least as expected. Prices of CO_2 allowances vary around 6-8 EUR instead of forecasted 30-40 EUR. Such low prices do not affect production of electricity with the use of fossil fuels. The EU ETS, as any other system based on the fragile balance between the number of allowances assigned for the trade and changing demand for electricity, is very difficult to control. Any direct intervention into this system (as announced by the European Commission), could lead to its further deterioration.

On the other hand, the long economic crisis and problems in the Euro zone result in more cautious approach of Member States to accept climate obligations leading to high energy prices and a larger burden on the power consuming industries, as well as the public sector. A lot of questions relating to the European climate policy have been raised. Is it possible to set ambitious goals in the emission reduction to 2050 ourselves, when the rest of the world economies is not going to join the European Union? What should the most effective system for the promotion of low emissions be, without imposing a heavy burden on the Member State economies? What can lead to the reduction of the competitiveness on the global market? How to overcome technical barriers in vast development of RES, which are very unstable as energy production sources? What should the best system of subsidies for RES be, that would allow for the integration of RES into competitive energy markets?

All these challenges are more and more visible. In June 2012, the European Commission released Communication[1] related to Renewable Energy as a major player in the European energy market. The Commission indicates that *"…current policy initiatives are not adequate to achieve our long-term energy and climate policy objectives, as the 2050 Roadmap suggests, renewable energy annual growth would slump from 6% to 1%." The conclusion of the document is "Whatever form the post 2020 renewable energy milestones take, they must ensure that renewable energy is part of the European energy market, with limited but effective support where necessary and substantial trade."*

The existing climate policy was defined for a period of 2008-2020. Thus, the time is ripe for the discussion on the goals of the climate policy beyond 2020 and the best measures to make these targets achievable. The Report delivered by the Kosciuszko Institute can be seen as the commitment to the discussions on future goals of the European climate policy and measures that should allow the most effective implementation.

This Report delivers an analysis of opportunities and challenges of the EU Climate and Energy Package with a special focus on Poland. It is followed by recommendations for the modification of the climate policy for maintaining European economic competitiveness. It includes a description of hitherto and current tendencies concerning climate issues and effects of the climate policy on competitiveness in different regions on the global markets. Furthermore, it contains an analysis of climate commitments of the EU and main mechanisms aimed at securing their achievement.

The analysis indicates that Poland's loss due to the lower GDP growth would reach 15-30 billion EUR by 2020. The Report points out that an overall balance of opportunities and costs is significantly negative. It is one of the most important conclusions, which has to be taken into account when discussing new, more ambitious goals of the Road Map to 2050. Any climate policy goes through an acceptance of the European public. It would be difficult to find common approach to the climate policy when some Member States and their societies are burdened more than others. The success of the European climate policy depends on the solidarity of all member nations in sharing the implementation costs.

The Report released by the Kosciuszko Institute is a very important commitment to the discussion on the European climate policy and it should be carefully analysed by the policy makers, both on the European and Member State levels.

1 COM(2012) 271 final

Executive summary

The Report presents an analysis of opportunities and challenges of the EU Climate and Energy Package with a special focus on Poland, followed by recommendations for modification of the climate policy for maintaining European economic competitiveness.

The Report includes:

- a description of previous and current tendencies concerning climate issues on international agenda and their effects on competitiveness on different regions on the global markets;
- an analysis of climate commitments of the EU and main mechanisms that are to secure achievement of EU goals (e.g. EU Emissions Trading Scheme);
- an analysis of costs and potential benefits of Polish economy resulting from implementation of the EU Climate and Energy Package;
- an analysis of the EU climate policy impact on selected EU Member States;
- a proposal of modification of the EU climate policy with the aim of adjusting it to diverse models and stages of economic development of Member States.

With respect to Poland, the Report demonstrates that although certain opportunities may be seized (e.g. development of renewables and bio fuels sectors or energy efficiency), they would be outweighed by costs of implementation of the EU Climate and Energy Package (e.g. overall price level growth, deterioration of conditions of doing business in energy and emission intensive industries and growth of energy poverty). The enumerated factors are expected to result in **Poland's loss due to the lower GDP growth that would reach EUR 15-30 billion till 2020. Therefore authors of the Report indicate that an overall balance of opportunities and costs is significantly negative for Polish economy.**

Diversity of interests among Member States question the assumptions and targets of the EU climate policy. As a result Authors suggest to take **a moderate approach aiming at modification and not abandonment of the EU climate policy.**

Authors of this Report conclude that **the EU climate policy should be developed** in order to secure its objectives, on the one hand, and to mitigate the adverse effects on EU Member States' economies, on the other. The EU climate policy should include such elements as:

- linking of climate-oriented objectives with EU Member States economic capabilities - more detailed analysis should be conducted prior decision making process on climate policy goals
- linking of EU's commitments with commitments on the global scale;
- conclusions of monitoring of carbon leakage and overall competitiveness of the EU and its Member States on the global markets;
- development of compensative mechanisms on the EU level in order to secure social and economic cohesion in the spirit of solidarity;
- enabling stable economic development for Member States with different energy fuel-mixes.

1. Greenhouse Gases Emission Problem

Tomasz Siewierski

The warming of the Earth's climate that has been witnessed since the end of the 19th century is an unquestionable fact. Since the beginning of the 20th century, the temperature on the Earth's surface has increased by 0.8°C, with most of this rise observed from 1980. Although, there are several different external factors affecting the climate system, like for example changes in solar activity, volcanic eruptions, and variations in the Earth's orbit around the Sun, a dominating discourse of climatologists blames for such situation a rising concentration of the so-called greenhouse gases (GHG) in the atmosphere. Between the beginning of the 19th century and the beginning of the 21st century, concentration of GHG increased from approximately 280 ppm to over 380 ppm. Although palaeoclimatologists[1] admit that similar or even higher concentrations of GHG have already been seen in the history of the Earth,the current pace of change is unprecedented.

The expression 'greenhouse gases' describes a group of gases that can absorb and emit infrared radiation and primarily includes: water vapour (H_2O), carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) and ozone (O_3). Their concentration depends on the balance between sources (emission of gas from natural systems and human activities) and sinks (removal of gas from the atmosphere by conversion to a different chemical compound).The main sources linked with human activity, called anthropogenic sources, are:

- burning of fossil fuels;
- deforestation, agricultural activities including livestock farming and use of fertilizers;
- industrial activities (e.g. cement and steel production);
- use of chlorofluorocarbons in refrigerators.

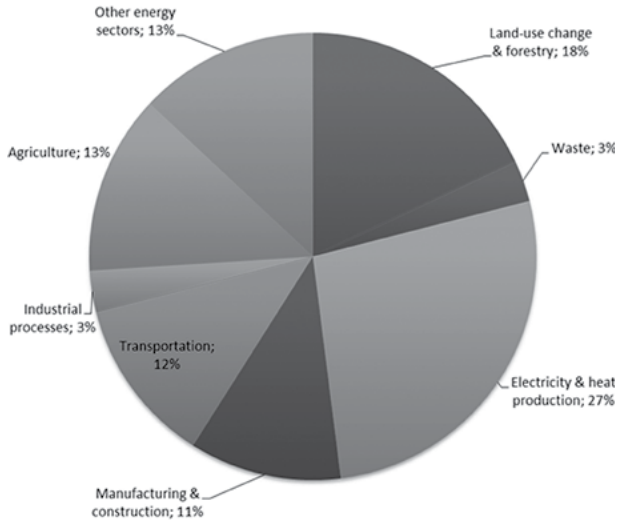
It is estimated that CO_2 emission contributes by 25% to the greenhouse effect. Natural sources of CO_2 emission (e.g. land and vegetation, oceans) release 20 times more carbon dioxide than sources linked with human activity, but they are also natural sinks for CO_2 and usually the balance for natural sources is negative (i.e. they absorb more carbon dioxide than release).

Although anthropogenic emission of GHG is linked with a number of areas of human activity, due to the significant share of emitted CO_2, the lack of viable alternatives in other sectors of

1 Palaeoclimatology is the study of changes in climate during the entire history of Earth.

economy, as well as, due to political and social reasons,strategies for fighting global warming focus on emissions produced by industry, chiefly by the power sector.

Chart 1.1. Contribution of Different Economy Sectors to the Rising Concentration of GHG in the Atmosphere



1.1. The Climate Policy

The principal objectives of the United Nations (UN) include peacekeeping and social and economic development of the world. Protection of the environment is one of the most important conditions of sustainable development, responsible exploitation of natural resources and transformation of the biosphere. Accepting its responsibility in this area and recognizing emerging problems linked with the fast economic development observed in the 20th century, in 1972 the UN funded the United Nations Environment Programme (UNEP). It deals with various issues regarding the atmosphere, marine and terrestrial ecosystems, environmental governance and the renewable economy sector. UNEP financially supports environment-related research activities and development projects.

In 1988, together with another UN agency, the World Meteorological Organization (WMO), UNEP launched the Intergovernmental Panel on Climate Change (IPCC). The IPCC has been formally recognized by the UN through Resolution 43/53 and its principal task is the assessment of scientific information about climate change, the impact of various human activities on the weather, as well as methods and tools aimed at mitigation of dangerous anthropogenic interferences with the climate system. The IPCC does not carry out research, nor does it collect or analyse climate related data, but it publishes reports with assessments of information on climate change on the basis of peer reviewed and published scientific papers.

In June 1992, during the Earth Summit Conference in Rio de Janeiro that was held as a response to alarming reports published by the UN, NGOs and scientific research centres, the UN agencies managed to successfully negotiate an international environmental treaty with the objective of stabilization of the GHG concentration entitled the United Nations Framework Convention on Climate Change (UNFCCC). One hundred sixty five countries signed the treaty, but as little as 50 states have ratified it. As of May 2011, UNFCCC had 194 parties. The treaty itself did not establish limits on GHG emissions for individual countries and did not contain enforcement mechanisms. However, following the agreement national inventories of GHG emissions have been set up and the emission levels of 1990 were selected as a benchmark and reference point for future actions aimed at curbing emissions.[1] Signatories to the treaty decided to meet annually and the first Conference of the Parties (COP) was held in 1995 in Berlin, Germany, yet no real progress regarding further actions has been made. The second COP in 1996 in Geneva, Switzerland, was more productive, since it accepted the scientific findings on climate change published by the IPCC in their second report (1995) and called for introduction of binding legal targets for all signatories, but rejected the idea of a harmonized international policy on fighting GHG emissions.

The real breakthrough happened during the third COP meeting held in Kyoto, Japan, in December 1997. During this conference, after intensive negotiations an international agreement has been reached, widely known as the Kyoto Protocol.

The Kyoto Protocol imposed emission reduction commitments mainly on developed countries (Annex I countries) and allowed the developing countries (including China and India) to catch up with their developed counterparts, which in the 19th and the early 20th centuries underwent an industrial transformation and benefited from their fast economic development without any constraints on carbon emissions. The Protocol entered into force on 16 February 2005. Initially, only 83 countries signed the agreement and new states joined in later on. According to Article 25 of the Protocol, the treaty would enter into force if not less than 55 parties to the Convention, including those enumerated in Annex I which accounted in total for at least 55% of the total CO_2 emissions benchmarks established for the Annex I countries, have ratified the agreement.

As of November 2009, 187 countries and one regional organization (the EU) have ratified the agreement, representing over 63.9% of the total GHG emissions of 1990 for all Annex I countries. The USA signed the Protocol, but subsequently refused to ratify it without similar obligations also being imposed on developing countries. Recently (December 2011), the Canadian government invoked Canada's legal right to formally withdraw from the Kyoto Protocol, when the country was unable to fulfil the imposed obligations during early stages of the Protocol's implementation.[2]

1 Due to on-going transformation of their economies a number of countries, including Poland, have requested and have been granted the possibility to choose different reference year. For Poland GHG emission level of 1988 has been chosen for a benchmark.

2 Canada was committed to cutting its greenhouse emissions to 6% below 1990 levels by 2012, but in 2009 emissions were 17% higher than in 1990.

Under the Protocol, 37 countries called "Annex I countries" committed themselves to a reduction of emissions of four greenhouse gases and two other groups of gases (hydrofluorocarbons and perfluorocarbons). At negotiations, the Annex I countries (including the U.S.) collectively agreed to reduce their GHG emissions by 5.2% on average for the period 2008-2012, compared to the previously established benchmarks. Since the U.S. has not ratified the treaty, the collective emissions reduction of Annex I countries fell from 5.2% to 4.2% below the reference level.

The Protocol introduced three flexibility mechanisms to support the reduction of GHG emissions:

- emissions Trading (ET), which gives industrialized countries the possibility of trading allowances to emit GHG within the limits laid down in national emission inventories;
- Joint Implementation (JT), which is an offset mechanism and gives the developed countries (Annex I countries) the possibility to invest in projects in other developed countries, where emission reduction cost is lower and then receive credits that might be used to fulfil domestic quota;
- the Clean Development Mechanism (CDM), which is another type of an offset mechanism, but it is designed to help the developing countries (non-Annex I countries) to curb their GHG emissions without jeopardizing their economic development.

Emissions Trading (ET)

The emissions trade can take several forms:

- engine cover (Bubbles), which is to give the group of entities emitting GHG the maximum total emission level by allowing them to perform the most common cost-effective emission reductions. In this case, the emission source may also belong to the same entity, and their emissions are counted together;
- the mechanism of compensation (offset), which allows operators to invest in facilities owned by other entities;
- emission reduction credits (Emission Reduction Credits), which allow entities that do not use their allocated production quota to sell the surplus to entities, whose emissions are higher than their assigned limits;
- restrictions on Trade (Cap and Trade), which determine the total limit for a group of companies, entire sectors or countries. Owners may reallocate quota allocated to them, which can then be used for production of energy and goods, may be sold or retained for future needs (in subsequent settlement periods).

The last form currently enjoys the greatest popularity due to the following advantages:

- low administrative costs;
- optimization of the cost of reducing emissions;
- supporting the development and application of new technologies;
- the achievement of the assumed global warming reduction by the free choice of individual issuers.

Emissions trading can operate at the level of fuel suppliers (upstream) or fuel consumers (downstream), but now only the second form is commonly used.

The emissions trading idea is based on differences in marginal cost of emission reduction existing between fuel consumers. Companies with lower costs can invest this way in an additional reduction of emissions and sell excess allowances to companies with higher costs of reducing GHG emissions.

In the long term, the price of allowances in the trading system is determined by the following factors:

- the amount of emission allowances allocated to countries (National Allocation Plans);
- emission credits obtained in JI and CDM systems described above;
- economic growth;
- energy intensity of industry (structure and the technology used);
- cost reduction (reduction technologies);
- use of renewable energy sources for generation of heat and/or electrical energy.

The European system of emissions trading (EU ETS – the European Union Emissions Trading System) was officially launched in 2005 under Directive 2003/87/EC. The EU ETS includes also Norway, Iceland and Liechtenstein. In terms of heating and electricity, it covers heating installations with a total installed capacity of more than 20 MW. The estimation of ETS system implementation and operation costs till 2011 amounts to 250 billion EUR and the impact of this system on the reduction of GHG emissions is negligible due to abundance of issued allowances.

Also other Annex I countries started their emission allowance trading systems and they are run usually by national or regional governments. Carbon allowance trading systems currently exists in:

- Canada, Alberta province, started in 2007;
- States of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire; New Jersey, New York, Rhode Island and Vermont, USA, started in 2009;
- New South Wales Greenhouse Gas Reduction Scheme, Australia, started in 2003;
- New Zealand, started in 2008;
- Japan, started in 2010;
- Switzerland, started in 2008.

Following the agreement reached in Kyoto, more trading schemes are currently in the stage of discussion, planning or implementation, including the following with the biggest potential impact:

- California Cap-and-Trade Programme. Trading system is scheduled to be officially launched in 2013. It will cover emissions from power plants, manufacturing and transportation fuels (starting in 2015). The target is to cut the state's emissions to 1990 levels by 2020. Most credits will be allocated for free in the early years and emitters will be allowed to use offsets to fulfil up to 8% of their compliance obligations.

- Western Climate Initiative involves 11 USA states and Canadian provinces. The target is to cut emissions by 15% below 2005 levels by 2020. Under the scheme, emitters will have to buy offsets to cover their emissions. After Arizona, Montana, New Mexico, Oregon, Utah and Washington left the WCI at the end of 2011, Quebec announced one year delay in its enforcement of the cap and with California going ahead with its Cap-and-Trade Program the future of this initiative looks rather gloomy.

- South Korea trading system is expected to start in 2015, covering about 470 companies from all sectors that, combined, produce about 60% of the country's emissions. The South Korean government has set a 2020 emissions reduction target of 30% below the projected levels that will be reached assuming business as usual model.

- India (Achieve and Trade system). India has pledged a 20-25% reduction in emissions intensity from 2005 levels by 2020. Trading is planned to start in 2014 after a three-year rollout period. It is a mandatory energy efficiency trading scheme, covering eight sectors responsible for 54% of India's industrial energy consumption. Under the scheme, annual efficiency targets will be allocated to firms. Tradable energy-saving permits will be issued depending on the amount of energy saved during a target year.

- China is responsible for approximately 50% of the carbon emission growth observed in recent years. If the current economic trends continue, China is expected to surpass the U.S. emissions per capita in 2017. This is why the development and implementation of the Chinese carbon emission cap and trade system is of paramount importance. In November 2011, China approved pilot projects in seven provinces and cities – Beijing, Chongqing, Guangdong, Hunan, Shanghai, Shenzhen and Tianjin. Some of the pilot regions will start trading in 2013 or 2014. Although in its 12th Five Year Plan (2011-2015), the Chinese government announced that it intends to establish a national carbon trading system by 2015, taking into consideration limited progress and the worsening economic situation it is hardly possible that such system will become operational before the end of 2016.

Clean Development Mechanism (CDM)

The concept of CDM assumes that the cost of GHG emission fighting in developing countries is lower than in industrial countries. This creates an opportunity for rich countries of Annex I to invest in projects in developing countries to bring down their emissions. However, to register a CDM project an applicant (sponsor from Annex I country) has to prove in the first place additionality of the project, in the sense that such project would not have happened otherwise. The project is then validated by a third party to ensure that the project results in real, measurable and long lasting effects on GHG emissions. Positively verified projects are registered and after being implemented they receive Certified Emission Reductions (CERs) and receive carbon credits, which are equivalent to emission reduction in their own country.

Implementation of the Clean Development Mechanism began in 2001. CDM was expected to result in approximately 1.5 billion tonnes of GHG emission reduction by 2012, mostly through investments in renewable energy sources, energy efficiency, and fuel switching. Until the beginning of 2012, nearly 4000 projects have been registered and they are expected to bring GHG emission down by 538 million tonnes CO_2 equivalent per year. At the moment, another 5,600 projects have been submitted and they are in the validation stage. Although theoretically these new projects might reduce CO_2 emissions by over 2.7 billion tonnes until the end of 2012, accounting for the success rate of projects submitted and verified until now (approximately one quarter of submitted projects were registered), the realistic assessment of CDM implementation seems to give GHG emission reduction in the range of 1.2-1.3 billion tonnes of CO_2.

The majority of CERs issued so far have been from HFC destruction project, but the fastest-growing project types are renewable energy and energy efficiency. The biggest potential beneficiaries of the CDM are China (52% of CERs), India (16%) and Brazil (7%).

Yet practical experience gained from CDM implementation casts doubts upon the overall efficiency of this tool. Some studies have suggested that less than 30% of the money spent on buying CDM credits is directly used for implementation of carbon offset projects and the rest covers operating and capital expenditure costs, shareholder's profits, management and brokerage services. Another problem with CDM implementation was the risk of fraud related to financing projects, which are economically viable (lack of additionality) and exaggerated values of carbon benefits. Approvals given by CDM Executive Board (EB), especially during the first period of the tool implementation were politically motivated, but the situation improved with time when EB carefully examined all applications. CDM was also expected to prevent carbon leakage, but in practice CDM influence on leakage reduction is negligible.

Table 1.1. CERs Distribution by Country
[Website of UNFCCC, Statistics Section, 2012]

Country	Share of issued CERs [%]
China	41
Brasil	14
India	14
South Korea	11
Mexico	5
Chile	2
African countries	2
Other countries	11

Joint Implementation (JI)

Like in the case of CDM mechanism, JI investors receive credits called Emission Reduction Units (ERUs)[3] but conversely to CERs issued in CDM, the amount of ERUs that might be granted for investments in a country from Annex I is limited by the Assigned Amount Units (AAUs). For each country the amount of AAUs has been calculated on the basis of its benchmark emission level. Such regulation was embedded in JI mechanism to ensure that the total amount of emission credits among Annex I parties does not change for the duration of the first commitment period.

Country	ERUs issued	Share	ERUs planned	Share
	[mln tonnes CO_2]	[%]	[mln tonnes CO_2]	[%]
Russia	29.2	25	154.0	43
Ukraine	63.5	53	129.4	36
Poland	7.8	7	13.6	4
Romania	2.4	2	10.6	3
Bulgaria	2.6	2	9.5	3
France	3.6	3	8.9	2
Germany	2.1	2	8.7	2
Hungary	1.3	1	7.0	2
Lithuania	3.4	3	5.8	2
New Zealand	1.9	2	3.2	1
Czech Republic	0.6	1	1.8	0
Sweden	0.0	0	1.1	0
Finland	0.2	0	1.0	0
Estonia	0.3	0	0.8	0
Spain	0.0	0	0.5	0
Total	118.8	100	355.9	100

It was planned that JI implementation would result in reduction of approximately 350 million tonnes of CO_2 equivalents. By the beginning of 2012, 326 projects have been registered in JI mechanism and 119 million ERUs have been issued.

Contrary to CDM, Joint Implementation mechanism gave rise to fewer concerns about validity and efficiency of projects financed within this mechanism. The project selection was limited to countries from Annex I, but in practice, due to arbitrage price spread in the cost of GHG abatement, most savings from JI projects came from investments in "economies in transition": Russia (approximately 60%), Ukraine and the new EU Member States (approximately 20% in each of them).

After the conference in Kyoto, 15 more or less successful meetings were organized. Initially, discussions were held regarding details and adjustments to the agreement reached in Kyoto. The milestones of this process were:

- conference in Berlin, Germany, in 2001 (COP 6bis), where flexible mechanism tools were enhanced, agreement concerning incorporation of carbon sinks (e.g. forests and croplands) was reached, three new funds were established to support actions related to the climate protection;

- conferences in Buenos Aires, Argentina, in 2004 (COP 10) and in Montreal, Canada, 2005 (COP11) were important, as they triggered discussion about the future of the Kyoto agreement and the extension of GHG reduction obligations assumed in the Protocol;

3 One ERU represents an emission reduction of one tonne of CO_2 equivalent

- conference in Bali, Indonesia, in 2007 (COP13), where parties to the Kyoto Protocol agreed on a timeline and structure of the post-Kyoto framework;

- conference in Copenhagen, Denmark, in 2009 (COP15), which was expected to establish ambitious, tangible and binding targets for the post-Kyoto period. Although parties were not able to reach the main objective, they signed an agreement (the Copenhagen Accord) in which they recognized scientific justification for keeping temperature rise below 2°C, but they could not impose individual reduction quotas. Nevertheless, during the conference some countries preliminarily declared their individual targets and actions that should help to reach these goals. At the end of the conference, other parties were also asked to submit emission targets on a voluntary basis and later on, 67 countries registered their targets. Technology Action Programs (TAPs) were proposed to manage future technology efforts under UNFCC and a new flexible offsetting mechanism was also implemented, that allows developed countries to pay the developing countries to reduce deforestation and land degradation, which increase GHG emissions.

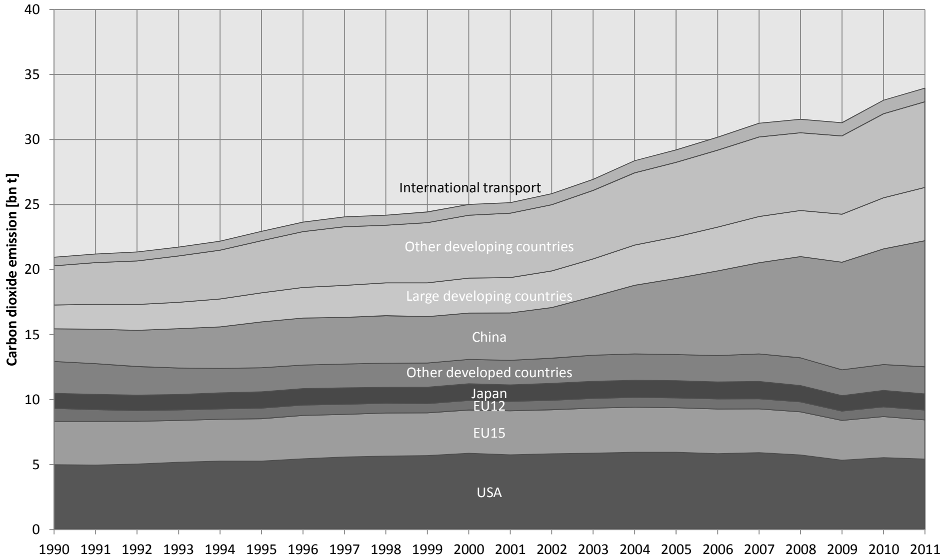
The last COP conference was held in Durban, South Africa in 2011 (COP17) and it brought some progress in the preparation of legally binding obligations for the post-Kyoto period and an agreement concerning management structure of Green Climate Fund (GCF), which is expected to distribute 100 billion USD per year to support adaptation of poor countries to climate change.

1.2. Carbon Intensity of the World Economies

Emission of GHG linked with human activity started to rise sharply together with the Industrial Revolution in the 18th and 19th centuries in Europe and later on also in the U.S. Insatiable appetite for energy and land resulted in the surge of fossil fuel burning, development of heavy industry and deforestation. But at the same time the world leading economies have been established, as well as solid foundations were laid down for more sustainable development based on infrastructures, knowledge and advanced skills. The structures of national industries and fuel mixes that we encounter today are strongly linked to the past and the availability of natural energy resources. They can't be altered at short notice and without financial efforts.

Generally the level of GHG emission of any country depends on its population, availability of natural resources, the level of economic development and industrialization. Carbon intensity or carbon footprint of the industry have been developing over the 200 years of industrialization and can be improved by a shift in the economy structure (from manufacturing to servicing), decarbonisation of fuels including carbon offset (carbon sequestration) and increase in energy efficiency. These are arduous processes that are currently fostered by depleting fossil fuels, scientific and technological progress, rising awareness of human activity impact on the environment and our living conditions.

Chart 1.2. GHG Emission 1990-2011 [Oliver JGJ, Janssens-Maenhout G and Peters]



The following analysis of the past and current trends in carbon intensity of leading economies, regions and industry sectors provides and insight into the problem of the development of carbon-free economies.

Independently of recent trends,since 2006 the ranking list of the biggest emitters remains unchanged, with China (29%), the U.S. (16%), the EU (11%), India (6%) and the Russian Federation (5%), followed by Japan (4%) occupying the top five places on this list.

During the last 20 years, most of the top emitters from the developed countries managed to stabilize their emissions, with some countries (mostly the old EU Member States, the EU-15) that recently started to curb their emissions. On the other side of the world, a limited group of developing countries and European countries, which underwent major economic transformation, continue to increase their share in the global GHG emissions. Similar situation concerns also coal (coke), oil and natural gas producers, as increasing demand for fossil fuels results in bigger carbon dioxide and other GHG emissions, due to leakage, ventilation and flaring, as well as fracturing which is recently gathering momentum.

After one year of decline (2009) caused by the first stage of the economic crisis, the global emission of GHG caused by human activity continued to grow and in 2011 it reached a historical maximum of 34 billion tonnes per year, which means an increase by 3% compared to 2010. This rise is not evenly distributed among regions and countries.

A similar picture emerges when we analyse emission of GHG per capita. At the same time, when China's total emission increased by 9% and emission per capita reached the level of 7.2 tonnes of CO_2 and approached an average emission of all the EU countries (7.5 tonnes per capita), emissions of the EU and the U.S. went slightly down – by 3.8 and 2.8% respectively.

Chart 1.3. GHG Emission Per Capita, Years 1990, 2000, 2010, 2011

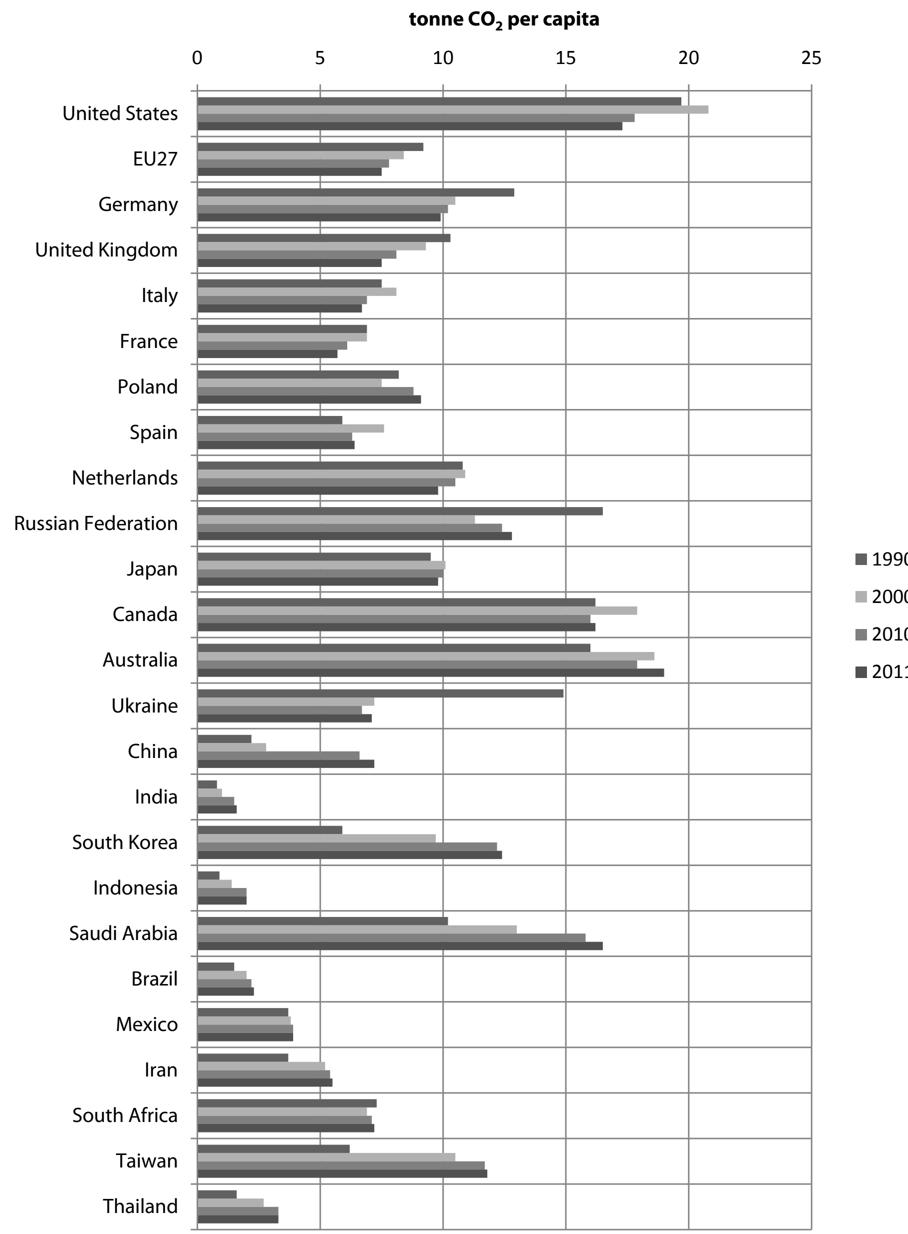
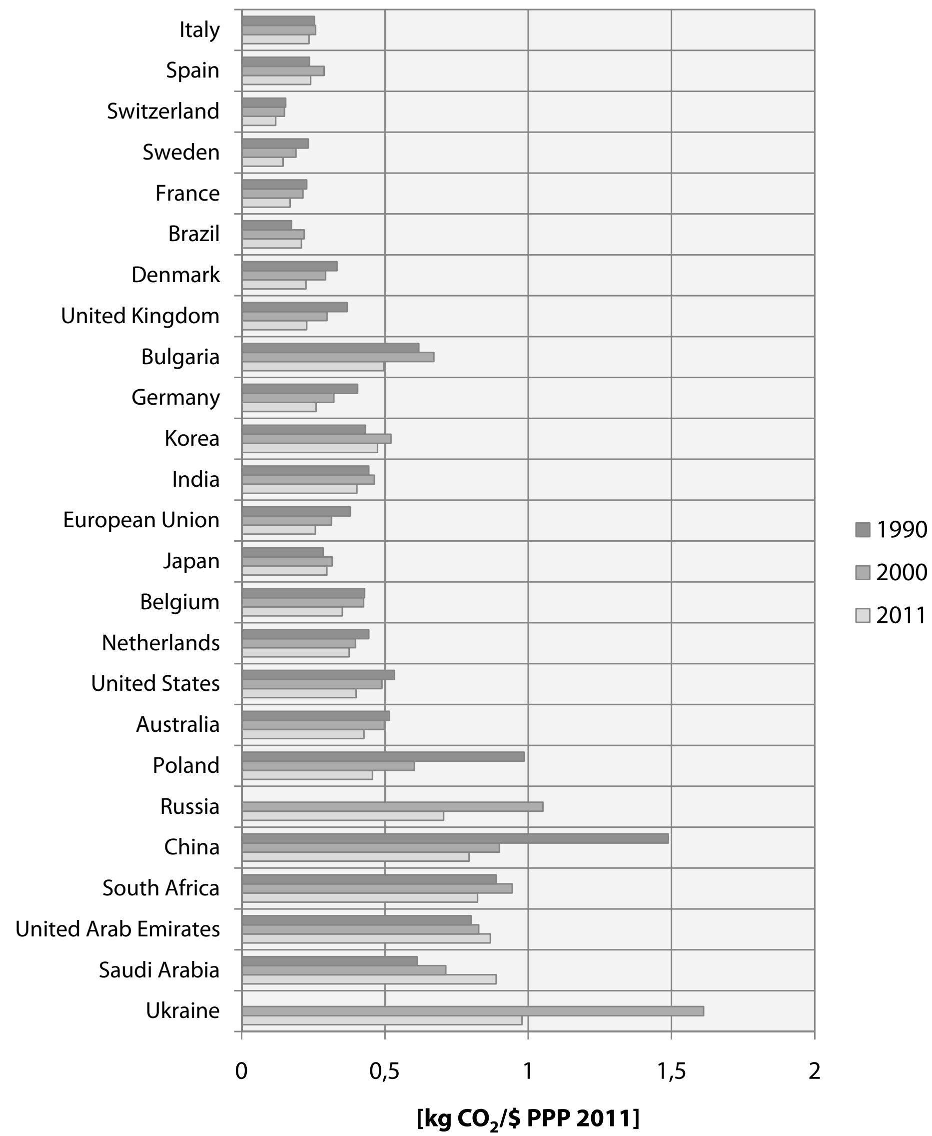


Table 1.4. GHG Emissions 1990-2011 [Oliver JGJ, Janssens-Maenhout G and Peters]

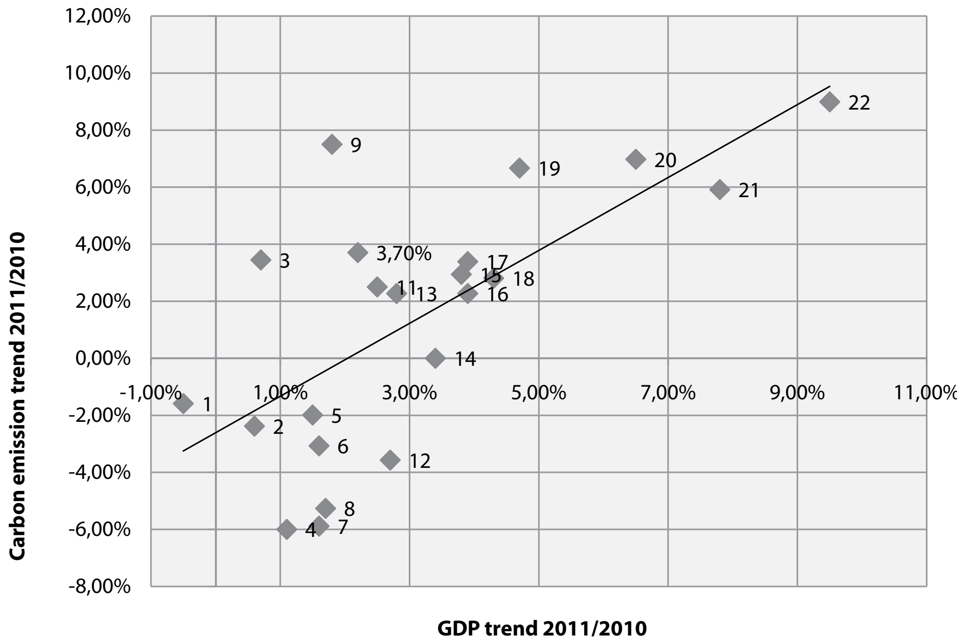
	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11
USA	**4,99**	**4,96**	**5,04**	**5,18**	**5,26**	**5,26**	**5,44**	**5,58**	**5,65**	**5,69**	**5,87**	**5,75**	**5,83**	**5,87**	**5,94**	**5,94**	**5,84**	**5,91**	**5,74**	**5,33**	**5,53**	**5,42**
EU27	**4,32**	**4,27**	**4,12**	**4,04**	**4,02**	**4,08**	**4,15**	**4,06**	**4,07**	**4,01**	**4,06**	**4,13**	**4,11**	**4,22**	**4,23**	**4,19**	**4,21**	**4,15**	**4,09**	**3,79**	**3,91**	**3,79**
EU15	**3,33**	**3,36**	**3,29**	**3,22**	**3,23**	**3,27**	**3,34**	**3,28**	**3,32**	**3,29**	**3,33**	**3,39**	**3,39**	**3,47**	**3,47**	**3,43**	**3,43**	**3,37**	**3,32**	**3,07**	**3,16**	**3,02**
France	0,39	0,42	0,41	0,39	0,38	0,39	0,4	0,39	0,42	0,41	0,41	0,42	0,41	0,42	0,41	0,41	0,4	0,39	0,4	0,38	0,38	0,36
Germany	1,02	0,99	0,94	0,93	0,92	0,92	0,94	0,91	0,9	0,87	0,87	0,89	0,87	0,88	0,88	0,85	0,86	0,84	0,86	0,8	0,84	0,81
Italy	0,43	0,42	0,42	0,42	0,41	0,44	0,42	0,42	0,43	0,43	0,46	0,46	0,47	0,48	0,48	0,48	0,49	0,47	0,46	0,41	0,42	0,41
Spain	0,23	0,24	0,25	0,23	0,24	0,25	0,24	0,26	0,27	0,29	0,31	0,31	0,33	0,33	0,35	0,36	0,35	0,37	0,33	0,3	0,29	0,3
United Kingdom	0,59	0,6	0,58	0,56	0,56	0,56	0,57	0,55	0,55	0,54	0,55	0,56	0,55	0,56	0,55	0,55	0,56	0,54	0,53	0,49	0,5	0,47
Netherlands	0,16	0,17	0,17	0,17	0,17	0,17	0,18	0,18	0,18	0,17	0,17	0,18	0,18	0,18	0,18	0,18	0,17	0,17	0,17	0,16	0,17	0,16
EU12 new members	**1**	**0,91**	**0,83**	**0,81**	**0,79**	**0,81**	**0,8**	**0,78**	**0,75**	**0,71**	**0,73**	**0,73**	**0,72**	**0,75**	**0,76**	**0,76**	**0,78**	**0,78**	**0,77**	**0,72**	**0,75**	**0,76**
Poland	0,31	0,31	0,3	0,31	0,31	0,32	0,3	0,3	0,29	0,28	0,29	0,28	0,28	0,29	0,31	0,31	0,32	0,32	0,32	0,31	0,34	0,35
Japan	**1,16**	**1,17**	**1,18**	**1,18**	**1,23**	**1,25**	**1,26**	**1,26**	**1,22**	**1,26**	**1,28**	**1,26**	**1,3**	**1,31**	**1,31**	**1,32**	**1,3**	**1,33**	**1,25**	**1,18**	**1,26**	**1,24**
Other Annex II	**0,83**	**0,83**	**0,85**	**0,85**	**0,87**	**0,89**	**0,92**	**0,96**	**0,99**	**1,01**	**1,03**	**1,03**	**1,05**	**1,08**	**1,1**	**1,12**	**1,11**	**1,15**	**1,14**	**1,1**	**1,07**	**1,11**
Australia	0,27	0,28	0,28	0,28	0,29	0,3	0,31	0,33	0,35	0,36	0,36	0,36	0,37	0,38	0,4	0,41	0,42	0,42	0,44	0,44	0,4	0,43
Canada	0,45	0,44	0,45	0,45	0,47	0,48	0,49	0,51	0,52	0,53	0,55	0,54	0,55	0,57	0,57	0,57	0,55	0,59	0,57	0,53	0,54	0,56
Russian Federation	2,44	2,3	2,08	2	1,76	1,75	1,72	1,59	1,57	1,62	1,66	1,67	1,66	1,72	1,73	1,72	1,79	1,81	1,8	1,74	1,78	1,83
Other Annex I-EIT	**1,62**	**1,53**	**1,35**	**1,19**	**1,02**	**0,97**	**0,89**	**0,87**	**0,87**	**0,85**	**0,85**	**0,86**	**0,89**	**0,93**	**0,93**	**0,89**	**0,92**	**0,97**	**0,99**	**0,89**	**0,92**	**0,97**
Ukraine	0,77	0,71	0,63	0,55	0,45	0,45	0,39	0,38	0,36	0,36	0,35	0,35	0,35	0,38	0,36	0,34	0,33	0,35	0,34	0,28	0,3	0,32
China	**2,51**	**2,65**	**2,78**	**3,02**	**3,19**	**3,52**	**3,62**	**3,59**	**3,65**	**3,57**	**3,56**	**3,64**	**3,9**	**4,5**	**5,28**	**5,85**	**6,51**	**7,01**	**7,79**	**8,27**	**8,9**	**9,7**
Large developing countries	**1,83**	**1,91**	**1,99**	**2,03**	**2,15**	**2,24**	**2,35**	**2,46**	**2,53**	**2,6**	**2,69**	**2,72**	**2,81**	**2,91**	**3,09**	**3,2**	**3,37**	**3,56**	**3,54**	**3,7**	**3,93**	**4,1**
India	0,66	0,7	0,74	0,76	0,81	0,87	0,92	0,96	0,97	1,03	1,06	1,08	1,12	1,15	1,24	1,29	1,38	1,48	1,56	1,75	1,86	1,97
Brazil	0,22	0,23	0,23	0,24	0,25	0,27	0,29	0,31	0,32	0,33	0,35	0,35	0,35	0,34	0,36	0,37	0,37	0,39	0,41	0,39	0,44	0,45
Mexico	0,31	0,32	0,32	0,32	0,34	0,33	0,34	0,35	0,38	0,37	0,38	0,38	0,38	0,39	0,4	0,42	0,44	0,45	0,45	0,44	0,44	0,45
Iran	0,21	0,23	0,24	0,24	0,27	0,28	0,29	0,3	0,31	0,32	0,34	0,35	0,37	0,4	0,43	0,45	0,48	0,51	0,37	0,38	0,4	0,41
Saudi Arabia	0,17	0,17	0,19	0,2	0,21	0,21	0,23	0,23	0,24	0,25	0,26	0,27	0,28	0,3	0,31	0,32	0,34	0,36	0,38	0,4	0,43	0,46
South Africa	0,27	0,26	0,27	0,27	0,27	0,29	0,3	0,31	0,32	0,3	0,31	0,29	0,31	0,34	0,36	0,36	0,36	0,37	0,37	0,35	0,36	0,36
Other non-Annex I	**2,31**	**2,42**	**2,51**	**2,65**	**2,76**	**2,94**	**3,13**	**3,27**	**3,26**	**3,38**	**3,53**	**3,6**	**3,69**	**3,81**	**4,03**	**4,17**	**4,31**	**4,47**	**4,3**	**4,34**	**4,65**	**4,75**
Asian tigers	**0,71**	**0,79**	**0,84**	**0,92**	**0,99**	**1,07**	**1,17**	**1,24**	**1,17**	**1,25**	**1,31**	**1,36**	**1,41**	**1,46**	**1,53**	**1,57**	**1,61**	**1,65**	**1,68**	**1,68**	**1,81**	**1,84**
South Korea	0,25	0,28	0,3	0,33	0,37	0,4	0,43	0,45	0,39	0,42	0,45	0,46	0,48	0,49	0,51	0,5	0,51	0,52	0,54	0,54	0,59	0,61
Indonesia	0,16	0,17	0,18	0,19	0,2	0,21	0,23	0,26	0,26	0,28	0,29	0,32	0,32	0,33	0,35	0,36	0,38	0,4	0,41	0,44	0,49	0,49
Taiwan	0,13	0,14	0,14	0,16	0,16	0,17	0,18	0,19	0,21	0,22	0,23	0,24	0,25	0,25	0,26	0,27	0,28	0,28	0,27	0,26	0,27	0,27
Thailand	0,09	0,1	0,11	0,13	0,14	0,16	0,18	0,18	0,17	0,17	0,17	0,18	0,19	0,2	0,22	0,23	0,23	0,22	0,23	0,22	0,23	0,23
International transport	**0,66**	**0,66**	**0,69**	**0,68**	**0,69**	**0,72**	**0,73**	**0,76**	**0,77**	**0,82**	**0,83**	**0,8**	**0,84**	**0,85**	**0,93**	**0,95**	**1**	**1,05**	**1,04**	**1,01**	**1,04**	**1,04**
Total	**22,7**	**22,7**	**22,6**	**22,8**	**22,9**	**23,6**	**24,2**	**24,4**	**24,6**	**24,8**	**25,4**	**25,4**	**26,1**	**27,2**	**28,5**	**29,3**	**30,3**	**31,4**	**31,7**	**31,3**	**33**	**33,9**

Chart 1.4. GHG Emission per Gross Domestic. Selected countries [BP Statistical Review of World Energy June 2012; World Bank Database; OECD Database]



The differences in national and regional trends are generally linked with national wealth described by Gross Domestic Product (GDP) per capita and current economic development rates (GDP change rate). Developing countries maintaining strong economic growth quickly increase their emissions, while developed countries experiencing economic stagnation were able to cut their emissions or keep the increase under control.

Chart 1.5. Correlation Between Economic Growth and Emission of GHG. Selected Countries (1-Japan, 2-Italy, 3-Spain, 4-United Kingdom, 5-USA, 6-EU-27, 7-Netherlands, 8-France, 9-Australia, 10-Canada, 11-Iran, 12-Germany, 13-Brazil, 14-South Africa, 15-Poland, 16-Mexico, 17-South Korea, 18-Russian Federation, 19-Ukraine, 20-Saudi Arabia, 21-India, 22 China)

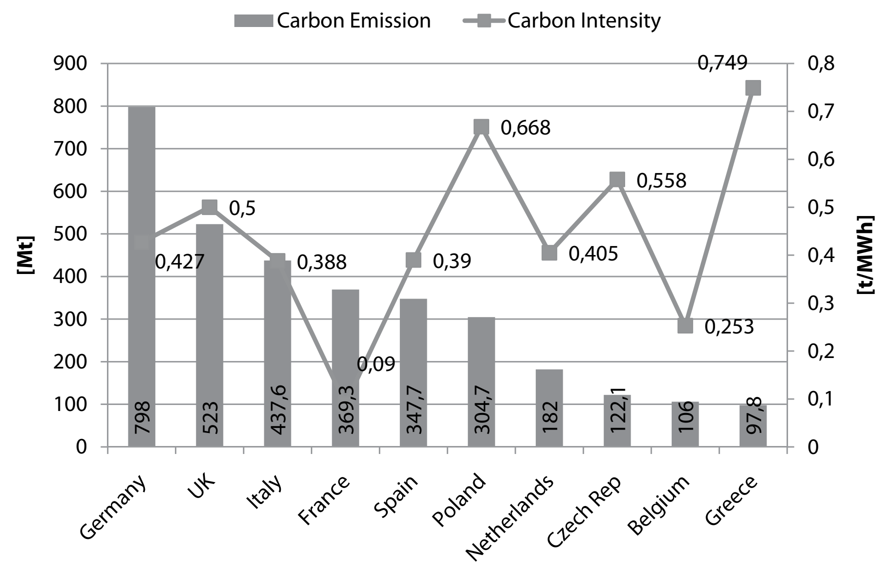


The U.S., still the largest emitter per capita after a steep decline caused by the recession in 2008-2009, high oil prices and increased production and consumption of natural gas contributed to maintaining this positive trend in the total GHG emission level also in 2011. However, after the first signs of economic recovery, industrial emissions from fuel combustion jumped in 2010 by 5% and levelled at 0.4% rise in 2011.

In 2006 China became the biggest GHG emitter in the world, surpassing the long-term leader – the U.S. Since 1996 when the Kyoto Protocol was signed, China's emission increased by 168%, with an average annual growth of 6.8%. This surge was triggered by the fast economic development resulting in growing consumption of fossil fuels, construction and expansion of the communication infrastructures requiring large amounts of steel and cement. In 2011 China was relatively unaffected by the global recession and emission from thermal power plants (mostly coal-fired power plants). Steel production and cement production rose by 14.7% – 7.3% and 10.8% respectively.

GHG emissions in the power sector are primarily determined by electricity and heat consumption, as well as by fuel mix. Since over 90% of electricity production is based on coal, the Polish power sector has one of the highest carbon intensity (amount of GHG emitted per unit of generated energy). Therefore, very ambitious decarbonisation targets recently proposed by the European Commission and supported by some Member States will have far-reaching consequences for the Polish power sector and the whole economy. Direct – with soaring electricity and heat prices for industry and households;and indirect– with carbon and power leakage.

Chart 1.6. Comparison of the Total Annual Emissions and Carbon Intensities in the Energy Sector in Selected EU Member States [CO_2 Emissions from Fuel Combustion, 2011 Edition, IEA, Paris.].



1.3. The Use of Renewable Energy Sources

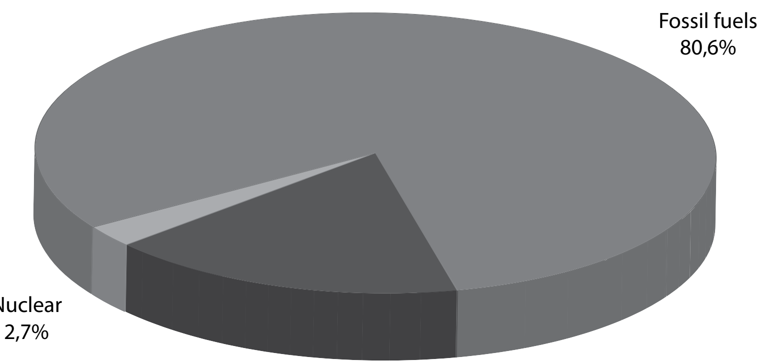
There are two ways to curb GHG emissions caused by heat and/or power plants. The first and obvious one is the reduction of electricity and heat consumption by increasing efficiency of energy conversion, transmission, distribution and end use. The second possibility is the substitution of fossil fuel based heat and/or power generation technologies with new ones, either those non-CO_2 emitting power stations, like for example nuclear power plants, or those using renewable energy sources and thus having a significantly lower lifetime carbon footprint, accounting for manufacturing, construction, maintenance and decommissioning aspects. However, in opposition to nuclear technology, renewables are generally accepted; their development is hampered by economic and technical issues:

- elevated investment costs, higher than in the case of power and heat plants burning fossil fuels;
- limited availability, predictability and controllability;
- higher costs of grid integration and more complicated methods of network control faced by transmission and distribution system operators;
- immature technologies (offshore wind farms, geothermal sources) resulting in low reliability.

Since renewable resources currently used for power and heat generation are not evenly distributed around the world, development and operation of RES is determined by local weather conditions, geological formation and hydrological conditions. As a result, the productivity of renewables differs significantly between countries and regions and the cost of mitigation of carbon emission by replacing fossil fuel plants with renewables incurred by different economies and power systems varies considerably. However, it is generally true that as against a steep learning curve and dropping manufacturing costs caused by economies of scale and technical progress, the heat and power supplied by renewable plants are still more expensive than those produced in classic power plants. To facilitate further progress of renewables, various financial support schemes are in use around the world, directly and indirectly subsidising the development (grants, loans) and operation (feed-in tariffs, quota obligations) of renewable plants. In 2011, at least 118 countries had some type of policy target or a renewable support policy at the national level.

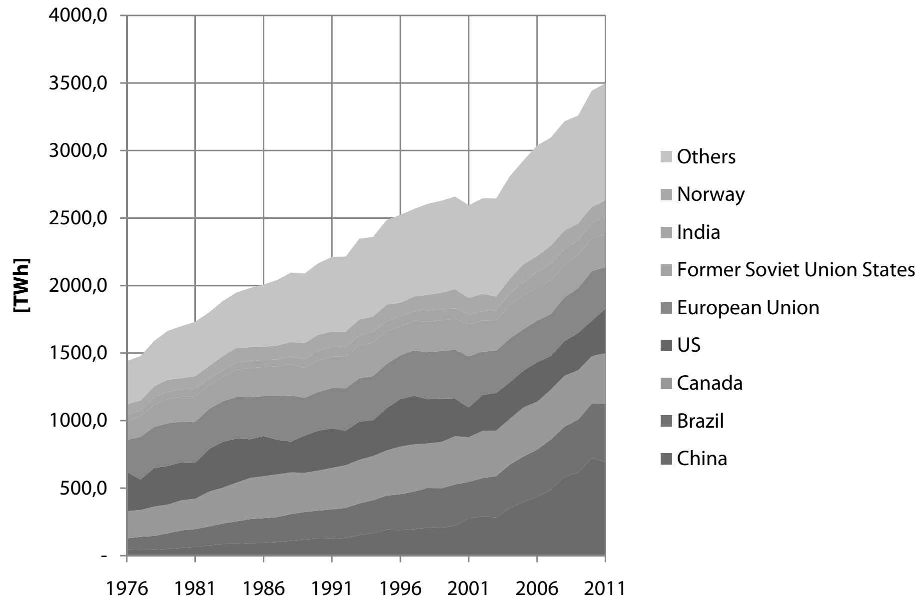
Renewable energy generation continues to grow in all end-use sectors: heat, power and transport. In 2011, renewable power plants delivered over 16.7% of the global final energy consumption. The volume of renewable energy consists mainly of heat generation (11.8%) and power generation (4.2%). Biofuels cover 0.7% of energy consumption.

Chart 1.7. The Share of Renewable Energy Supply in the Total Energy Consumption, 2011[Renewables 2012, Global Status Report, Renewable Energy Policy Network for the 21st Century]



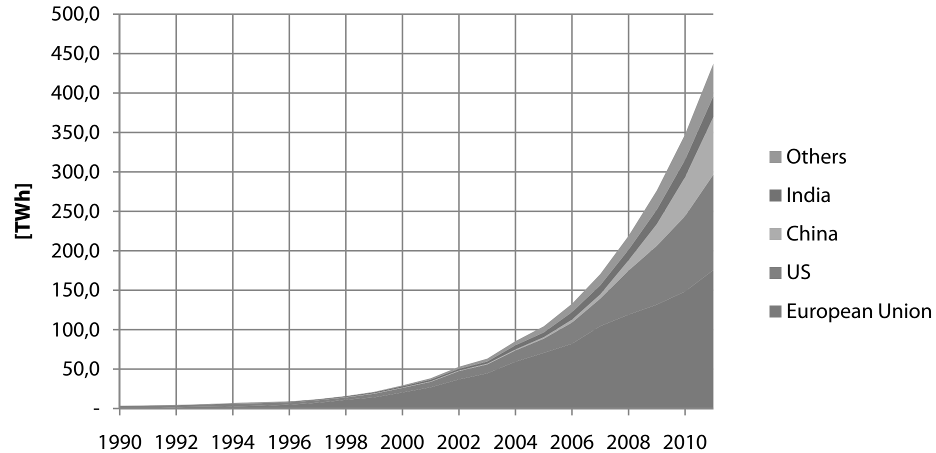
In 2011, renewable energy share of the global electricity production reached 20.3%. Major part of this share came from hydro power plants, which in 2011 generated nearly 3500TWh of electricity, followed by wind generation (437TWh),biomass and geothermal (367TWh) and photovoltaic panels (55TWh).

Chart 1.8 Consumption of Electricity Supplied by Hydro Power Plants [BP Statistical Review of World Energy Ju.ne 2012]



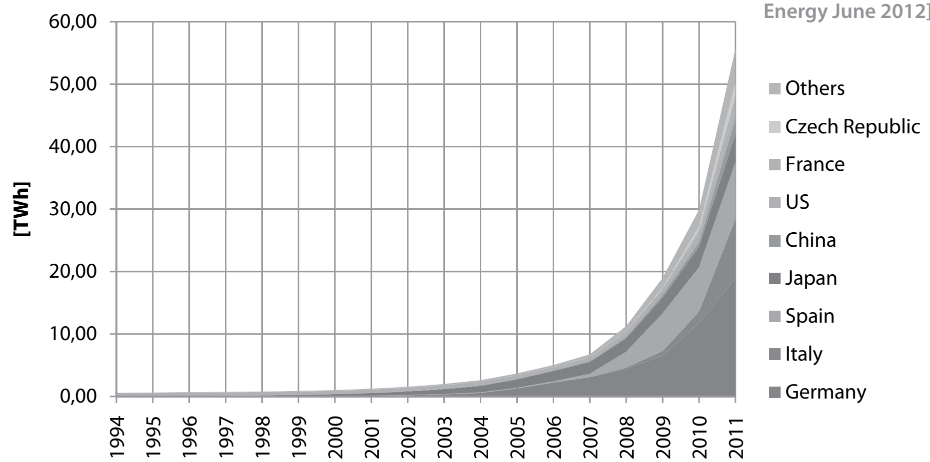
The top countries for hydro capacity are China, Brazil, the United States,Canada and Russia, which together account for 51%of the total installed capacity. In the developed countries, both the share of the hydro production and the installed capacity remain at the same level due to the lack of suitable locations. New large-scale projects are implemented in the developing countries (China 12.3 GW of new capacity, Vietnam,Brazil, India, Canada, and Malaysia).Small-scale projects are developing in Asia, Africa and Latin America.

Chart 1.9. Consumption of Energy Supplied by Wind Generation [BP Statistical Review of World Energy June 2012]



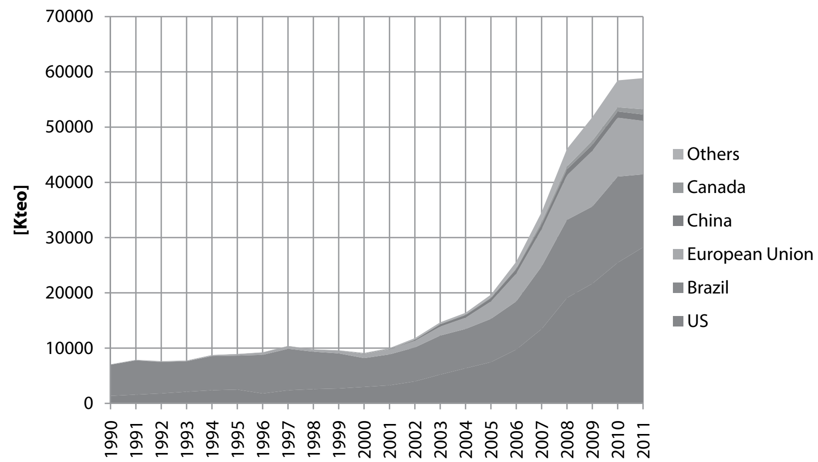
Wind power is currently the most popular renewable technology. In 2011, 40 GW of new capacity was brought on line and the total capacity of wind farms reached 239 GW. The biggest share of installed capacity is in Europe (40%, 96 GW), China (26%, 62 GW) and the U.S. (19%, 47 GW). However, during the last two years more wind capacity was added in the developing countries than in Europe, and the leaders of the latest trends are China (17.6 GW), the U.S. (6.8 GW), India (3 GW), Germany (2 GW) and the United Kingdom (1.3 GW).In Europe, due to problems with integration with the grid, during the last two years investors were more interested in PV and gas fired plants than in wind power. For this reason and because of the better efficiency of large wind projects, new large wind farms are now planned offshore. By the end of 2011, 5.3 GW in offshore wind farms was under construction in Europe. The biggest offshore capacities were in the United Kingdom (2.1 GW), Denmark (857 MW) and in Germany (200MW).Outside Europe,two offshore projects have recently been finalized in China, where the total capacity of offshore wind farms is now 258 MW. Further progress in the development of offshore wind projects is currently hindered by elevated investment costs and technology. Parallel to large wind projects, the application of small turbines is also increasing, mainly in rural areas, but further development of these plants might be slowed down by licensing and zonal regulations, the lack of sufficient financial support schemes and falling prices of PV panels. In 2011 electricity generated in wind farms amounted to 437 TWh.

Chart 1.10. Consumption of Energy Supplied by Solar Generation [BP Statistical Review of World Energy June 2012]



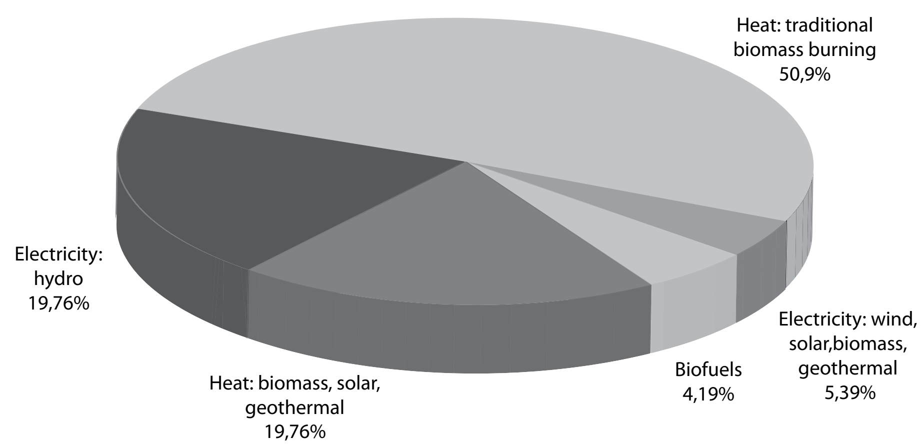
Over the past years the solar electricity generation (PV) was the second fastest-developing renewable technology. In 2011, 30GW of new PV plants were added, almost doubling the installed capacity, which reached 70 GW. This situation was mainly caused by problems with implementation of wind projects, especially in Europe, where connection of new wind farms requires reinforcement of transmission and distribution networks, substantial drop of prices for PV panels and inverter, as well as very high direct and indirect financial incentives recently introduced in some EU Member States. Europe is an undisputed leader of the PV market thanks to countries like Germany, Italy, the Czech Republic, Belgium, and Spain. Over 57% of the new capacity has been installed in Germany (over one million installations connected to grid) and Italy. For the first time solar PV accounted for more additional capacity than any other electricity generating technology in Europe. The total capacity of PV installations in Europe exceeded 51 GW. Beyond Europe, China is the second fastest developing market for PV technology, with 2.1 GW installed in 2011 (rise by 235%) and the total PV capacity at the level of 3 GW. Next come the U.S. (1.9 in 2011 and 4.3 GW in total), Japan (1.3 GW in 2011 and 4.9 GW in total) and Australia (0.8 GW in 2011 and 1.3 GW in total).

Chart 1.11. Production of Biofuels [BP Statistical Review of World Energy June 2012]



Although the use of biofuels still contributes bya small percentage to the renewable energy share, production of biofuels (ethanol, biodiesel) increased from 79 billion litres to 105 billion litres. In 2011, the top five producers of biofuels were: the U.S. (28251 kteo), Brazil (13196 kteo), the EU (9693 kteo), Argentina (2233 kteo) and China (1149 ktoe). In Europe, the first place was occupied by Germany (2839 kteo) and the second was France (1720 kteo).

Chart 1.12. The Structure of Renewable Energy Production in 2011 [Renewables 2012, Global Status Report, Renewable Energy Policy Network for the 21st Century]



Economic viability of investments in generation is determined, among other factors, by availability (load factor). In case of wind power and solar power, effective use of installed capacity is rather low, 9% and 25% respectively. That means that at the current stage of development, without support,the more advanced energy storage facilities or more reliable generating technologies, as well as further development of the most popular renewable technologies are facing technical barriers related to security of power system operation and economic barriers linked with power system planning. A further increase of electricity supply from intermittent renewables that should replace carbon-intensive fossil fuel plants will depend on the progress of energy storage technologies.

Chart 1.14. Average Availability of Solar Plants [based on data from BP Statistical Review of World Energy June 2012]

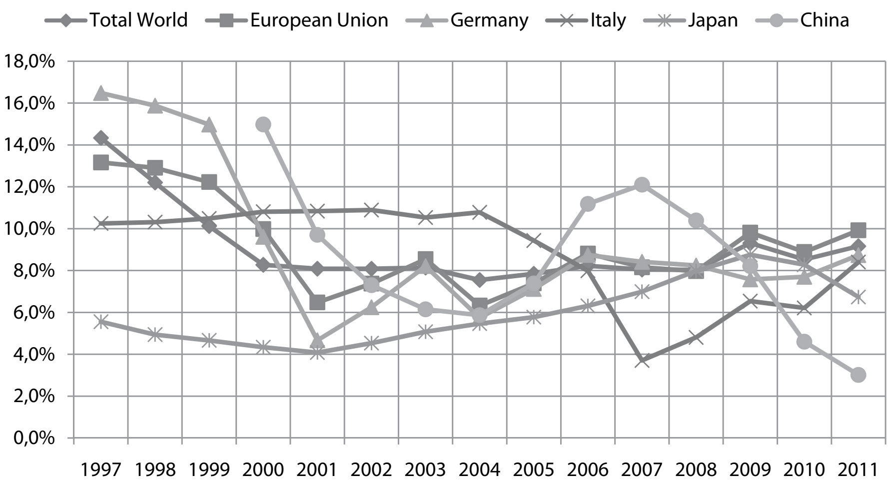
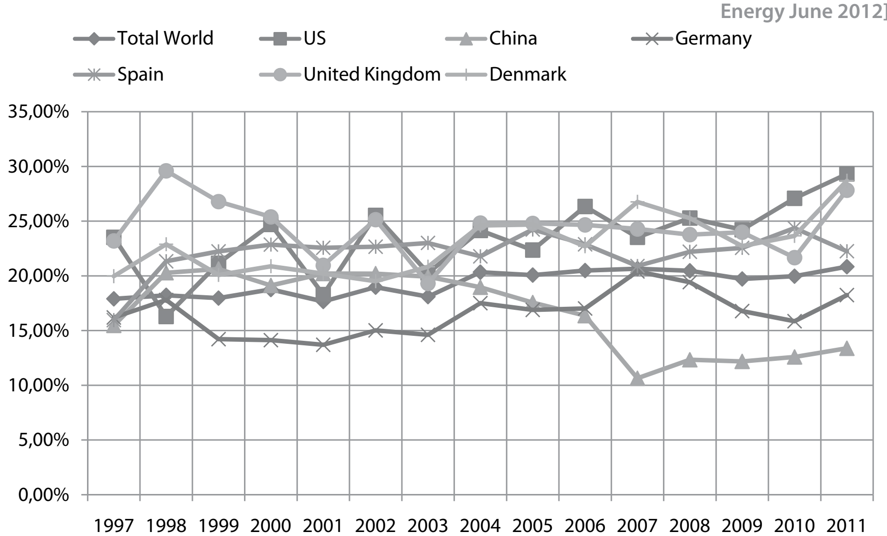


Chart 1.15. Availability of Wind Power Plants [based on data from BP Statistical Review of World Energy June 2012]



Investments in renewable power plants have been substantially growing and reached 170 billion EUR in 2010 and 225 billion EUR in 2011. It is estimated that renewable energy sector has already created over 5 million jobs, most of them in Europe (1.12 million) and in China (1.6 million).

1.4 Recent Developments and the Future of the Climate Policy

The last COP conference (COP17) was held in Durban, South Africa, in December 2011. The goal of the conference was the preparation of a new treaty to limit climate changes by curbing GHG emissions. During this conference participating countries agreed that the current climate policy is inadequate and deeper cuts are required to limit the temperature rise within 2°C compared to the preindustrial level. The important step forward after the years of discussion was an agreement concerning legally binding targets for all parties, which should be prepared by 2015 and will be implemented by 2020 as an international law act. The new treaty will impose serious obligations also on big emerging economies like China, India and Brazil. This is particularly important, since emission of GHG in these countries is growing very fast and some industrial countries (the U.S., Canada, Australia, Russia) are reluctant to accept any contractual obligations, unless developing countries make similar declarations. To prepare the new treaty, a working group called the Durban Platform has been established.

Most of the delegates also decided that there should be a continuation of the Kyoto Protocol before this new treaty is negotiated and becomes effective, but only some countries, mainly UE Member States were ready to declare that they would still respect their obligations imposed by the Protocol. Other developed countries, including large emitters (Australia, Russia and Canada) rejected the possibility to continue the Kyoto commitments after 2012 without similar obligations being assumed by developing countries.

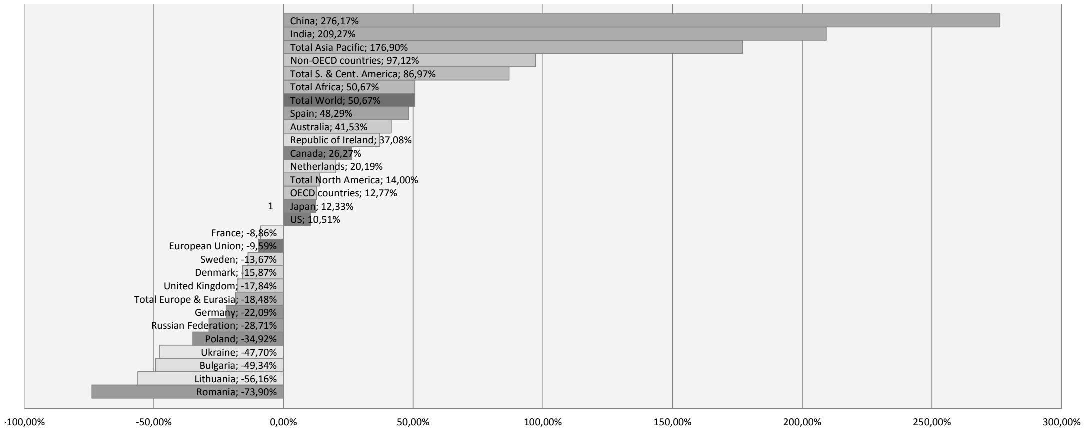
Another outcome of the COP17 conference was the establishment of the Green Climate Fund, which will support poor countries in adaptation of their economies and living conditions to climate changes.

As usually, the devil is in detail. The agreement reached at the conference set up a timeline for negotiations, where parties will discuss how to share financial and technological efforts without jeopardizing economic development. During the current financial and economic crisis, this is a particularly difficult task and some parties will try to slow down the process or even put it off. Whether the new agreement can be reach before 2015 depends on economic recovery in industrial countries. Even big countries and large regional organisations, like for example the EU, will not be able to promote the climate policy and sustainable development facing the risk of worsening their competitiveness. Therefore, to make the climate deal more feasible, there is a need for economic instruments combining globalisation mechanisms and climate policy. An approach called *climate justice without revenge*, where commitments are reflecting not only historic emissions, but also current economic growth, seems to be the best.

1.5 Conclusions

The commitments made in Kyoto will expire at the end of 2012. In the final version of the agreement, after the U.S. decided not to ratify the Protocol, rich countries signatories to the Protocol listed in Annex I, promised to reduce their global emission of GHG by 4.2% below the established reference level. However, without any formal obligations, developing countries that are supported financially vowed that they would join in as much as their economic development would not be jeopardized.

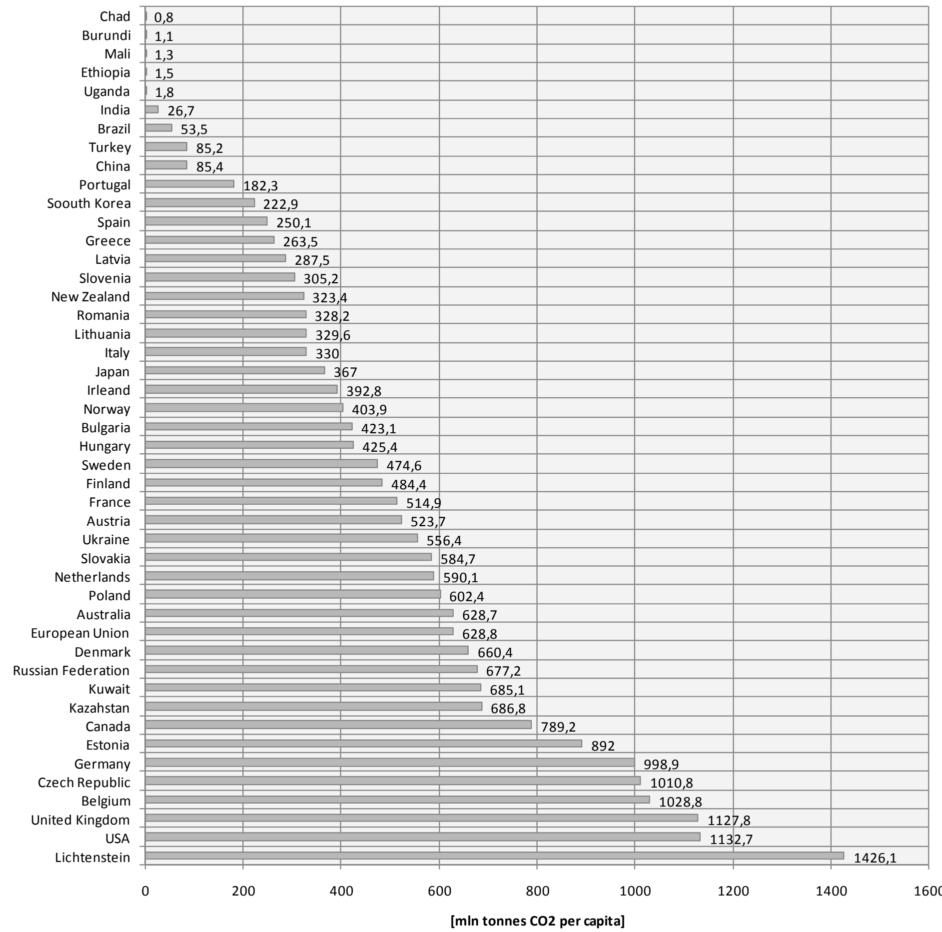
Chart 1.16. Changes in the Reduction of GHGs Emission between Reference Year of the Kyoto Protocol and 2011 [BP Statistical Review of World Energy June 2012]



Regrettably, some recently published statistics show completely opposite trends. The total world emission rose by over 50% with leaders of this trend –China and India – increasing their emissions by 276% and 209% respectively. Generally, except for Europe, all regions of the world increased their emissions by between 177% (Asia, Pacific) and 14% (North America). In Europe, which seems to swim against tide, emission of GHG fell by 18,5% and most of this reduction was accomplished thanks to "economies in transition" including the new EU Member States (Poland 35%, Romania 74%, Bulgaria 50%, Lithuania 56%) and the former Soviet Union states (Ukraine 48%, Russian Federation 29%). This was a side effect of a severe downturn and dramatic transformation of the industry structure in these countries. Among the old EU Member States only Germany, the United Kingdom, Denmark, Sweden and France were able to cut their emissions below the level established by the Protocol. The other old EU Member States, particularly those enjoying a period of economic prosperity, were not able to combine economic development with curbing emissions of GHG (Spain, jump by 48%, Republic of Ireland, increase by 37%, the Netherlands, increase by 20%). Although the results, both for Europe and the EU, are positive (9.5% drop of carbon emission at the EU level), efforts made by many European countries had no considerable influence on global trends and reaching of the Kyoto targets. OECD countries, which were expected to take on the heavy burden of the Protocol implementation, increased their GHG emission by approximately 12.77%, leaving no doubts about the possibility to stabilize GHG level in the atmosphere, with non-OECD countries doubling their output.

The presented data clearly shows that the Kyoto Protocol barely represents any progress at all, both because its reduction targets are low and not respected and due to the fact that emissions in developing countries will continue to grow unchecked. This means that mechanisms introduced by the Protocol, which was a step in the right direction, turned out to be inefficient and of secondary importance for the majority of signatories. The first issue is related to the exclusion of the developing countries and the lack of administrative and economic punishments for parties not respecting the assumed obligations and economic incentives for countries that meet their commitments. Developing countries generally reject the idea of equal treatment and financial effort would be proportionate to the current GHG emission levels. They insist on taking account of historic, cumulative anthropogenic emissions per capita as a fairer approach. However, taking into consideration differences between the currently first two biggest emitters only, China and the U.S.,with their historic cumulative emissions of 85 million tonnes CO_2 per capita and 1132 million tonnes CO_2 per capita, in practice such approach would either put a tremendous financial strain on the developed countries that would need to dramatically and immediately cut their emissions to almost zero or, in case of extending such process in time,it would result in significant additional increase of GHG in the atmosphere, which will bring damage mainly to the developing countries. Therefore, the only feasible solution is a common effort and solidarity in sharing costs of decarbonisation.

Chart 1.17. GHGs Emission per capita, 2011 [BP Statistical Review of World Energy June 2012]



The second issue arises from the fact that decarbonisation of economies might be beneficial in the future, but the cost of this transformation must be paid upfront and it is not evenly distributed, either according to countries' wealth or to their current contribution to GHG emissions. Colossal costs of decarbonisation make governments reluctant to make commitments that would put economic development at risk and worsen the current living conditions now to make it better for future generations. Direct costs related to investments in new technologies, reconstruction of power and heat industry, energy efficiency, as well as collateral damage linked with security of the power system operation, the loss of price competitiveness, loss of jobs, and other social and economic phenomena linked with carbon leakage are political arguments that are still not equalized with rising ecological awareness.

Estimates of leakage rates for action under the Kyoto Protocol range from 5 to 20%, as a result of a loss in price competitiveness, but these leakage rates were viewed as being very uncertain.[1] An assessment of the direct GHG emission reduction costs is difficult, since with no access to a large-scale carbon capture and storage technology, a marginal price curve for carbon abatement is difficult to guess. Some studies[2] suggest negative prices for first small reduction volumes, mainly related to energy efficiency improvements, waste management and application of new technologies in industry (cement, food and automotive industries). Negative prices mean that investments in these projects are, or soon will be, economically feasible and the incurred costs will be more than sufficiently compensated with savings in energy consumption. It is estimated that the reduction of approximately 10 billion tonnes of GHG emissions per year could be reached with economically feasible projects and the reduction of 38 tonnes per year to stabilize the level of GHG in the atmosphere would cost approximately 150 billion EUR, with an average cost of abatement of only 4 EUR/tonne CO_2. These forecasts/estimates are very optimistic and attract a lot of critical opinions. A more aggressive approach to decarbonisation with wide application using renewables (that must be accompanied by storage facilities) and a future carbon capture and storage technology will shift abatement prices to the level of 40-50 EUR per tonne. With these assumptions and the total decarbonisation scenario of the EU, the analysis shows that cumulative power system investment cost alone could reach 1.5 to 2.2 trillion EUR between 2011 and 2050.

Allocation of global carbon abatement costs to individual countries and regions of the world depends on scenarios describing global and individual reduction quota, economic models and simulation tools, which produce individual and regional marginal abatement cost curves (MAC). The Copenhagen Convergence Scenario is one of the widely used scenarios and assumes that countries adhere to their Copenhagen targets by 2020 and after that they will follow a linear l path of emission reduction until a uniform level of emission per capita in all countries drops to the level of 1.43 tonnes CO_2 to meet the commitment to keep the temperature rise within the 2°C range.

1 Carbon leakage of 20% means that 5% reduction in greenhouses gases emission in developed countries will result in increase of emission in developing countries by 1%.

2 "Pathways to a Low-Carbon Economy", McKinsey 2009

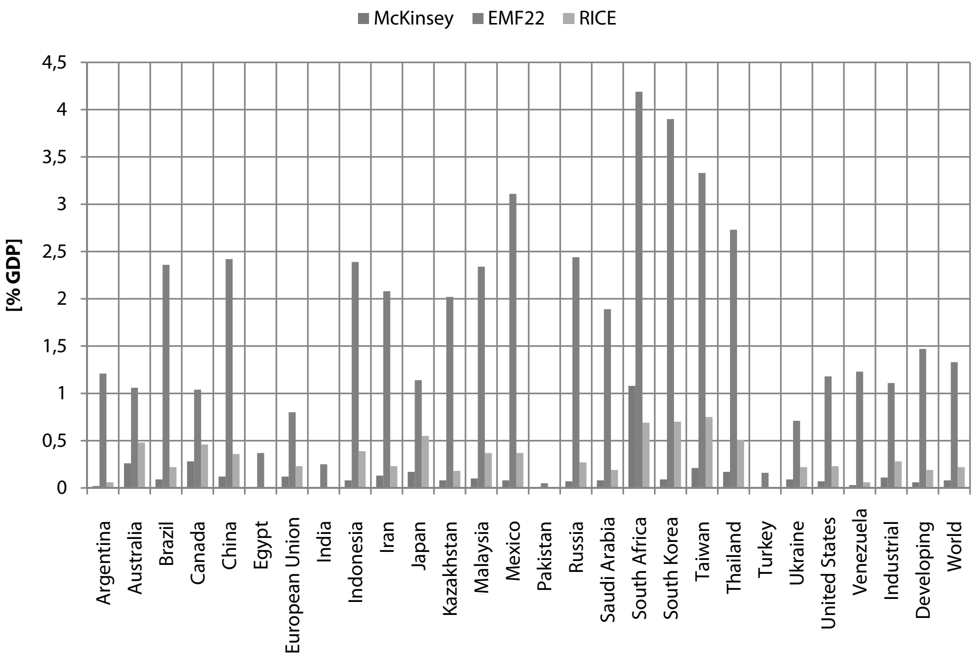
Assessments of decarbonisation costs for 2030 individual targets, prepared using three different tools (RICE, EMF-22 and McKinsey/Ackerman) and presented below, show huge differences between models and to some degree this challenges the credibility of these results.

Table 1.5. Reduction of GHG Emission in Copenhagen Convergence Scenario, selected countries [Carbon Abatement Costs and Climate Change Finance, William R. Cline, Peterson Institute for International Economics, July 2011]

Country	2020	2030	2040	2050
Argentina	0	24	47	70
Australia	26	48	69	91
Brazil	24	39	51	61
Canada	23	47	70	92
China	0	39	68	88
Egypt	0	10	21	32
European Union	17	41	63	84
India	0	10	19	27
Indonesia	26	38	49	57
Iran	0	35	64	87
Japan	30	50	69	87
Kazakhstan	1	34	64	91
Malaysia	0	38	67	89
Mexico	30	46	60	72
Pakistan	0	3	7	12
Russia	7	40	68	92
Saudi Arabia	0	32	63	91
South Africa	34	57	76	91
South Korea	30	54	74	91
Taiwan	0	49	79	97
Thailand	0	42	70	88
Turkey	0	13	28	45
Ukraine	0	36	65	89
United States	17	40	65	91
Venezuela	0	24	49	76
World	9	35	57	75
Industrial countries	17	42	65	89
Developing countries	3	31	53	69

Higher annual costs are observed in the developing countries, with an average of 1.5% GDP. For the EU,the decarbonisation cost varies between 0.12 and 0.8% GDP and for the U.S. – between 0.07 and 1.18% GDP.

Figure 1.18 Influence of Decarbonisation According to Copenhagen Convergence Scenario. Percentage Change in the Gross Domestic Product in Selected Countries [Carbon Abatement Costs and Climate Change Finance, William R. Cline, Peterson Institute for International Economics, July 2011]



2. Analysis of Climate Obligations of the European Union

Robert Zajdler

2.1. The Legal Basis of the EU Climate Policy

The EU policy on climate change is one of the key elements of the EU environmental policy. It was primarily based on the internal market rules. The first directive on environment – directive for harmonised classification and labelling of dangerous chemicals was approved in 1967. Separate environmental policy was introduced to the Treaty establishing the European Community (TWE)[1] in 1987 and further amendments have not changed the merit of this policy.[2] The policy is currently regulated in Articles 191-193 of the Treaty on the Functioning of the European Union (TFEU).[3]

The EU environmental policy is based on the overall protection of each element of the environment by two methods: quality standards and emission limit values. Quality standards require Member States to implement certain level of protection but fail to give scientific data in support of this policy. Emission limit values are based on minimal countable level of emissions based on analysis. A combination of strengths of both approaches helps to achieve or go beyond environmental quality standards.[4]

However, the EU competences in the environmental policy are limited by the Treaty rules on division of competences. Due to Article 4 TFEU, environmental policy is one of these policies where regulatory competences are shared between Member States and the European Union. The EU sets minimum standards leaving the decision on how to achieve them up to Member States. The EU has to prove that legislative actions at the EU level fall within the principles of proportionality and subsidiarity. It restricts the EU from proposing rules not acceptable by the majority of Member States. It also restricts Member States from introduction of additional rules of supposedly environmental nature which

1 Consolidated version of the Treaty establishing the European Community. OJ C 325 24.12.2002, p. 33.

2 S. Scheuer, *EU Environmental Policy Handbook, A Critical Analysis of EU Environmental Legislation, Making it accessible to environmentalists and decision makers*, Brussels 2005, p. 8; M.Nowacki M., A. Przyborowska-Klimczak, *Commentary on Title "Environment"* [in] A. Wróbel (ed.): *Commentary on Treaty on the functioning of the European Union*, Warsaw 2012, p. 1268-1269.

3 Consolidated version of the Treaty on the Functioning of the European Union, OJ C 115 9.5.2008, p. 47.

4 S. Scheuer, *EU Environmental Policy Handbook, A Critical Analysis of EU Environmental Legislation, Making it accessible to environmentalists and decision makers*, Brussels 2005, p. 12-13.

may negatively affect the internal market and competition. Additionally, Article 192(2)(c) TFEU gives each Member State a pivotal role in regulating environmental issues if the proposed measure significantly affects "its choice between different energy sources and the general structure of its energy supply".[5] This rule was confirmed by the Court of Justice of the European Union (ECJ) in a number of judgments.[6] Additionally, Article 194(2)(2) TFEU (Energy), explicitly supports the competence of each Member State to unilaterally create its energy mix.[7] These legal bases theoretically give more regulatory powers to Member States but practical use of this exception is difficult. Additionally, negotiation skills of the EU makes it difficult for a Member State to get regulation which would take due account of national circumstances. The only choice for such a Member State is to make a plea to the ECJ.

As part of the EU environmental policy, climate change has taken central stage in actions by the European Union (EU) at the international and the European level. The EU policy on climate change is based on its external climate actions aimed at strengthening its international leadership on this issue and the development and implementation of internal climate policy among Member States. This policy created a vast amount of EU legislation.[8]

International interest in global climate protection dates back to 1968, when during the 23rd Session of the General Assembly of the United Nations the concept of the need for popularisation of global environmental protection was created. The EU has started to develop its leadership role since the negotiations at the Climate Change Convention in 1991, when it supported binding emission reduction targets. Its leadership role was strengthened during negotiations of the Kyoto Protocol of 1997. Then, the EU proposed deep emission reductions among industrialised countries, priority to domestic reductions and greater unity among countries.

The European Council's conclusions of 8-9 March 2007[9] enhanced the EU's international leadership. It decided to make a firm independent commitment to achieve at least a 20 % reduction of GHG emissions by 2020 compared to 1990, based on differentiated contributions of EU Member States, reflecting *"fairness and transparency as well as taking into account national circumstances",* until a global and comprehensive post-2012 agreement is concluded, and without prejudice to the EU position in international negotiations. The EU has also offered to increase its emission reduction to 30% by 2020, on condition that other major emitting countries out of both the developed and developing countries commit to do their fair share under a future global climate agreement (the post-Kyoto agreement). It also agreed to increase the share of renewable energy sources in the EU energy supply to 20%, the contribution of biofuels in transport to 10% in 2020 and to achieve energy savings of 20% of EU energy consumption for 2020. This *"leadership by example"* was regarded as a new EU strategy at the international level aiming to support actions based on diplomacy and persuasion. The aim was also to close the *"credibility gap"* between international promises made by countries and the domestic implementation of policies devoted to climate change. This strategy is commonly called "the 20-20-20 targets". An example of this leadership was the unilateral declaration of the European Commission to increase the EU's emissions reduction to 30%, on condition that other major emitting countries in the developed and developing world also make their fair commitment under a global climate agreement.

The European Council decided to achieve this goal by political and legislative actions at the internal EU level. They were focused on three sectors: electricity generation, energy-intensive industries and domestic energy consumption. The EU internal approach was based on administratively tailored actions in each of these sectors. The Council established national targets for each Member State and created the common EU target.

The EU has proposed actions aimed at tackling GHG emissions since 1990. However, the lack of interest among Member States and energy intensive industries curbed/softened these legislative initiatives or limited their outcome. The first European Climate Change Programme (ECCP) of 2000 gave new momentum to actions at the EU level. It was to identify the most environmentally effective and most cost-effective policies and measures that can be taken at the European level to cut GHG emissions. It was followed by a number of regulatory measures proposed by the EU and implemented by Member States.[10] The EU also distributed efforts to fulfil its obligations under the Kyoto Protocol in a burden-sharing agreement among the EU-15 Member States.[11]

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5 M. Nowacki M., *Swoboda państwa w zakresie kształtowania krajowej struktury zaopatrzenia w energię w świetle prawa Unii Europejskie*j [in:] A. Walaszek-Pyzioł (ed.) *Wybrane węzłowe problemy współczesnego prawa energetycznego*, Kraków 2012, p. 17-35.

6 Judgement of the ECJ T-183/07 Poland vs. European Commission; M. Nowacki, *Skutki polskiej skargi w sprawie limitu gazów cieplarnianych*, Europejski Przegląd Sadowy 2011, nr 1, s. 20-32.

7 R. Zajdler, *Legal aspects of electricity and gas interconnectors with third countries* [w:] R. Zajdler, *EU Energy Law: Constraints with the Implementation of the Third Liberalisation Package,* Cambridge Scholars Publishing 2012; M. Nowacki, *Swoboda państwa w zakresie kształtowania krajowej struktury zaopatrzenia w energię w świetle prawa Unii Europejskiej* [in:] A. Walaszek-Pyzioł, (ed.)*Wybrane węzłowe problemy współczesnego prawa energetycznego*, Kraków 2012, p. 26-29; M.Nowacki, *Commentary on Title "Energy"* [in] A. Wróbel, (ed.) *Commentary on Treaty on the functioning of the European Union*, Warsaw 2012, p. 1380-1388.

8 M. Nowacki, *Prawne aspekty wspólnotowych działań na rzecz ograniczania emisji gazów cieplarnianych a bezpieczeństwo energetyczne Polski* [in:] J. Maliszewska-Nienartowicz(ed.), *Organizacja i funkcjonowanie Unii Europejskiej. Zagadnienia wybrane*, Toruń 2009, p. 264-268.

9 7224/1/07 REV 1.

10 Directive 2001/77/EC of the European Parliament and of the Council of 27 September 2001 *on the promotion of electricity produced from renewable energy sources in the internal electricity market* (OJ L 283, 27.10.2001, p. 33-40), Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 *on the energy performance of buildings* (OJ L 1, 4.1.2003, p. 65-71), Directive 2003/30/EC of the European Parliament and of the Council of 8 May 2003 *on the promotion of the use of biofuels or other renewable fuels for transport* (OJ L 123, 17.5.2003, p. 42-46), Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 *establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC* (OJ L 275, 25.10.2003, p. 32-46), Directive 2004/8/EC of the European Parliament and of the Council of 11 February 2004 *on the promotion of cogeneration based on a useful heat demand in the internal energy market and amending* Directive 92/42/EEC (OJ L 52, 21.2.2004, p. 50-60), Directive 2006/32/EC of the European Parliament and of the Council of 5 April 2006 *on energy end-use efficiency and energy services and repealing Council* Directive 93/76/EEC (OJ L 114, 27.4.2006, p. 64-85), Regulation (EC) No 842/2006 of the European Parliament and of the Council of 17 May 2006 *on certain fluorinated greenhouse gases* (OJ L 161, 14.6.2006, p. 1-11).

11 Council Decision 2002/358/EC of 25 April 2002 *concerning the approval, on behalf of the European Community, of the Kyoto Protocol to the United Nations Framework Convention on Climate Change and the joint fulfilment of commitments thereunder* (OJ L 130, 15.5.2002, p. 1-3).

The EU credibility was further enhanced by the implementation of the so-called Climate and Energy Package.[12] It consists of rules on: (1) reduction of GHG emissions by 20% below 1990 levels by 2020 (or 30% conditional on an international "post-Kyoto" agreement), (2) increased penetration of renewable energy sources by 20% and biofuels by 10% in the EU energy consumption by 2020, (3) improvement of energy efficiency by 20% to 2020 in relation to business-as-usual scenario, (4) setting a legal and policy framework for carbon capture and storage (CCS).

These actions require greater commitment from Member States to reduction of GHG emissions than that required by the Kyoto Protocol. The Climate and Energy Package relates to the great part of the EU GHG reduction requirements. Actions are less dependent on the EU Member States and rely more on supranational obligations and control of the European institutions. The commitments are less dependent on equalisation of burdens and more on uniform measures within the EU, based on sector specific conditions. The greatest costs of these measures are imposed on the energy production sector, in particular its most carbon-intensive part and on the energy-intensive industries.

This pressure for leadership was followed by a declaration of the European Commission, which confirmed and extended the scope of the above-mentioned actions in a document entitled *A Roadmap for moving to a competitive low carbon economy in 2050*.[13] It confirms the overall goal of the EU "*to keep climate change below 2ºC*". According to the Commission, the EU will contribute to it by reducing GHG emissions by 80-95% by 2050 compared to 1990. The sectors most affected by this policy measure are: the power sector (emission reduction by c. 90% by 2050) and energy-intensive industries (emission reduction by c. 80% by 2050)[14]. In order to "soften" the negative effect of this policy on the above-mentioned sector, the *Roadmap* proposes several measures. In relation to the power sector, the Commission wants to implement the technology plan aimed at spurring innovation and R&D, particularly by promoting low carbon technologies. It will be financed by incomes from the EU ETS auctions and the EU cohesion fund. At the same time, the Commission wants to artificially stimulate the price of emission permits in the EU ETS by limiting their supply on the market. Such policy does not ensure financial security of investments. In relation to energy-intensive industries, the Commission wants to encourage enterprises to apply more advanced resource and energy-efficient industrial processes and equipment, increased recycling, as well as abatement technologies for non-CO_2 emissions (e.g. nitrous oxide and methane). Additionally, it wants to provide wider penetration of CCS technologies, especially in the cement and steel sectors. Energy efficiency is also a key action. The plans aim at continuous improvement of the energy efficiency of buildings, equipment, household appliances and transport. Additionally, promotion of investments in distributed generation (smart grids, smart appliances) will give intensive momentum to low carbon economy. This document has not been approved by Member States and may be regarded as the sole view of the European Commission. It is subject to a hot debate within the Council.

Certain other actions of the European Union within the environmental policy influence climate policy and are a source of additional costs incurred by European economy:

- The Clean Air for Europe programme (CAFE) was launched with the aim to develop long-term, strategic and integrated policy advice to protect against significant negative effects of air pollution on human health and the environment.[15] Its aim was to limit air pollution from particulates emitted by different sources (incl. combustion plants) or gaseous pollutants (VOCs, NOx, SOx and NH_3). The research carried out within CAFE led to creation of seven thematic strategies (air pollution, the marine environment, sustainable use of resources, prevention and recycling of waste, sustainable use of pesticides, soil protection and urban environment) provided for in the Sixth Environmental Action Programme (2002).[16] In order to simplify and clarify the existing provisions and reduce unnecessary administrative burdens, certain actions were proposed by the European Commission.[17] Their objective was to further reduce emissions arising from industrial activities, which was proposed in the Directive 2010/75.[18] CAFE was a tool for additional regulatory measures related to the environmental protection, which required additional investment from the industry;

- Directive 2010/75/EU (IED) recasts several European regulations.[19] It aims to reduce industrial pollution and covers all pollutants except CO_2.[20] It provides standards for prevention

12 It consists 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, 5.6.2009, p. 16-62), 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 (OJ L 140, 5.6.2009, p. 63-87), Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009 *on the geological storage of carbon dioxide and amending* Council Directive 85/337/EEC, European Parliament and Council Directives 2000/60/EC, 2001/80/EC, 2004/35/EC, 2006/12/EC, 2008/1/EC and Regulation (EC) No 1013/2006 (OJ L 140, 5.6.2009, p. 114-135), 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, 5.6.2009, p. 136-148).

13 Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, A Roadmap for moving to a competitive low carbon economy in 2050, COM(2011)112 final.

14 European Commission: Background paper Energy Roadmap 2050 – State of Play, 3.05.2011 [in:] http://ec.europa.eu/energy/strategies/2011/doc/roadmap_2050/20110503_energy_roadmap_2050_state_of_play.pdf.

15 Communication from the Commission, *The Clean Air for Europe (CAFE) Programme: Towards a Thematic Strategy for Air Quality*, COM(2001) 245 final.

16 Communication from the Commission to the Council, the European Parliament, the Economic and Social Committee and the Committee of the Regions *On the sixth environment action programme of the European Community 'Environment 2010: Our future, Our choice' – The Sixth Environment Action Programme*, COM/2001/0031final.

17 In particular Communication from the Commission to the Council and the European Parliament of 21.09.2005, Thematic Strategy on air pollution, COM(2005) 446 final.

18 Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 *on industrial emissions (integrated pollution prevention and control)*, OJ L 334, 17.12.2010, p.17.

19 Directive 2008/1/EC of the European Parliament and of the Council of 15 January 2008 *concerning integrated pollution prevention and control* (OJ L 24, 29.1.2008, p. 8-29), Directive 2001/80/EC of the European Parliament and of the Council of 23 October 2001 *on the limitation of emissions of certain pollutants into the air from large combustion plants* (OJ L 309, 27.11.2001, p. 1-21), Directive 2000/76/EC of the European Parliament and of the Council of 4 December 2000 *on the incineration of waste* (OJ L 332, 28.12.2000, p. 91-111), Council Directive 1999/13/EC of 11 March 1999 *on the limitation of emissions of volatile organic compounds due to the use of organic solvents in certain activities and installations* (OJ L 85, 29.3.1999, p. 1-22), Council Directive 78/176/EEC of 20 February 1978 *on waste from the titanium dioxide industry* (OJ L 54, 25.2.1978, p. 19-24), Council Directive 82/883/EEC of 3 December 1982 *on procedures for the surveillance and monitoring of environments concerned by waste from the titanium dioxide industry* (OJ L 378, 31.12.1982, p. 1-14), Council Directive 92/112/EEC of 15 December 1992 *on procedures for harmonizing the programmes for the reduction and eventual elimination of pollution caused by waste from the titanium dioxide industry* (OJ L 409, 31.12.1992, p. 11-16).

20 It is covered by directive 2009/28 being a part of the Climate and Energy Package.

and control of emissions into air, water, soil, waste management, energy efficiency and rules on accidents and their prevention. It simplifies emission regulations by combining seven regulations into one. It affects several industries and activities in Europe (energy industry, production and processing of metals, mineral industry, chemical industry, waste management and other activities, including, under certain conditions, production of paper, the pre-treatment or dying of textile fibres; the treatment or processing of raw animal or vegetable materials);

- IED sets strict limits on air pollution from different pollutants and sets rules on the integrated prevention and control of pollution from industrial activities. It clarifies the Best Available Technique (BAT) concept, formalities on permits outside the scope of BAT. It also requires Member States to adopt and regularly update general binding rules on BATs (which do not prescribe the use of any technique or specific technology). It also introduces minimum standards on inspection and review of permit conditions and compliance reporting, extends the scope of the IPPC Directive (Directive 2008/1/EC) to cover additional installations (incl. combustion plants between 20-50 MW). Industry will have to comply with these rules from January 2014 but rules governing the IPPC Directive, which will enter into force on 1 January 2016. The IED provides derogations for large combustion plants, which, under certain conditions, may postpone the new rules until 30 June 2020.
  This regulation generates significant costs, particularly for the energy sector, which is based on combustion of fossil fuels. It requires innovation in this sector giving time for compliance. However, Poland has received derogation from some of the requirements of the LCP Directive (one of the predecessors of the IED), which gave additional time for compliance that should be respected by this new regulation.

Summing up, the EU is responsible for less than 13,5% of the global GHG emissions, which is relatively small physically but of great political potential for the EU institutions. Since 1990, the EU has assumed a clear leadership position with regard to climate change. Its international actions on climate change based on diplomacy and persuasion have lacked effectiveness. The *"leadership by example"* could give credibility to the EU. However, it required domestic actions. Different economic, social and environmental positions of the EU-27 Member States create a burden for implementation of supranational command-and-control mechanisms. The EU was built on solidarity among Member States and shared, yet diversified responsibilities. It seems that the EU internal policy on climate change sacrifices this goal, sometimes irrespective of the fairness, transparency and failing to take into account national circumstances. The present situation of Member States (including the economic problems of some of them) supports the need for a more diversified approach. It is particularly important in the situation where the real cost-benefit analysis of the discussed EU policy has not been performed and estimations made by different actors vary considerably.[21]

Despite internal problems, the EU may also face challenges at the international level. The international climate change agenda goes beyond emission cuts to cover political relations

21 R.S.J.Tol, *The costs and benefits of EU climate policy for 2020*, Economic and Social Research Institute, Dublin, Ireland 2010.

between developed and developing countries, financial assistance, R&D deployment particularly in developing countries, equalisation of inequality between countries. *Leadership by example* may not be sufficient to play an important role in this process any more. This method of filling the credibility gap may no longer give credibility. At the same time, it may create additional costs for the economies of Member States, which may limit innovation and investment in places where it would have real far-reaching benefits.

Additionally, different pieces of the EU environmental regulations influence the European industry. The climate protection is their secondary goal. However, they create additional costs for European industry. If the EU wants to be a global leader, a globally competitive European industry should be the arm of this policy. Environmental protection is an additional cost for industry which should be borne for public purposes. However, giving appropriate importance to this policy is essential. The EU *leadership by example* may be led by industry, which would respect reasonable and tailored environmental rules and would not be burdened by unnecessary and politically motivated environmental actions.

2.2. A Comparison of Energy Portfolios and Climate and Energy Package Obligations of the EU Member States

The EU is a group of 27 countries, which differ in many aspects, starting from the level of advancement of their economies to geographical locations and resource availability. The history of Central and Eastern European (CEE) countries has shaped their resources utilization policy, as well as the underdevelopment of their energy production technology, coupled with environmental protection issues. At the same time, Western European countries were developing their nuclear programs and participating in the EU Environment Action Programs (EAP). These circumstances have affected the differentiation of energy portfolios in the EU countries.[22]

Chart 2.1. below pictures the energy mix in gross electricity generation (Axis Y) and the country share in total EU electricity generation (Axis X) in 2010. Three biggest electricity producers (Germany, France and the UK) have part of their energy coming from nuclear power plants. In France, the nuclear share is substantial, representing 78% of total generation, whereas in Europe nuclear energy stands for not more than 30%. Coal and lignite generation represent a similar share of the EU electricity production as nuclear. Poland is the country with the biggest share of electricity generated from solids (92%) but coal and lignite play a vital role in Germany, the UK, Italy, Spain, Czech Republic and Bulgaria. Gas is the main energy source in Italy, Netherlands and the UK and covers a significant share of demand in Spain, Germany, Austria and Finland. It represents 23% of the EU gross electricity generation. Installations utilizing renewable resources are present to some extent in every EU country but their share in electricity generation varies from approx. 5% in Poland and Czech Republic to nearly 52% in Sweden.[23] Apart from the fact that renewable energy is promoted in EAPs, its utilization is also

22 M. Nowacki M, *Swoboda państwa w zakresie kształtowania krajowej struktury zaopatrzenia w energię w świetla prawa Unii Europejskiej* [in:] A. Walaszek-Pyzioł, (ed.)*Wybrane węzłowe problemy współczesnego prawa energetycznego*, Kraków 2012, p. 19.
23 EU energy trends to 2030, European Commission, 2010.

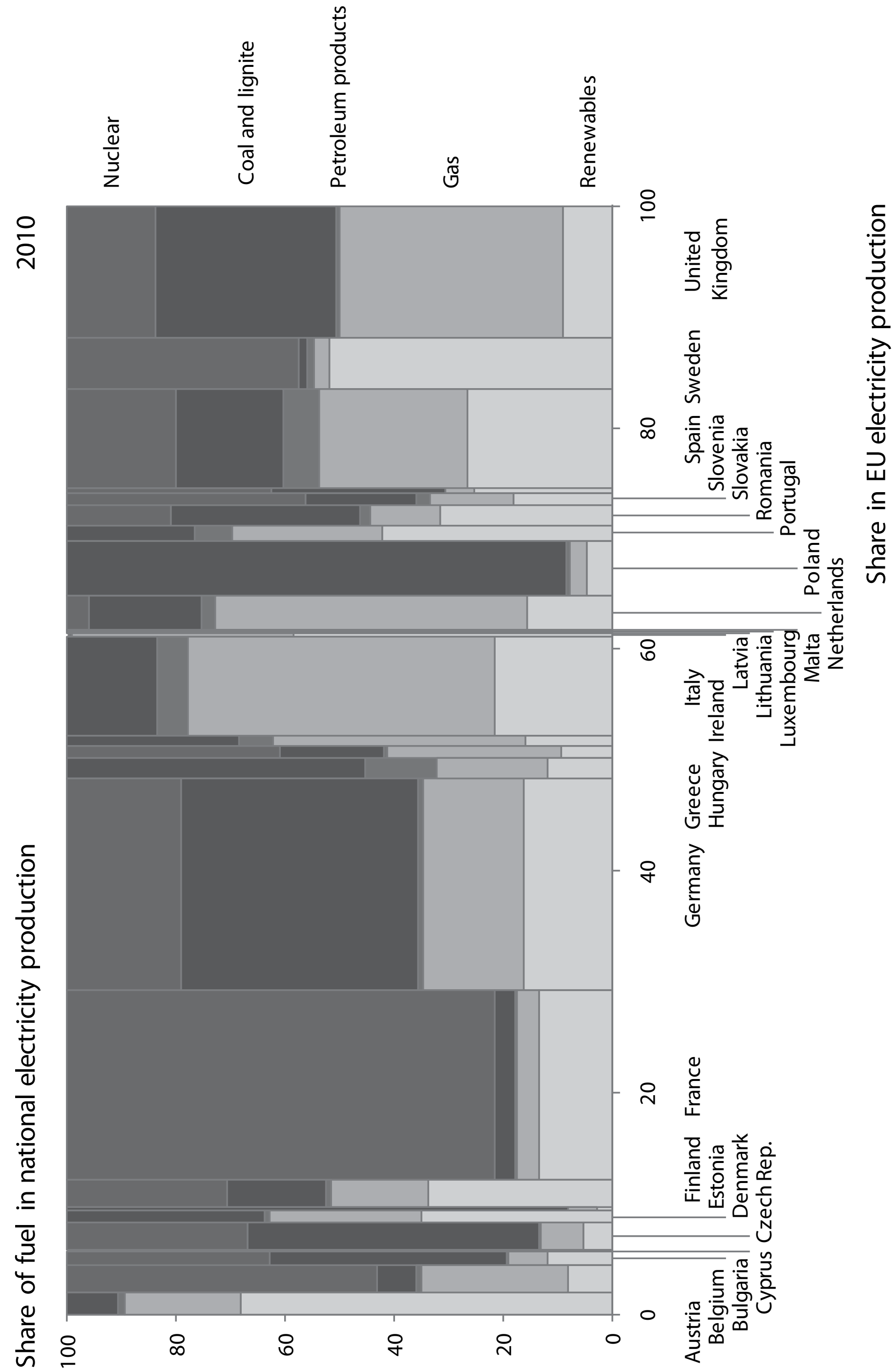
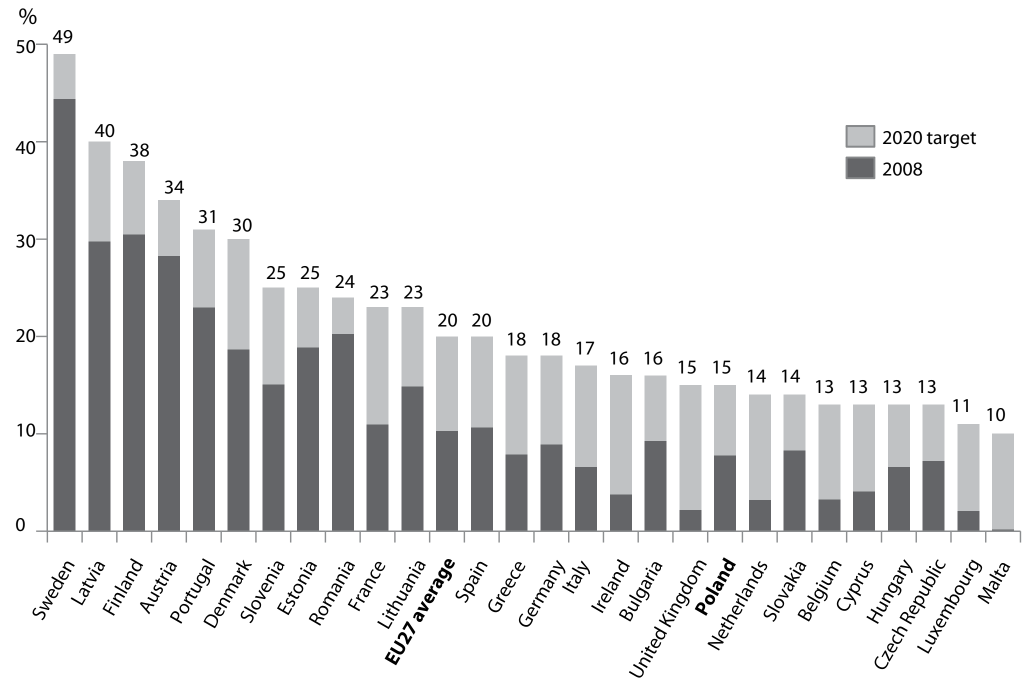


Chart 2.1. Gross Electricity Generation by Fuel in 2010. Source: European Commission

linked with geographical location and resource availability. Petroleum products do not play a substantial role. They stand for 2% of electricity generation in the EU.

According to the Directive 2009/28 (part of the Climate and Energy Package), the EU Member States are obliged to reach a certain level of renewable energy share in total energy consumption. The objective of the Climate and Energy Package is to generate 20% of energy from renewables but country thresholds were set individually. Chart 2.2. presents the 2008 status and the 2020 objectives, as regulated by the EU Climate and Energy Packagers. It shows the gap that needs to be addressed in order to meet the EU objective in 2020. The highest goals were set for Scandinavian members and Latvia but the gap to meet the requirements is relatively small. The biggest increase is expected from the UK, which needs to cover a 12,8% gap, whereas minor efforts are required from Romania and Sweden, where the gap equals 3,7% and 4,6% respectively. Poland is in the middle of the stake and has to increase its renewable energy share by 7,2% in order to reach the 15% target.[24]

Chart 2.2. Renewable Energy Share Targets in the EU Countries. Source: http://www.energy.eu



Based on the Climate and Energy Package objectives, economic development and local policies, the European Commission issued forecasts of electricity generation installed capacity in 2020. Chart 2.3. below presents the comparison of the 2010 status with forecasted 2020. Shades of green represent the share of installed capacity of renewable plants.

24 http://www.energy.eu/.

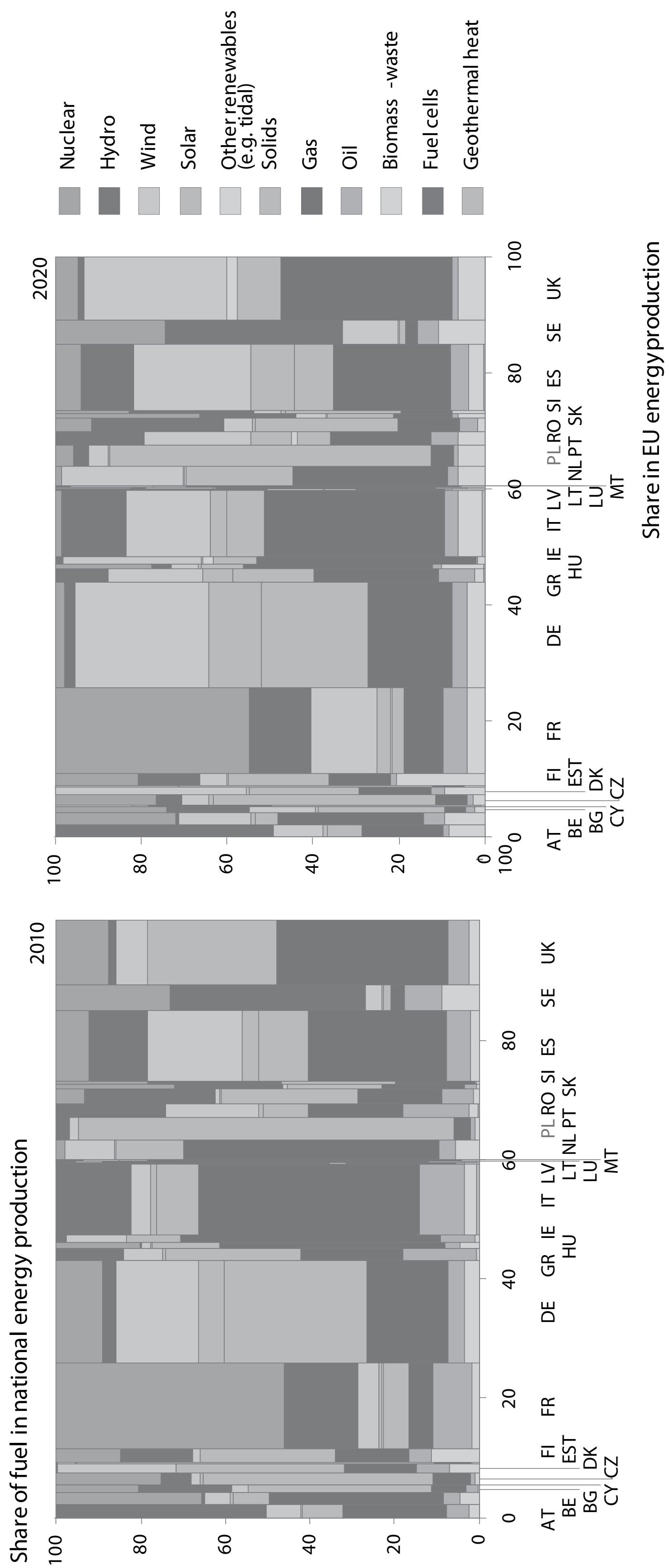
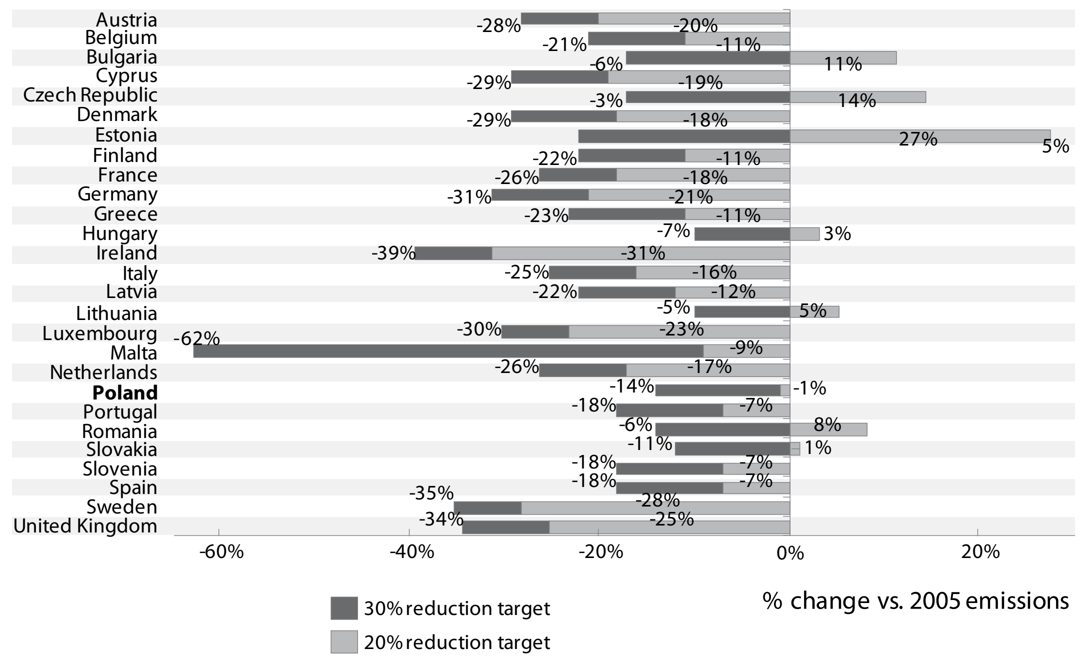


Chart 2.3. Share of Installed Capacity by Fuel Type in 2010 and 2020. Source: European Commission

It is important to notice that indeed the biggest energy producers contribute most to reaching the EU objectives. The chart above shows gaps to be addressed by countries, whereas the chart below shows that 1% change in case of the biggest electricity generators stands for much more than a couple of per cent in case of smaller countries. For instance, Germany with a much lower share of renewable energy plants will be able to generate more "green energy" than Sweden, with more than 50% capacities based on renewable resources.

The EU countries are also obliged to reduce their GHG emissions with focus on emissions of CO_2. The burden-sharing concept has resulted in different emission caps depending on economic circumstances. The total emission caps are set for the ETS and non-ETS sectors independently. Based on the Climate and Energy Package data, Chart 2.4. describes the total emission reduction as compared to 2005 in two scenarios: scenario in which the EU emission is decreased by 20% and an alternative scenario with a 30% reduction objective. Green bars show changes in the 20% reduction scenario. Some countries have been granted additional emission allowances (Bulgaria, Czech Republic, Estonia, Hungary, Lithuania, Slovakia and Slovenia), Poland will be only slightly affected (1% cap decrease) and some other will have to cut their emissions by 20% and more (Austria, Germany, Ireland, Luxembourg, Sweden and the UK). Bottom bars represent required emission reduction in the scenario aiming at 30% reduction. The scale of allowances decrease varies between 6% and 62%, with most countries having to cut emissions by approx. 20-30%.

Chart 2.4. CO_2 Emission Cap Change Compared to Base Year.



The table below presents detailed data with emission split between ETS[25] and non-ETS sectors.

Table 2.1. Projection of CO_2 Emission Allowances in Mt. Source: Bloomberg

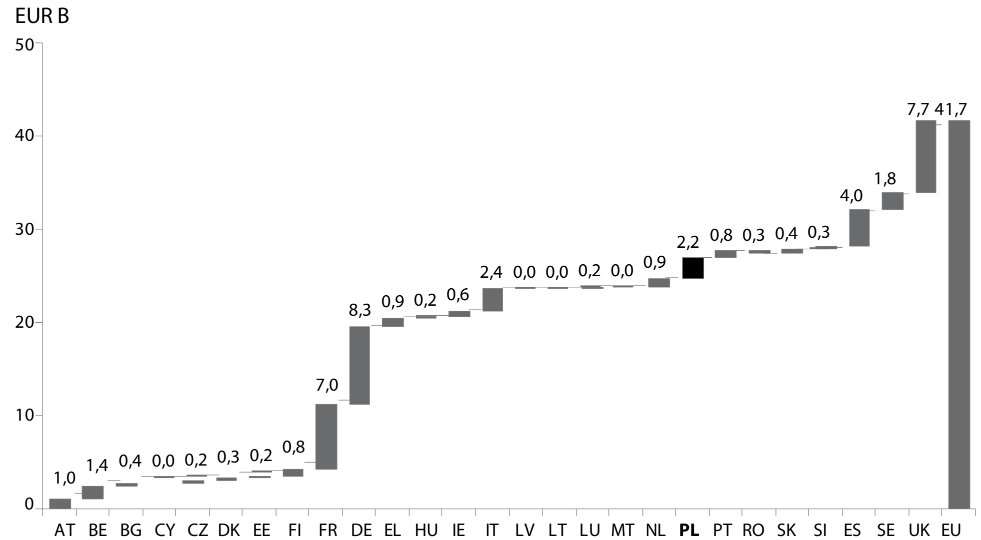
	Annual emissions in 2005			Emissions caps in 2020 for 20% target			Emissions caps in 2020 for 30% target		
	ETS	NTS	Total	ETS	NTS	Total	ETS	NTS	Total
Austria	45	57	102	34	48	82	29	44	73
Belgium	67	80	147	63	68	131	54	62	117
Bulgaria	39	28	67	41	34	75	32	32	63
Cyprus	8	5	13	6	4	10	5	4	9
Czech Republic	59	61	120	70	66	136	54	62	115
Denmark	26	36	62	22	29	51	18	26	44
Estonia	9	8	16	12	9	21	9	8	17
Finland	39	34	73	36	29	65	31	26	57
France	213	396	609	156	340	497	138	312	450
Germany	533	490	1023	387	421	809	319	387	705
Greece	73	64	137	60	61	122	49	57	106
Hungary	33	51	84	31	56	87	26	52	78
Ireland	34	45	80	18	36	55	15	33	48
Italy	253	337	590	205	293	498	172	269	442
Latvia	8	8	15	4	9	13	3	8	12
Lithuania	13	15	28	12	18	30	10	17	27
Luxembourg	6	10	16	4	8	12	4	7	11
Malta	2	1	3	1	1	3	1	1	2
Netherlands	99	123	222	82	103	185	71	94	165
Poland	220	182	402	192	208	400	149	195	344
Portugal	44	46	90	37	46	84	31	43	74
Romania	85	79	164	83	95	177	66	89	154
Slovakia	35	20	55	33	23	55	28	21	49
Slovenia	9	11	21	8	12	19	6	11	17
Spain	185	234	419	178	210	388	148	194	342
Sweden	42	43	85	26	36	62	23	33	55
United Kingdom	338	355	693	220	298	518	184	273	457

2.3. Potential Benefits for the EU and its Member States from Implementation of the Climate and Energy Package

The technological reduction of GHG emissions, shift to renewable energy resources, the CCS development and the EU ETS require huge investments but are also expected to bring potential benefits. GHG emission reduction was originally hoped to trigger innovation, economic growth and job creation in low-carbon technology industries. The initial hopes were dimmed by the 2009 downturn and an ongoing deterioration of the global economy. Low-carbon technologies that had been implemented prior to 2009, together with slow economic growth, resulted in oversupply of emission trading allowances on the market that put pressure on their price. The EU faced low progress in the transformation to low-carbon technologies because the 2020 initial targets (14% reduction vs. 1990) were within the reach in 2009. This also led to low interest in developing commercial technologies, such as CCS. However, the market development has proved that reaching 20% GHG emission target can be cheaper than expected. Its cost is currently estimated at 42 billion EUR, accounting for 0,3% GDP, most of which will be consumed by transition to renewable energy.

System costs will be distributed unevenly among Member States. Chart 2.5. below presents distribution of system costs over the baseline.

Chart 2.5. System Costs of the Climate and Energy Package Implementation in EUR B. Source: European Commission



Lower costs for Member States also result in lower potential benefits. There are three reasons behind that: a decreased price of allowances means lower potential revenue from their sales, revenues from auctioning between Member States and within the ESD[26] and finally, governments are not interested in making use of the co-operation mechanism to meet renewable energy targets.

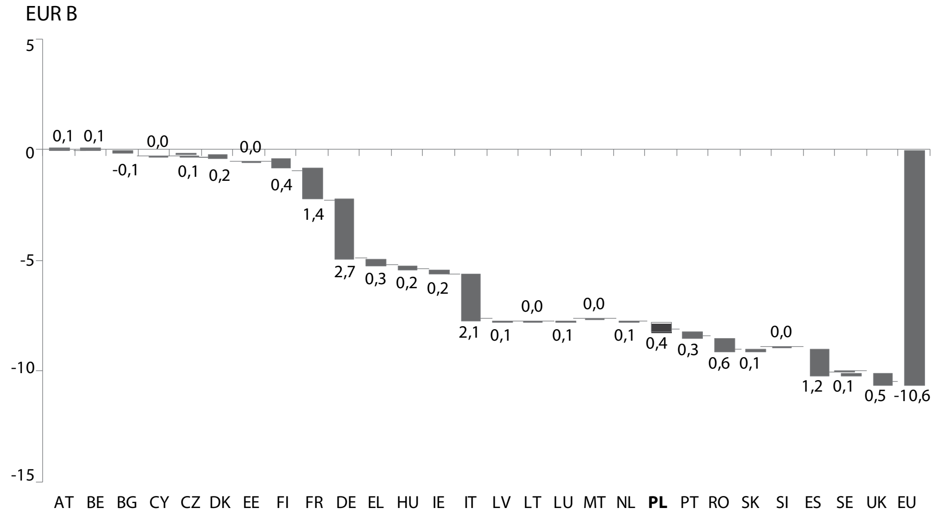
Lower cost of transition into low-carbon energy gave rise to the idea of increasing the reduction target to 30% instead of current 20%. The European Commission estimates the current cost of further 5% reduction at 70 billion EUR, including the 20% transition investments. This expenditure is the direct net impact on energy consumers and is not lowered by indirect benefits from innovations implementation, increased security and reduced air pollution.

25 The ETS sector includes the power and heat generation sector, combustion plants, oil refineries, coke ovens, iron and steel plants and factories making a.o. cement, glass, lime, bricks, ceramics and aviation (as of 2012).

26 The so-called "Effort Sharing Decision" establishes annual binding GHG emission targets for Member States for the period 2013-2020. These targets concern the emissions from sectors not included in the EU ETS such as transport, buildings, agriculture and waste. It is part of a package of policies and measures on climate change and energy that will help transform Europe into a low-carbon economy and increase its energy security.

There are potential benefits that have been measured and forecasted for the EU and Member States. One of them is the lower consumption of fuels that is linked to new technologies and lower energy intensity. Chart 2.6 presents average annual expenditures of fuels in the period 2016-2020, as compared to baseline. The total saving is estimated at almost 11 billion EUR annually, totalling at almost 55 billion EUR in the discussed period. The countries that have the biggest savings opportunity are Germany, France, Italy and Spain. Polish potential savings may reach 2 billion EUR in the given period.

Chart 2.6. Average Annual Fuel Expenses in the Period of 2016-2020 vs. 2009. Source: European Commission



Additional benefit is the reduction of costs related to air pollution balanced by higher health impact costs. The latter increase is connected with increased emissions of PM 2.5. It increases emissions in some sectors. The air pollution control costs are expected to decrease by almost one billion EUR, whereas negative health impact is estimated to cost the EU Member States between 90 and 250 million EUR.[27]

As a result of the environmental policies, the EU has grown to be a market leader in renewable energy technologies, with its market share reaching almost 70%.[28] However, the EU position might be threatened by competitors like China. Maintaining the strong market position requires firm investment and support policies that are subject of regulation in legislation linked to the Climate and Energy Package.

Apart from the mentioned costs and benefits, new technologies create new employment opportunities. According to EU calculations, the renewable energy industry could generate a value of 129 billion EUR giving employment to 2,8 million people in 2020. Further projections claim the value added might increase to 188 billion EUR and the number of jobs might be by 0,6 million EUR higher in 2030.

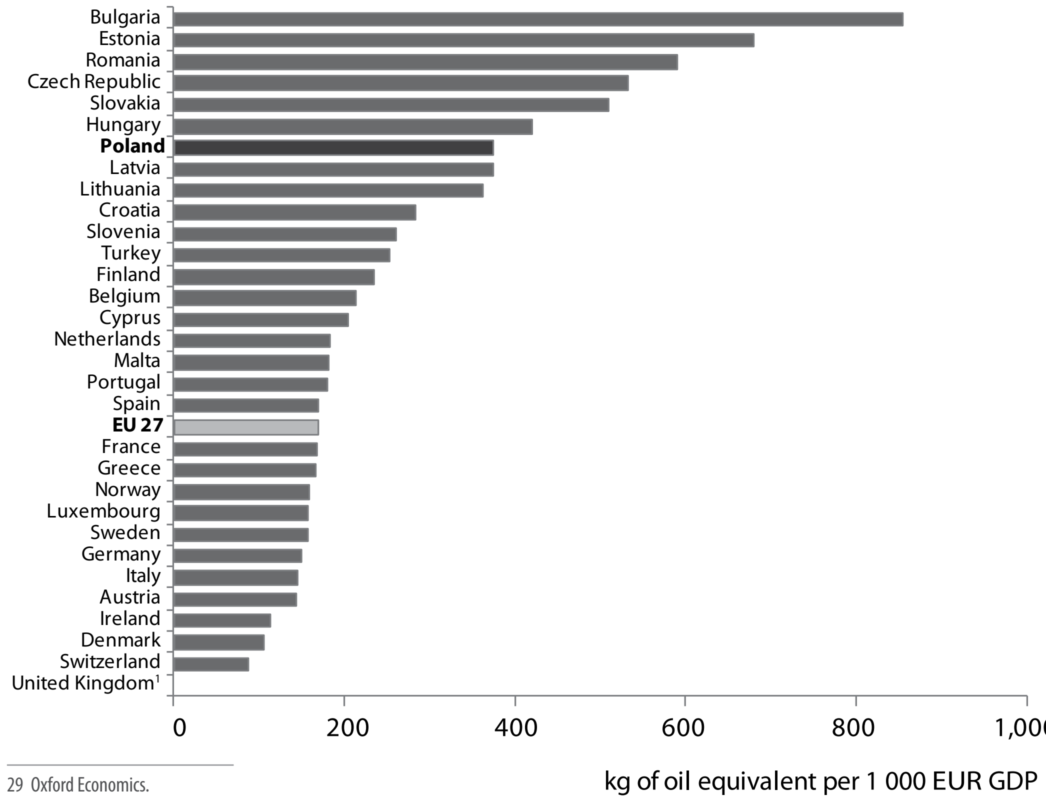
27 Commission Staff Working Paper: Analysis of options Beyond 20% GHG emission reductions: Member States results, Brussels 2012.
28 Multiple authors, The economic benefits of environment al Policy, Amsterdam 2009.

One must not underestimate the environmental impact of the reduction of conventional air pollutants. The EU Member States generate almost 30% of the global GDP[29] accompanied by less than 13,5% GHG emissions.[30]

2.4. The Climate and Energy Package Requirements for Poland, the Scope and Effects of Derogation Measures.

Poland is one of the most energy-intensive countries in the EU, which is specific for countries from the CEE region. Generation of one thousand EUR GDP value is accompanied by utilization of almost 400 kg of oil equivalent, whereas the EU average stands at less than 170 kg. This leaves room for improvements in order to reach the objective of increasing the EU energy effectiveness by 20% till 2020. In the Polish energy sector strategy till 2030 (*Polityka energetyczna Polski do 2030 roku*[31]) energy effectiveness improvement is ranked as the first priority. The objective is to be achieved by investing in effective burning units, co-firing, decrease in network losses, and efficient utilization by the end user. However, there are no specific direct requirements set for Poland in this area in the Climate and Energy Package-related documents.

Chart 2.7. Energy Intensity in European Countries in 2010 r. Source: Eurostat



29 Oxford Economics.
30 2005 data according to World Bank. Most probably the share now is lower.
31 http://www.mg.gov.pl/Bezpieczenstwo+gospodarcze/Energetyka/Polityka+energetyczna.

According to the Directive 2009/29/EC (part of the Climate and Energy Package), Poland has been obliged to increase its renewable energy share in consumption from current 7,8% (2008) to 15% by 2020. The minimum threshold of renewable energy places Poland in the middle of the stake, which can be seen in Chart 2.6. As presented in Chart 2.3, Poland aims mainly at wind production to meet the target. According to the Polish Central Bank (NBP), investment in renewable energy will reach 33 billion EUR till 2030. Additional investment of over 24 billion EUR will have to be made in order to construct and renovate transmission networks, making them suitable for renewable plants connection.[32]

The new limits on emission allowances have been presented in the table above. According to Bloomberg, Poland will not be much affected by EU actions aimed at meeting 20% emission reduction goal. The estimated reduction level required for Poland equals 1%, with a shift of allowance from the ETS to non-ETS sector. The number of ETS allowances will decrease by 28 million, whereas the number of allowances granted to non-ETS sectors will be 26 million higher. With regard to allowances, Poland is one of the countries that will be granted many free emission allowances in the period of 2013-2020, based on derogation.

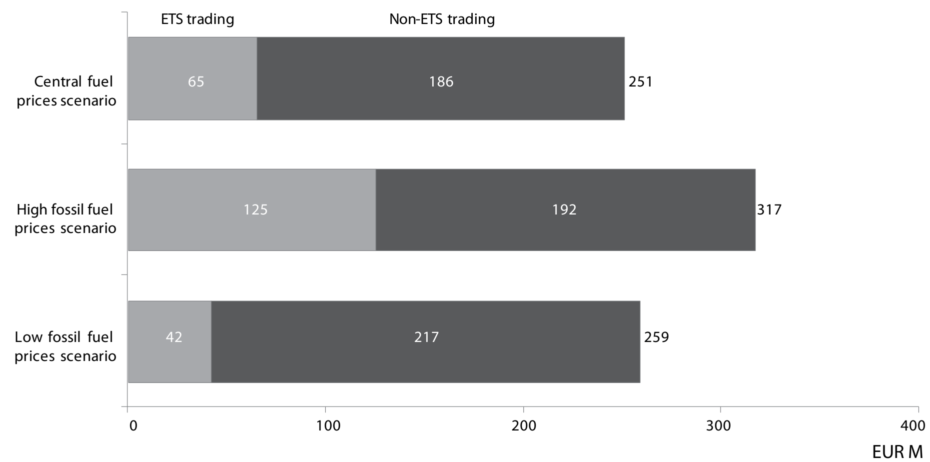
Based on Article 10(c) of the Directive 2009/29, close to 673 million allowances will be allocated for free to power plants in these seven Member States of the EU in the period 2013 to 2019. Poland will receive more than 404 million allowances, which form 60% of the total amount granted to these countries. The number will be reduced each year, reaching zero in 2020. The Member States will put in place strict monitoring and enforcement rules to ensure that the economic value of free allowances is at least mirrored, if not exceeded, by a corresponding amount of investments in modernising their electricity generation. The temporary free allocation of allowances represents a major derogation from the general rule laid down in the revised EU ETS legislation that there should be no free allocation for power plants.[33]

Free allowances will help the Polish energy sector and industry to adapt to high environment standard by investing the capital they may gain from trading the surplus of emission rights. This triggers willingness to invest promptly and take advantage of longer possibility of selling unused allowances. The problem, however, that Poland and other countries from the region face, is the post-crisis pile-up of emission allowances that put pressure on price, making them cheaper than expected in the planning phase. Moreover, revenues from trading should be reinvested in technology, since power generation in Poland is mostly based on coal and lignite and old technology that heavily pollutes air. According to an EEA report,[34] PGE in Rogowiec was the biggest carbon dioxide producer in the EU.

Based on Bloomberg calculations, the potential annual trading revenue in the period from 2011 till 2020 in the 20% reduction scenario may equal between more than 250 million EUR and almost 320 million EUR in case of high fossil prices.[35]

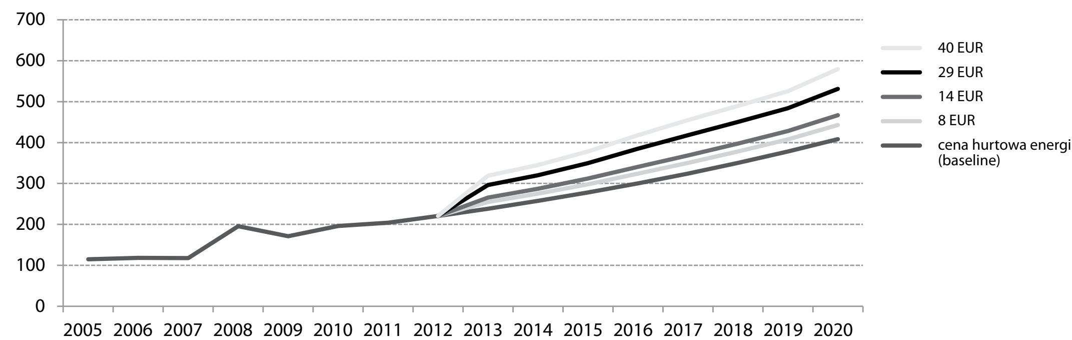
32 J. Hagemejer, (red.): *Krótkookresowe skutki makroekonomiczne pakietu energetyczno-klimatycznego w gospodarce Polski*, Warszawa 2012.
33 http://ec.europa.eu/clima/policies/ets/auctioning/derogation/documentation_en.htm.
34 European Environment Agency, *Revealing the costs of air pollution from industrial facilities in Europe*.
35 Bloomberg New Energy Finance, *The cost of meeting a 30% emission reduction target in Europe*, 2012.

Chart 2.8. Potential Annual Trading Revenues for Poland in the Period of 2011-2020. Source: Bloomberg



Some part of costs related to implementation of the Climate and Energy Package solutions will be transferred to industrial and individual end users. According to Central Bank calculations, the number of households for which electricity cost will make up more than 10% of disposable income will raise by almost 2%, reaching 46,3%.[36] Chart 2.9. below presents expected changes of wholesale electricity price in PLN/MWh depending on the price of CO_2 emissions certificate.

Chart 2.9. Wholesale Energy Prices Forecast Scenarios Depending on CO2 Allowance Price. Source: NBP



2.5. Conclusions

The aim of this chapter is to analyze the obligations of the EU, derived from the climate policy. There are several layers of obligations. Firstly, in relation to international negotiations on climate change, the EU wants to play an important role as an international actor. Its domestic policy is regarded as a tool in reaching goals of international political nature. There are, however, several risks of such policy. In may be inefficient, due to changing expectations

36 J. Hagemejer et. al., *Krótkookresowe skutki makroekonomiczne pakietu energetyczno-klimatycznego w gospodarce Polski*, Warsaw 2012

of other countries and modification of overall goals of the climate policy. On the other hand, playing such a role requires actions at the internal EU level, which may lead to additional costs that the Member State economies will have to handle. The question arises, whether these costs are necessary, particularity in the present state of the EU economy.

System costs of the climate policy will be distributed unevenly among Member States and sectors of the EU economy. Countries with the most developed energy-intensive industries (like Poland) contribute the most. Also the biggest EU energy producers contribute most to reaching the EU objectives. Poland is the fifth EU Member State with the highest cost of implementation of the Climate and Energy Package. There is no cost-benefit analysis of the sufficiency of the temporary exemptions or flexibility mechanisms to equalise costs among Member States and sectors of the EU economy.

Taking into account the rules on ETS and on non-ETS emissions, Poland will be affected by 1% cap decrease in GHG emission reduction within the 20% of the UE cap by 2020. It may considerably increase to 14% if the overall reduction cap increases to 30% in 2020. The major source of a relatively good position of Poland are the non-ETS emissions, which may help to fulfil the country's contribution.

The situation is considerably different for some of the sectors of the Polish economy included in the EU ETS. The power sector and the energy–intensive industries seem to be the most affected by the new rules. A detailed analysis of cost will be presented in the following chapters. It is, however, worth mentioning that it is not sufficient to spur innovation and progress towards low-carbon economy by restrictive regulations imposed on industry. These additional environmental costs should be borne in correlation with the development of the market.

3. European Trading Scheme Characteristics

EY Team

3.1. Description, Changes within the Clearing Period 2013-2020

In the early 2000s the EU decided to introduce a system, the main objective of which was enhancing emissions reduction – the European Emission Trading Scheme (EU ETS). The system was established to support Member States with regard to meeting obligations imposed by the Kyoto Protocol. It introduced the transferable allowances for GHG emissions. In this system each operator ought to posses the amount of allowances that equals the overall quantity of emissions in the course of the clearing period. The mechanism *cap-and-trade* was selected, in which caps for the Member States and operators are set. The allocated allowances may be then subject to trade. Consequently, when the amount of allowances is being insufficient for an operator, it is possible to buy it on the market, as well as reduce the emission. Penalty charges which may be imposed for not possessing the allowances are extremely severe. Accordingly, the controlling systems are highly sensitive when it comes to setting the limit based on development forecasts. To guarantee the market liquidity, liberal rules of trading were chosen.

The legal framework of the EU ETS was designed between 2002 and 2003. On 13th October 2003 the European Parliament and Council adopted the Directive 2003/87/EC introducing the largest system for emissions trading in the world. The Directive sets forth the methodology of issuing and allocating the allowances, calculating GHG emissions, cancelling allowances units, as well as penalty charges for not possessing the allowances. As per the Directive, the Commission was granted the right to approve the limits allocated to each of the Member States. Such mechanism allows to increase the pressure on emissions reduction, since the limits are not subject to negotiations.

Rules governing inclusion of CER and ERU reduction units into the EU ETS were provided by the Directive 2004/101/EC of the Parliament and Council dated October 27, 2004 (known as the "linking directive"). The Directive stipulates that Member States may grant the right to entities taking part in the EU ETS for using CER units since 2005 and ERU units since 2008 when balancing emissions, instead of EUA. The share of those units usage was set on the basis that was favorable for some countries. For most of the Member States the maximum limit equaled to 10%, however, certain countries had a share of over 20% (i.e. Germany).

The crucial objective for the EU is to retain the leading position with regard to climate protection initiatives. In March 2007, the European Council (prior worldwide arrangements were developed) agreed on a common European target for 2020, namely to reduce GHG emissions by 20% referred to the base year. It was emphasized that such goal would be increased up to 30% if other global economies apply similar solutions. Moreover, the Council declared that other actions leading to creation of non-emission economy in 2050 are necessary. Accordingly, The European Commission was obliged to design a set of relevant documents. Reaching the first goal may be enabled by the ETS Directive (Directive 2009/29/EC), which is a part of the Climate and Energy Package. Strategic actions leading to the achievement of the second goal are included in the draft report: 'Roadmap for moving to a competitive low carbon economy in 2050' (known as the Roadmap 2050). The Roadmap 2050 has not been enacted yet, due to the Polish veto thereto.

The first period of functioning of the EU ETS had a 'learning' status and began on 1st January 2005 and ended on 31st December 2007. The first period included installation responsible for 40% of the EU emissions. The second period started in 2008 and will last till the end of 2012. The third period will expire in 2020.

Phase I (2005-2007)

In the course of this period, the energy installations with the entry capacity higher than 20 MW were included into the system. For industrial installations emitting GHG threshold capacities were set at comparable level.

At this stage infrastructure essential for monitoring, reporting and verifying the actual levels of emissions was built and then checked. The central objective of this period was testing and learning rules that govern the new emissions trading regime.

Free allowances allocation was supposed to be not significantly lower than the actual needs. Up to 5% of the domestic demand could have been traded at auctions, however, almost nobody exercised this right.

A number of times the European Commission forced decreasing the national caps when National Allocation Plans were reconciled. Despite that, caps happened to be too high and prices of allowances dropped to the level of a few eurocents.

Phase II (2008-2012)

Given the experiences from the first period, especially the quantity of the allowances requested by the companies and Member States, the Commission reduced the overall amount of rights to be allocated in the second period by 6,5% (comparing with 2005).

Moreover, more types of gases were covered by the system, such as: nitrous oxide, being generated when producing nitric acid. EU ETS covered about 12 thousand installations. As per 2012, it is estimated that the system covers about 50% of the overall CO_2 emissions and 40% of the total emission (of all the GHG emissions) within the EU.

Since 2012, the EU ETS incorporated CO_2 emissions generated by the civil aviation. As a result, all the airways operating flights within the EU (when landing at the airport located in the EU) are obliged to obtain the allowances that cover the amount of GHG generated by their aircrafts.

It was expected that allowances subject to the allocation would not be sufficient (even when including the supply of CER and ERU units). 10% of the domestic quota could have been traded at auctions, however, only a few countries exercised this right.

In the course of the second period, the overall amount of GHG emissions decreased due to the economic crisis. Consequently, the caps proved to be too numerous and keeping the price level assumed by the Commission (20 EUR per EUA) was not possible. However, the main objective –meeting the Kyoto targets will be met.

Phase III (2013-2020)

Directive 2009/29/EC provided new standards with regard to the EU ETS. In particular, decreasing caps (year to year) for all Member States. The amount of installations and sectors covered by the system has also been broadened.

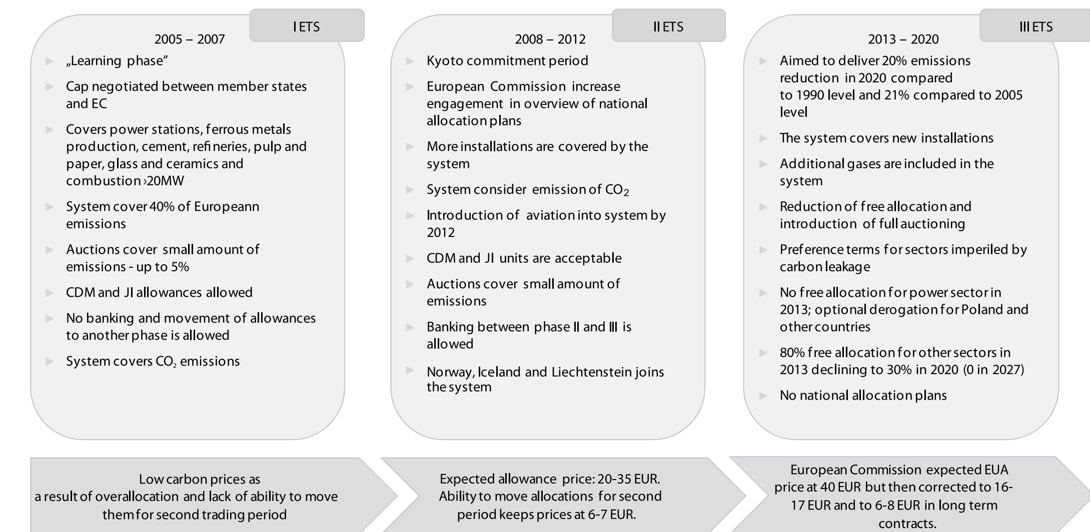
It has been observed that the quantity of the allowances allocated free of charge will be significantly decreased. In general, energy producers will have to acquire all the necessary rights since 2013. Producers of other goods covered by the EU ETS will be obliged to buy similar allowances from 2027 onwards. Auctions will represent the primary market as a place for the EUA exchange, governed jointly by most of the EU Member States (or separately by the governments of Great Britain, Germany and Poland).

Allocation of the free allowances for all the installations outside of the energy sector will be done based on the regulations described in Article 10a of the ETS Directive. The Commission's Decision (2011/278/EU) regarding the interim measures allowing for allocation of the 'free' allowances was issued with almost a year of delay (in April 2011). The decision introduced highly complicated rules and procedures, thus until now it is not certain how many allowances will be granted to each installation. The standard allocation is a result of a multiplication of a production in years 2005-2008 or 2009-2010 (higher value) and a benchmark ratio. The standard benchmark ratio equals emissions associated with a particular product at 10% of the most 'environment-friendly' installations. Such arrangements cause significant differentiations when it comes to production costs depending on energy resources (used for production). Applying one benchmark (without taking the type of fuel into account) is particularly disadvantageous to the heating industry based on coal. The base allocation at the level of a standard rate covers only a half of the demand of this industry sector. In 2013 initial allocation will equal 80% of the basic rate and might be modified down by the correction factor, depending on the industry classification that consumes the heat. The Polish government proposed an introduction of a couple of benchmark ratios, dependent on the type of fuel. Such proposition was unsuccessful and therefore Poland vetoed the methodology of setting the benchmark. In 2013 allocation will equal 80% of the quantity calculated on the basis of historical production and benchmarks. This quantity will be gradually reduced to 30% in 2020 and to 0% in 2027. For the sectors in which production may be subject to carbon leakage (industry migration outside of the EU), the allocation equals 100% of the quantity calculated by multiplication of historical activity and a benchmark. Allocation of allowances needed for heat produced for households may be calculated based on historical emissions, but then the pace of allocation reduction is becoming more intense. The Commission is responsible for collecting data on preliminary allocations for all the installations. If the sum does not equal the limit provided by the ETS Directive (may be lower or higher), the cross-sectoral correction factor is calculated to correct allocation for all installations.

Allocations given on the ground of optional derogations for electricity producers (Article 10c of the 2009/29/EC Directive) are granted on the basis of applications – the Commission has to accept applications submitted by qualified Member States. Currently, there is only one (Hungarian) application for derogation that is under consideration. Poland received a conditional acceptance of its application issued in July 2012. In 2013 installations with granted derogations will receive about 60% of the needed allowances free of charge. Allocation will be gradually decreasing to reach zero in 2020.

Amendments to the ETS Directive were expected to provide a better matching of the limits to the actual emission levels as well as to maintain prices at the level encouraging the emission-reduction targets. However, yet again there is an inability of balancing quantities of allowances and emission levels. For that reason the Commission aims at decreasing the quantity of allowances in the EU ETS or at least to shift the allocations which ought to be sold at the beginning of the 3rd ETS period to the last years of this period.

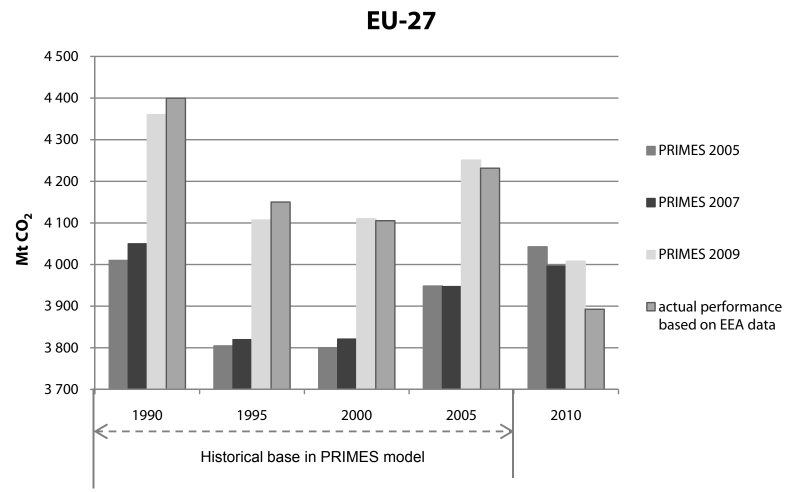
Picture 3.1 The Development of Emission Allowances Trading in Europe. Source: Ernst & Young



3.2. Allowances Allocation and Emissions Balance Forecast

For many years the European Commission has been conducting an analysis concerning GHG emissions, the supply of allowances, reduction units, allowance prices, as well as the influence of climate policy on the economies of the Member States. PRIMES is an econometric model used for analytical purposes. It contains data gathered from all the Member States and a few neighbouring countries. Basic data and forecasts are prepared by each Member State. Even setting the baseline containing historical GHG emissions may be a complicated task with a relatively high probability of failure. Many countries overestimated their forecasts in order to gain a better position when negotiating the compensations for introducing new regulations. Such approach deteriorates the reliability of data and forecasts, which is why using them for calculating GHG emission limits might be unreliable. The chart below presents difficulties in the course of forecasting the emissions. A change in quantity of installations covered by ETS explains only a marginal part of the differences that arose.

Chart 3.1. Differences in Historical Data and in Forecasts Compared with Actual Performance in 2010 According to PRIMES Reports. Source: Ernst & Young based on European Energy Agency and PRIMES data from "European Energy and Transport. Trends to 2030" – update 2003, 2005, 2007 and 2009.



The supply of allowances to emit CO_2 for the whole EU is calculated on the basis of the ETS Directive. The overall supply for the period of 2013-2020 is indicated in the Commission's decision of 22nd October 2010. Quantities for each segment are calculated on the basis of algorithms indicated in the Directive. If the Commission receives the relevant permission to shift certain quantity of allowances between particular years of the 2013-2020 period, the number of allowances issued each year might change. The allocation process is still in progress, therefore quantities in each segments may marginally change.

Table 3.1 Supply of EUA Allowances in the Course of the Third Period (million EUA)

	2012	2013	2014	2015	2016	2017	2018	2019	2020
Total quantity of allowances		2 039	2 002	1 964	1 927	1 889	1 852	1 814	1 777
Correction coming from enlargement of ETS installations		43	42	41	40	40	39	38	37
Total quantity after correction		2 089	2 044	2 005	1 967	1 929	1 891	1 852	1 814
Allowances granted on the basis of art.10a of the ETS directive	2 086	862	837	813	789	765	741	717	698
Reserves (5%)		104	102	100	98	96	95	93	91
Auctions		**963**	**968**	**972**	**976**	**983**	**990**	**999**	**1030**
Derogations granted on the basis of art.10c of the ETS directive		153	136	120	103	85	65	43	0

Source: European Commission, "Comission Staff Working Document. Information provided on the functioning of the EU ETS, the volumes of greenhouse gas emission allowances auctioned and freely allocated and the impact on the surplus of allowances in the period up to 2020"

In 2013 nearly 50% of allowances will be allocated free of charge. The ratio is expected to fall gradually to the level below 40% in 2020, if the list of sectors qualified as exposed to the 'carbon leakage' remains at the current level. If the sectors covered currently by carbon leakage list do not receive more favorable free emission allowances allocation after 2014, a share of allowances free of charge will fall down to around 20% in 2020.

The demand for allowances depends on the level of emission. Even though European economies are gradually decreasing the levels of GHG emissions, economic growth generally causes higher emissions level. This is why the forecasts of the GHG emissions for 2013-2020 depend on overcoming the global financial crisis and potential prospects of the European economy growth.

Chart 3.2 GDP and GHG Emissions Development in EU-27 in 1990-2010. Source: Eurostat, European Energy Agency

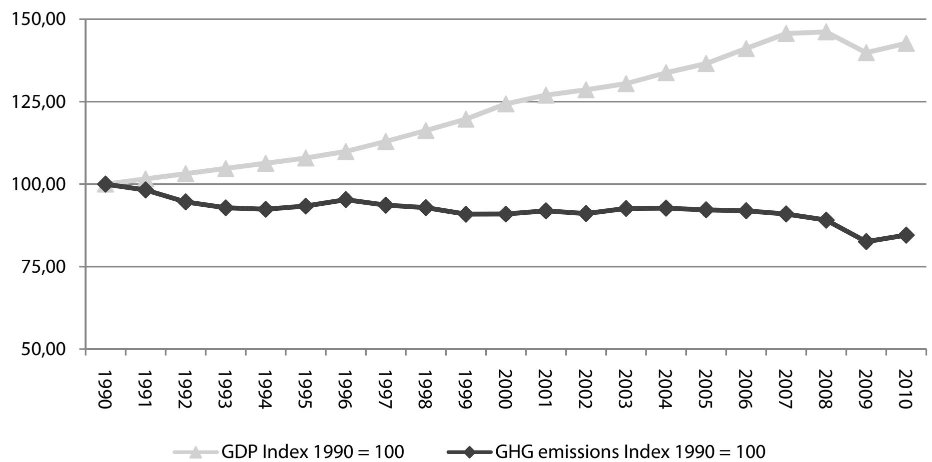
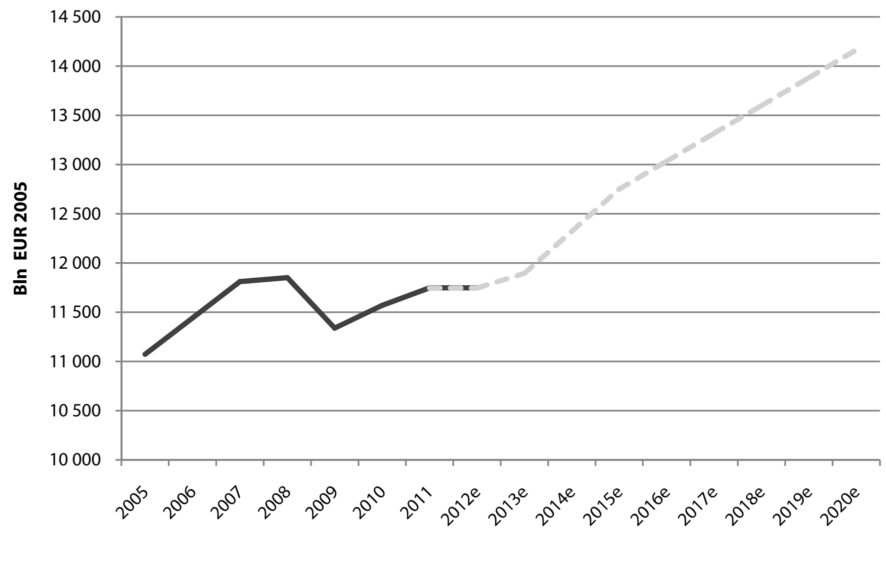


Chart 3.3 GDP in the EU-27 in 2005-2011 and Forecasts for 2012-2020 in EUR2005 Prices. e-estimations. Source: Eurostat, PRIMES



Efforts leading to the emissions reduction constitute a second, after level of GHG emissions, important factor of allowances demand. The pace of achievement of the targets depends mainly on the allowances' market price. The current price level does not foster emissions reduction and most investors make decisions ahead on the basis of long-term forecasts. What is more, the Commission takes efforts aimed at supply reduction.

Chart 3.4 GHG Emissions and Allowances Balance in Sectors Covered by the EU ETS in 2005-2011 in EU-27. Source: European Energy Agency

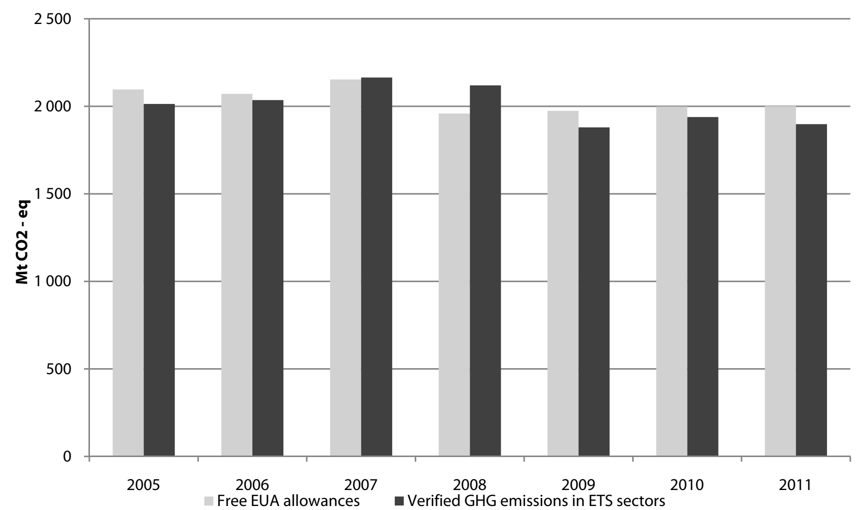


Chart 3.5 GHG Emissions and Allowances Balance in Sectors Covered by the EU ETS in 2005-2011 in Poland. Source: European Energy Agency

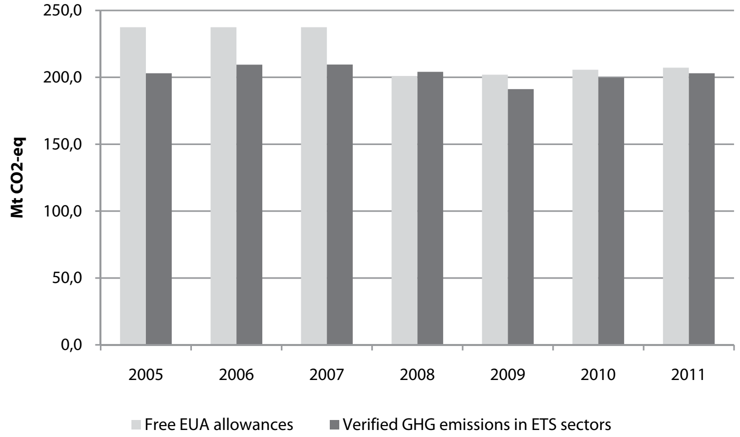


Chart 3.6 GHG Emissions and Allowances Balance in Sectors Covered by the EU ETS in 2012-2020 in the EU-27. Source: European Commission, PRIMES

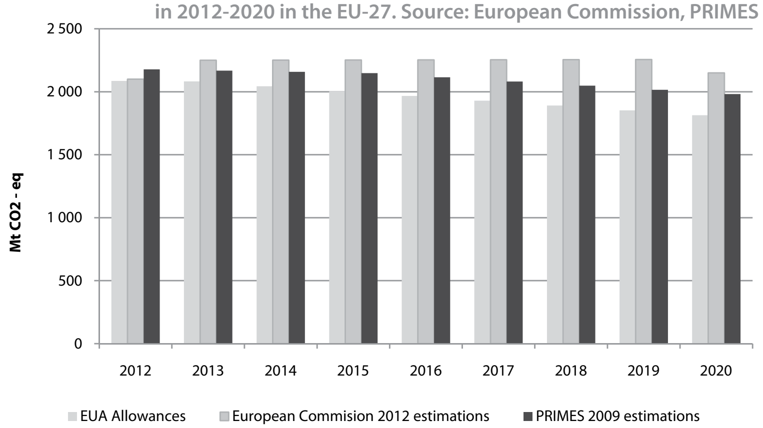
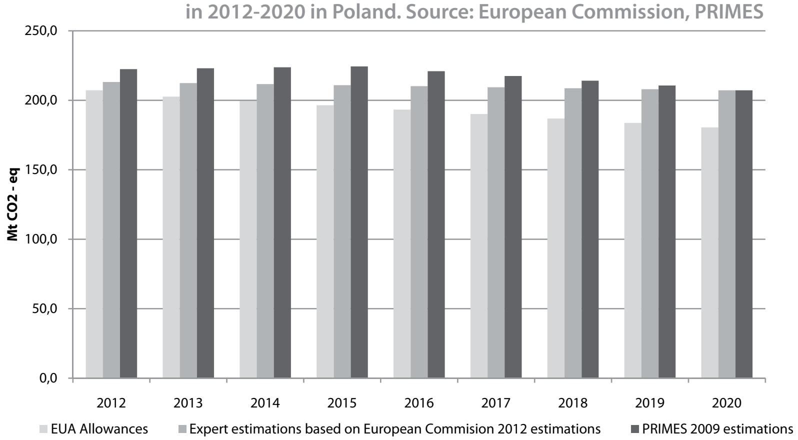


Chart 3.7 GHG Emissions and Allowances Balance in Sectors covered by the EU ETS in 2012-2020 in Poland. Source: European Commission, PRIMES



So far, the presented balances have been determined by numerous regulatory and economic risks. However, there are also other factors that can influence this balance and should be taken under consideration:

- transfer of some allowances from the second trading phase 2008-2012;
- acquisition of CER and ERU units;
- execution of ERU units from non-ETS segment by national offset based on Article 24a of the ETS Directive.

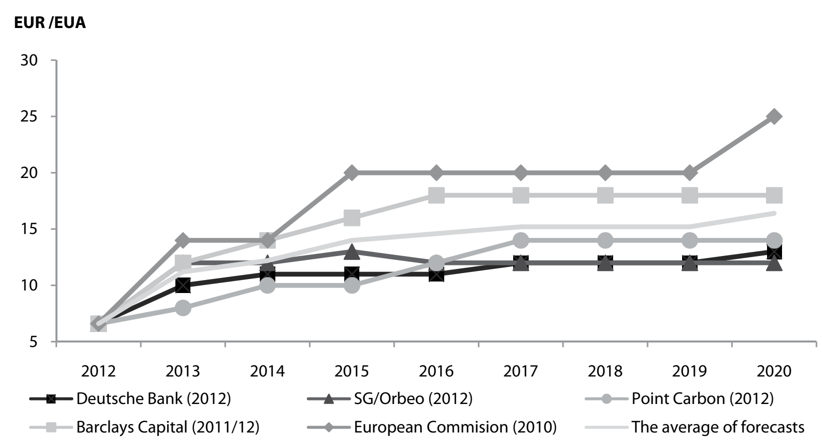
Allowances' Price Forecast

There are crucial factors determining the price of EUAs, such as: political and regulatory environment, demand and supply of the allowances, as well as energy prices (also dependent on the weather). Moreover, the EUA prices are subject to many other influences and risks that are less predictable. Merging price forecasts with risk factors complicates data presentation even further.

Table 3.2 Factors Determining EUA Prices. Source: Ernst & Young

EUA prices risk factors	Description
Economic situation	• Risk is related to the lower economic growth leading to decrease of industry activity. • Worsening economic situation leads to lower prices of allowances (since production is determining demand for allowances).
Political decisions	• As a regulated market, the EU ETS depends on political decisions taken domestically, as well as at the European and global level (i.e the UN and other organizations).
Development of low carbon technologies	• Prices of EUAs are related to prices of fossil fuels needed for energy generation. RES targets cause reduction of emissions and lower demand for allowances. • Availability of international project finance of new technologies depends on carbon prices. Cheap coal usually discourages from innovations.
Raw materials and energy prices	• EUA prices are correlated with prices of energy sources. High prices of fossil fuels foster actions improving energy efficiency, which lead to lower demand for CO_2 allowances.
EUA Management Strategies	• Transaction strategies, like hedging, related to emissions trading or using the allowances as a financing source.
CO_2 emission allowances on the other markets	• ETS remains highly dependent on emissions generated in other parts of the globe, especially on the emerging markets (China, South-East Asia, Brazil and other South American economies) as well as on the developed ones (U.S., Japan, Canada and Australia). Increased supply or broader distribution channels of allowances lead to the price decrease.
Extraordinary Events	• Unexpected events such as Fukushima breakdown in 2011 r. and decision of the German government to stop nuclear program caused a sudden price shift.

Chart 3.8 EUA Prices Forecasts. Source: Ernst & Young

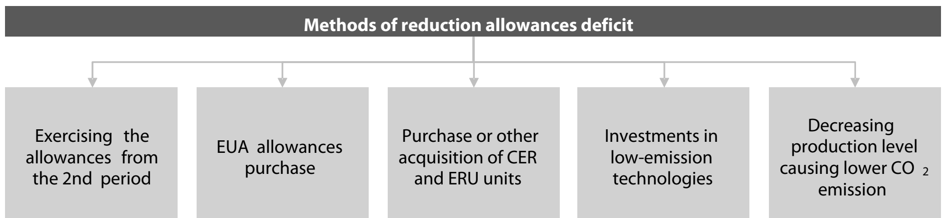


The analysis of historical forecasts of EUA prices indicates a high level of risk and uncertainty associated with such predictions. Extraordinary and political events, economic cycles fluctuations have always had strong and unpredictable influence on EUA price. Current forecasts for 2013-2020 vary significantly between each other.

According to the current forecasts, prices would range between 10-15 EUR/EUA during the third period. However, it is very likely that prices remain steady below 10 EUR, since some of the financial institutions revised their forecasts and matched that figure. On the other hand, the European Commission is looking for tools allowing market intervention to lift the price to 20 EUR/EUA, or at least to 15 EUR/EUA.

The law stipulates that an installation operator has a duty to issue an amount of allowances equal to the actual emissions in a given year. Failing to fulfill that duty in the third period will cause imposition of a significant penalty charge (above 100 EUR per tonne) and an obligation to buy allowances.

Figure 3.2 Methods of Reduction Allowances Deficit. Source: Ernst & Young



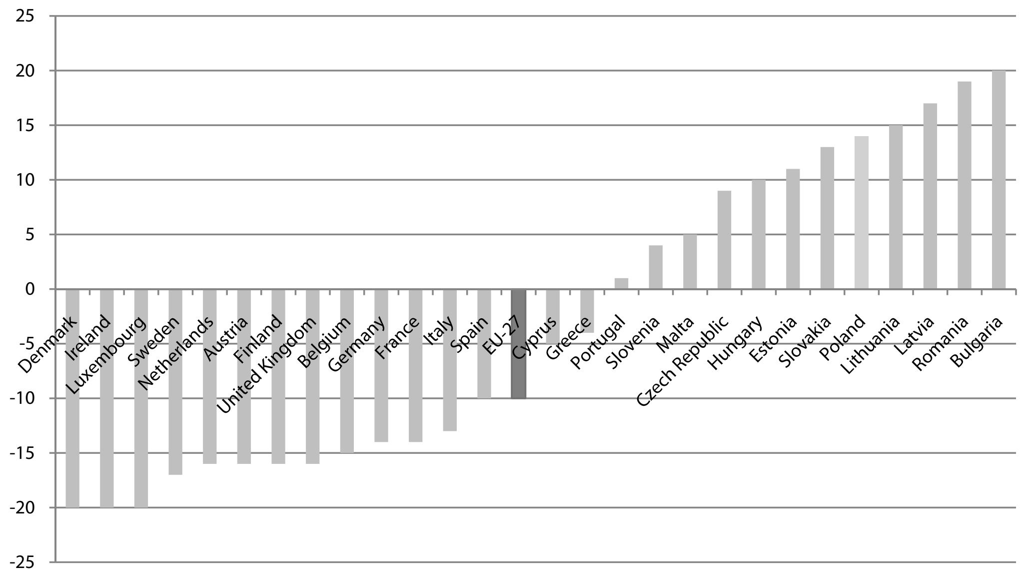
3.3. CO_2 Caps Observance in the non-ETS Sectors, Effective Utilization of a Potential Surplus

As a part of the Climate Package, the Decision 2009/406/EC which regulates emission-reducing actions in the sectors of economy not covered by the ETS was issued. The Decision sets the reduction targets for Member States till 2020.

The overall goal of emissions reduction within the non-ETS areas till 2020 is 10% referred to 2005 (20% when comparing with 1990). Non-ETS areas generate about 3 billion tonnes of CO_2, which equals 60% of the total emission produced by the EU. The potential for reductions is still significant, however, its utilization depends on regulatory regimes created by the EU and each Member State. The current regulatory framework and prices of the allowances do not create significant incentives for reductions.

The results of emissions reduction in non-ETS installations may be subject to trade between Member States and, indirectly, between installations to optimize costs associated with achieving emission targets or limits set in the 2009/406/EC Decision. Furthermore, there is a possibility to receive ERU units through investments in emission reductions in non-ETS installations in other. Those units can be used to balance emission limits in non-ETS sector (internal JI scheme). The system is available for Member States only and is simpler than the global one. There are no quantitative restrictions. Part of the surpluses can be used as reduction units (ERU) for clearing purposes within ETS on the basis of section 24a of the ETS Directive.

Chart 3.9 2020 Reduction Targets for non-ETS. Source: European Commission



Reduction potential of the non-ETS sectors is relatively high. However, it applies to numerous, but small installations. In order to release such potential, stable regulatory environment has to be designed and prevalence of new technologies is necessary. It is likely that potential savings would be used for meeting non-ETS targets. The supply of reduction units applicable for ETS will probably be marginal.

Below are presented limits agreed for Poland by the Decision 2009/406.

Table 3.3 Limits for Poland Provided by the Decision 2009/406. Source: "The methodology with an example of calculation the national limit of GHG emissions in Poland in 2013-2020 (ETS Directive and non-ETS Decision)", KOBiZE, 2010

2005 – base (183,69)	2013	2014	2015	2016	2017	2018	2019	2020
Overall allowance number (million)	197,41	199,12	200,84	202,55	204,27	205,98	207,7	209,41
Overall allowance number after including new sectors in the ETS (million)	184,08	186,02	187,94	189,83	191,74	193,65	195,56	197,47

Given the fact that Poland has a high limit of GHG growth in non-ETS sectors (+14%), there is an opportunity for attract JI projects pursued by countries with a low limit. It would be desirable to take advantage of capital resources available for distributed generation and elimination of the so-called 'low-emission'. Should 10% reduction be achieved by JI projects, capital stream from other countries can be accumulated: EUR 1-1,5 billion (ERU 150 million x 7-10 EUR/ERU). Allowances and a surplus of ETS reduction units may lead to a low level of prices, which may discourage implementation of internal JI projects. Costs of gaining reduction units by mentioned projects ought to be higher than the current price level of the allowances.

3.4. Models of Redistribution of Profits from Auctions of Allowances for CO_2 Emissions

Article 10 point 3 of the Directive 2009/29/EC introduced a general, but not effective rule that at least half of profits from allowances auctions should be spent on the climate protection and on reduction of impacts of climate policies on low and mid income households. The rest of the profits can be spent on anything, including further reduction of the climate policy impact on households and companies. Climate protection goals should include direct or indirect actions aimed at reduction of GHG emissions. Those actions can be hosted either in the Member State's territory or in other countries. Member States should keep track of all EUAs auction profits expenditures and must submit reports on the use of those funds to the European Commission

The way the profits from allowances auctions are disposed has a substantial impact on Climate Package effects on the economy and respective sectors. Profits from auctions can be spent on:
- development (investments, research, founds that dedicated to support climate protection or reduction of taxes);
- protective measures for households and enterprises (subsidies, compensations, special electricity tariffs and reduction of taxes);
- climate protecting actions outside the country; or
- government spending in other areas.

From the perspective of economy the most favourable situation is when all profits are dedicated to development. A support of development allows to modernize economy and to keep high economic growth. However, risk of ineffective investments should be taken into account. European regulations force countries to implement quick changes in sectors with high GHG emission, i.e. electricity and heat sectors. Large subsidies for new technology may lead to development of entities that are economically viable only when subsidized.

Allocation of profits to mitigate the effects of the Climate Package can take various forms, for example:
- direct subsidies for households to reduce the impact of higher cost of electricity and heating;
- indirect subsidies for households (i.e. reduction of personal taxes). Additional income from sale of allowances to increase the level of tax free income which leads to rise of disposable income of low income households;
- subsidies for sectors with high GHG emissions costs or high energy consumption. This kind of subsidies compensate extra costs originating from the Climate Package. As a result it is possible to mitigate the price growth on those sectors products and to reduce inflation impulses;
- reduction of VAT tax, which compensate increased by additional climate costs and investments prices of goods and services;
- subsidies for selected sectors that invest in technology, which would trigger a quick and significant reduction of GHG emissions and energy consumption. This should limit costs related to allowances purchases and would lead to lower prices of goods and services in the future.

The first three bullets are related with consumption and should be used only to reduce 'energy poverty' and to keep up financial stability of households and companies. The two other ways support country development.

Spending of profits from auctions on climate protection programs in other countries can benefit in the future, although spending outside of the national economy should be reduced only to levels expressed in international agreements and individual cases.

Spending on other things that are not linked with climate protection should be kept at a minimum level.

3.5. Risk of Speculations and Mitigation Methods

From the beginning the EU ETS was based on an assumption of high activity of firms which are not installation operators on the market. It was made that way to increase activity on the market and move risk of high volatility of volume and license cost. There are financial institutions that specialize in taking over the risk. These have experience from other markets, qualified labor force, highly developed methods of risk management and supporting tools.

After almost eight years of the EU ETS presence it may be said that these assumptions were confirmed. The market is liquid and firms not being installation operators are responsible for 80 to 85% transactions on the allowances market. For comparison, on the trading market in the United States where allowances for emission of SO_2 and NOx are traded, only 30% is generated by firms that are not installation operators. High activity of firms which do not take part in emitting GHG allows speculation.

Free access to allowances market can be used to buy all allowances at auctions only by few firms. This kind of firms can be interested in speculation on price of allowances and in increasing demand and prices for their goods (for example gas) or equipment (firms which make heat and electricity-generating equipment). To achieve these goals, a lot of capital is needed and up till now such scenario has not been fulfilled. However, main auctions have not taken place yet. The current surplus of allowances reduces the capability to speculate at a greater scale. Nonetheless, auctions and allowances market should be monitored to avoid such situations. Also the allowances market is still dependent on changing regulations, which increase the risk for all players on the market.

The current attempt to change allowances supply at the beginning of the next trading period confirms the regulatory risk. A draft of the relevant Commission decision has already been released for public consultations.

Another factor which may lead to speculation is the lack of a stable material base for price of allowances. The biggest emission of GHG is caused by the energy sector, which is why the evident material base should be the cost of reducing CO_2 emission. Reduction of GHG emissions by change of technology is very expensive and takes a long time. Carbon capture and storage (CCS) is in the initial phase of development and it is impossible to assess when it will be used at a greater commercial scale (as other projects, e.g. installations for denitronization and desulphurization of fumes). For a short period the price of allowances was based on the cost of reduction unit CER. However, the lack of international agreements on GHG reduction after 2012 and problems with CDM projects led to elimination of that base.

Based on the previous experiences in the U.S. with the SO_2 and NOx allowances market, it is possible to name that the greatest threat of speculation comes from regulations that are not adapted to the current level of market development, technology and monitoring system. Analysis of Californian crisis from the late 1990s and early 2000s demonstrates that one of the main beneficiaries are firms specialized in trade of NOx allowances. In California there was a transition period, which lasted for four years, during which there were strict regulations of the market without correction. Crisis came in the third year. Unfortunately the EU is not using these experiences sufficiently.

3.6. Conclusions

The major purpose of the EU ETS system creation is to facilitate the reduction of GHG emissions. Goals stated in the Kyoto Protocol should be achieved by all Member States, although the impact of the world economic crisis could influence these aspirations.

The main element of the EU ETS which influences the realization of climate policies is the European Commission, as it establishes the allowances limits. Those limits are based on macroeconomic and sector forecasts of every Member State. The lack of clear and unified rules on those forecasts is causing differences in the implementation of the climate protection policies. As a consequence, it makes it hard to reallocate emission reduction burden between Member States.

Table 3.4 SWOT Analysis of the ETS. Source: Ernst & Young

Strengths and Opportunities	Weaknesses and Threats
• System is based on known and working examples • ETS is the biggest system in the world and can be an example for other countries and regions • It is possible to include other countries • There is a good liquidity on the market and always someone wants to buy and sell EUAs • Infrastructure operators can reduce their risk • ETS has a built infrastructure and operational rules	• ETS system is dependent on regulations • It is vulnerable to speculation • There is high volatility of price of allowances which doesn't send signals that are strong enough for investors • ETS is not supported by other countries and there is no perspective for changing that • ETS may cause too high cost in some countries, sectors and installations

Rules on allowances allocation will hold until 2027 and they will concern the constantly decreasing number of allowances. In 20 years from decisions made by the European Council from March 2007, the EU will go to fully paid allowances for all installations in the EU ETS. Considering the lifetime of installations that are causing GHG emissions (ca. 40 to 60 years), this period is too short, especially in a situation where the technology of CCS is not ready for commercial use.

Such development of the EU ETS is causing benefits or costs for firms and countries, depending on historical determinants. Developed countries usually offset high costs of allowances by increasing sales of equipment and technology allowing reduction of the GHG emissions. Countries, which have a coal-based fuel-mix and are less economically developed are in the worst position (Poland is one of these countries). Compensation mechanisms will not enable keeping up the pace of economic development, which is required to achieve the EU average.

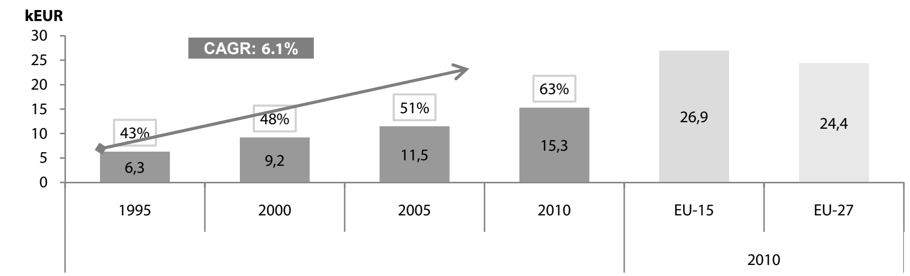
4. Direct Costs of the Climate and Energy Package's Obligations for Poland

EY Team

4.1. Characteristics of the Polish Economy in the Light of the Provisions of the Climate and Energy Package

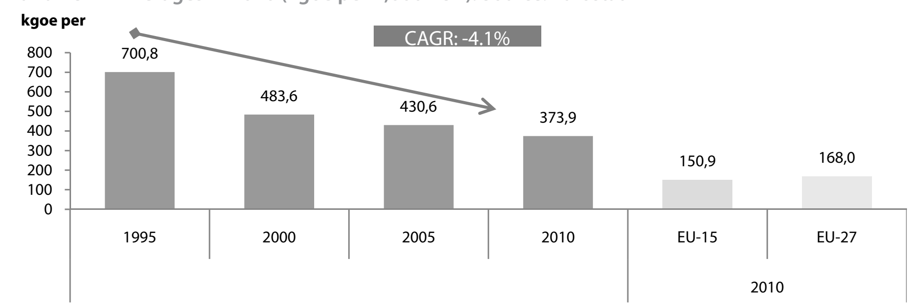
The Polish economy is relatively poorly developed; in 2006 per capita GDP considering purchasing power parity was at the level of only 52% of the EU average (per capita GDP in Poland in nominal figures did not exceed 50% of the EU average in 2006). That is why it is necessary to maintain a high pace of economic growth to reach the average EU level. Poland's relatively limited economic development is impeding the implementation of the Climate and Energy Package, which may in turn precipitate lower GDP growth in the short-term.

Chart 4.1. GDP per capita in Poland for 1995-2010 in Comparison with the EU-11, EU-15 and EU-27 Averages in 2010 (kEUR, PPP) and as a Percentage of the EU-27 Average (%). Source: Eurostat



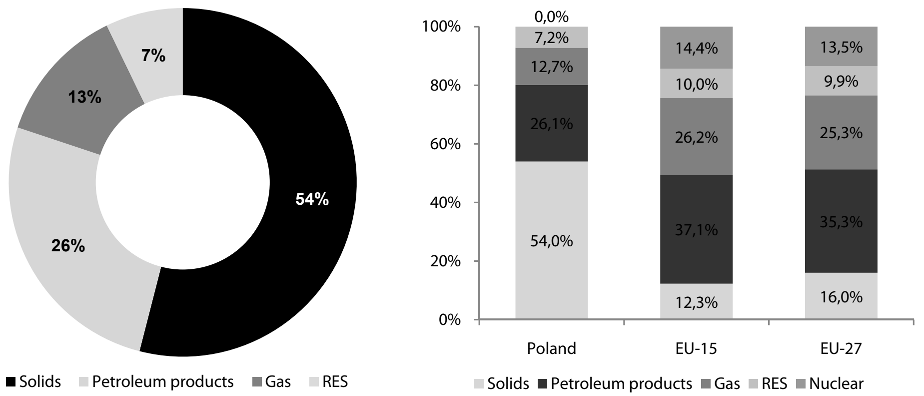
The energy intensity of the Polish economy is clearly above the EU average. Reduction of emissions in the economy is a process that has been in progress for many years; however, the emissions level in Poland is substantially higher than the EU average.

Chart 4.2. Energy Intensity of the Economy in Poland in 1995-2010 in Comparison with the EU-11, EU-15 and EU-27 Averages in 2010 (kgoe per 1,000 EUR). Source: Eurostat



The high level of emissions comes from the Polish economy being vastly powered by the coal-fired energy sector. In the past, in its peak period, the share of coal in the generation of electricity and heat topped 95%. This facilitated energy independence and a greater ease in navigating through oil crises, especially in the 1970s. Unfortunately, the coal-fired energy sector emits large quantities of CO_2 and many other pollutants.

Chart 4.3. Gross Inland Consumption in 2010 (%) and Gross Inland Consumption Structure in 2010 in Comparison with the EU-11, EU-15 and EU-27 Averages (%). Source: Eurostat



In addition to the energy sector, industries with high GHG emissions and/or a high level of energy intensity account for a large share of the Polish economy, namely the steel, coke, refinery, cement, glass, lime, ceramic goods, chemical and paper industries. Some of these industries have been profoundly modernized in the past twenty years but the share of obsolete installations remains high. According to the provisions of the Climate and Energy Package, as of 2027 all of these types of installations will have to purchase the required emission allowances. That is why further investments are needed to reduce CO_2 emissions. Nevertheless, the energy sector still has the highest share in the GHG emissions, while the costs of reduction of CO_2 emissions in this sector will burden the entire economy.

Chart 4.4. Greenhouse Gas Emissions per capita in Poland in 1995-2009 in Comparison with the EU-11, EU-15 and EU-27 Averages in 2009 (Mg per capita). Source: Eurostat

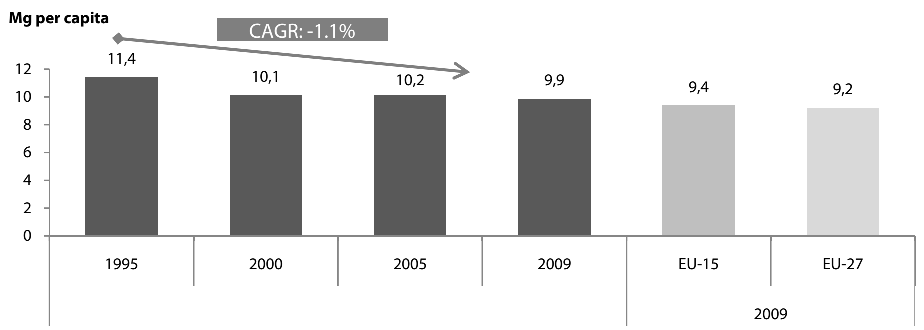
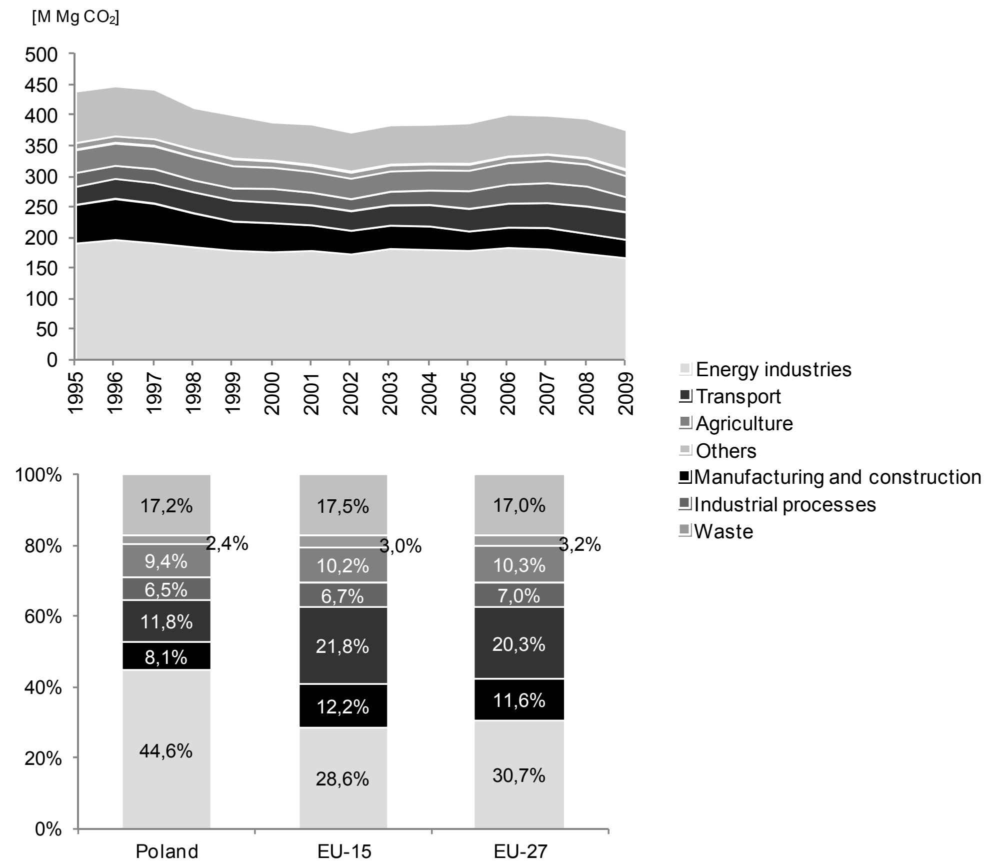


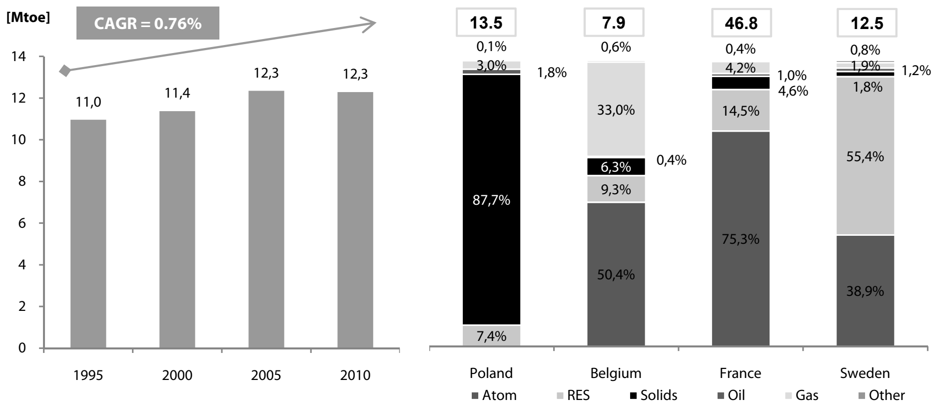
Chart 4.5. Greenhouse Gas Emissions in Poland by Sectors in 1995-2009 (Mt CO_2) and Greenhouse Gas Emissions in Poland by Sectors in 2010 in Comparison with the EU-11, EU-15 and EU-27 Averages (%). Source: Eurostat



4.2. Characteristics of the Fuel Mix and the State of the Energy Sector's Infrastructure in Terms of the Current and Future Fulfillment of the Requirements of the EU's Climate Policy

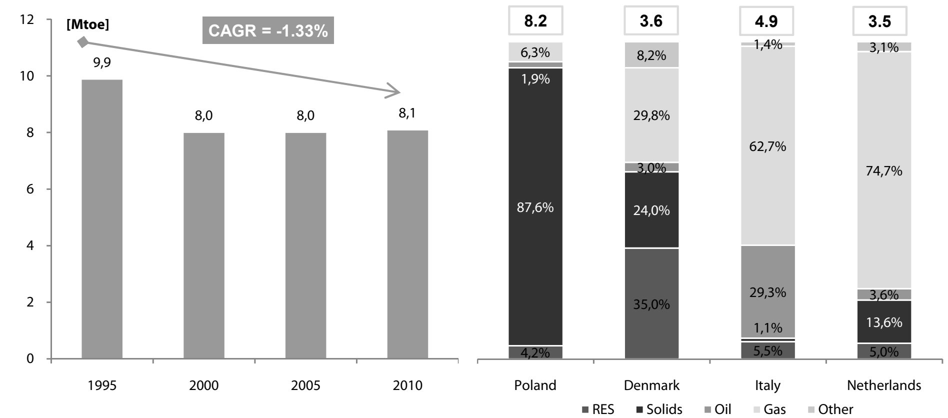
The fuel mix in gross electricity generation in Poland, compared to other EU Member States is very unfavorable (at present, hard and lignite coal prevail; however, the share of renewable energy sources is rising relatively rapidly). The share of natural gas sources is high in investment plans and preparations are underway to commence the construction of nuclear power plants. The average age and state of coal-fired power plants in Poland does not deviate from the average in EU Member States but in other Member States different sources, which are generally much younger, have a considerable share.

Chart 4.6. Net Electricity Production in Poland in 1995-2010 (Mtoe) and Gross Electricity Generation Fuel Mix of the EU-15 Leaders* 2010 (Mtoe and %). Source: Eurostat ***Selected comparable states have been identified as countries with the highest production, consumption and installed capacity of electricity per capita.** Source: Eurostat



A similar fuel mix exists in heat generation. Coal prevails, while the share of natural gas and renewable energy sources is growing rapidly. The average age of units in heat generation is somewhat lower than in the systemic electricity sector; however, there is a large group of units whose age exceeds 60 years.

Chart 4.7. Net Heat Production in Poland in 1995-2010 (Mtoe) and a Comparison of the Gross Heat Production Fuel Mix of the EU-15 Leaders* 2010 (Mtoe and %) ***Selected comparable states have been identified as countries with high heat consumption per capita, a high share of co-generation in heat generation and a diverse demand structure for heat.** Source: Eurostat



Moreover, one attribute of energy generation in Poland is the large share of coal-fired boilers operating in the base load, which on the account of cost reduction of the emissions of pollutants set in the Industrial Emissions Directive (IED) will have to be replaced by 2023.

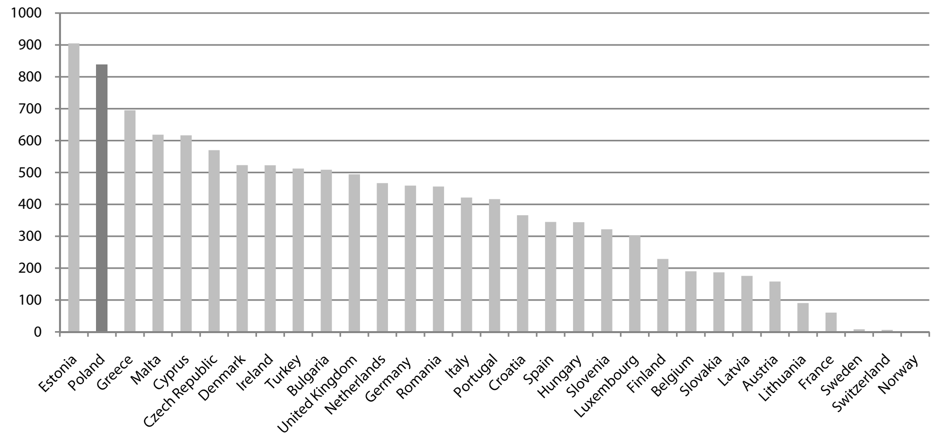
Reducing the fundamental pollutants – sulfur oxides, nitrates and dust to the levels set in the Industrial Emissions Directive (IED) is no longer a technological difficulty. The cost growth caused thereby will not be considerable in the electricity sector, especially in the systemic energy sector. The situation in the heat industry is much worse where a considerable number of the combined heat and power plants requires outfitting with sulfur and nitrate removal installations. Moreover, we still have a very large share of coal-fired water boilers operating in the base load, which it would not be profitable to outfit with such installations. Thus, they should be replaced by other units by 2023. The technology for removing CO_2 from flue gas has not yet been mastered and curtailing its emissions is the Polish economy's largest difficulty. That is why it is necessary to combine programs to adjust the Polish energy sector to the requirements of the EU regulations, where high capital expenditures in upcoming years are inevitable.

4.3. The Cost of Purchasing CO_2 Emission Allowances for the Energy Sector Businesses, Energy Intensive Businesses and other Manufacturing and Service Businesses Subject to the EU ETS

In principle, starting in 2013 electricity generators will have to purchase all their CO_2 emission allowances at auctions, though concessions (referred to as derogations) have been contemplated for generators from Poland and several other eligible Member States pursuant to Art. 10c of the ETS Directive. Eight states, including Poland, filed derogation applications, while to date the European Commission has approved seven applications, including Poland's application on a conditional basis. Under derogation, the quantity of free allowances in 2013 may be a maximum of 70% of the average emissions associated with the generation of electricity in 2005-2007 for the purposes of gross domestic consumption. The allocation of free allowances will fall in subsequent years according to an established algorithm; the average annual allocation is at the level of 45.5% of the historical basis, while in 2020 there will not be any free allocations. The condition for receiving free allowances is to incur capital expenditures for investment tasks in the national investment plan equal to the market value of these allowances. Despite taking advantage of the derogation, electricity generators will have to buy approximately 500-600 million allowances in the period of 2013-2020. With the forecasted prices of allowances in the area of EUR/EUA 10-20, the cost of purchasing allowances in the entire period may fall in the range of **5-12 billion EUR**. As a result, except for Estonia, these will be the highest expenditures to purchase allowances per unit of electricity in the entire EU.

The other installations emitting CO_2 covered by the EU ETS will receive an allocation of free allowances based on historical production figures and the emission standards for various products using the best technologies (referred to as benchmarks). The base allocation is the product of historical production and the benchmark. The preliminary allocations for 2013 are equal to 80% of the base allocation, and they are reduced in consecutive years by a constant figure, reaching the level of 30% in 2020. The sectors and products deemed to be at risk of considerable manufacturing emigration outside the EU (referred to as *carbon leakage*) shall receive an allocation equal to 100% of the base allocation. Installations are classified as belonging to this group every 5 years; the most recent one concerned the years 2010-2014. Moreover, household heat generators may select allocations as the product of historical emissions and the reduction co-efficient. The preliminary allocations will be adjusted by the sector co-efficient computed at the EU level to precipitate consistency between the sum of the allocations and the established limit. The method of computing preliminary allocations is very complicated, thus the procedure of the European Commission collecting and verifying them is still in progress. Free allowances will cover roughly half of the needs based on preliminary estimates without changing the benchmark for heat, while maintaining the current list of sectors at risk of carbon leakage up to the end of the period. In this area, there will be a shortfall in the period 2013-2020 of approximately EUA 250-350 million, with the vast majority being for heat generators. The cost of purchasing allowances may range from **2.5 to 7 billion EUR**.

Chart 4.8. Emission Level of Electricity and Heat Generation in the EU in 2009 (kg CO_2/MWh).
Source: Ernst & Young on the basis of Eurostat data



The generators of electricity, heat and other commodities will pass on the foregoing expenditures in the prices of their products, creating a cost-side impulse for the prices of other goods and services to grow. The utilization of surplus allowances from the 2nd settlement period, the acquisition of CER and ERU, as well as further reduction-related efforts may slightly reduce the expenditures to purchase emission allowances. In turn, the pace of economic growth may increase or decrease the quantity of the required allowances. One should not anticipate more extensive changes in the price of allowances; it is estimated that in the initial years, growth will be slight but later the pace of change in the level of prices for allowances should be higher.

4.4. Overview of the Methods for Reducing the Emissions of Greenhouse Gases, Capital Expenditures and Operating Expenditures.

In Poland, GHG are emitted on an annual basis to the magnitude of approximately 400 million tonnes equivalent of CO_2. The energy sector's consumption of fuel in the generation of electricity and heat emits approximately 250 million tonnes of CO_2, industrial processes emit approximately 50 million tonnes, transport produces roughly 35 million tonnes and agriculture produces more than 30 million tonnes. That is why it is precisely in these areas that one must first search for possibilities of reducing CO_2 emissions.

In all areas the possibilities of enhancing the effectiveness of using energy sources and reducing the emission levels of processes should be utilized. There are many technologies to be used and in many projects of this type, already today the cost of reducing CO_2 emissions is negative. According to the World Bank report entitled "Transition to a low emission economy in Poland" a viable reduction potential for enhancing effectiveness exceeds 50 million tonnes CO_2 a year, to be captured in 2030.

There is a considerable potential for reduction in industrial processes, transport and agriculture but measures focused on reduction must balance the emissions of growing production.

One may achieve the best results in reducing the GHG emissions in the generation of electricity and heat, where their percentage of emissions in Poland exceeds 60% of the total and approximately 80% in the areas covered by ETS.
When generating electricity and heat, one may reduce CO_2 emissions by:

- enhancing the efficiency of generation and transmission in the existing technologies;
- increasing the degree of co-generation in electricity and heat generation;
- switching fuels to lower emission ones
- implementing new generation technologies;
- CO_2 capture and storage.

Enhancing efficiency has a limited potential of up to approximately 10%, while costs generally fall within operating budgets.

Electricity and heat co-generation technologies

Expanding co-generation should be one of the fundamental courses of action. The Industrial Emissions Directive compels one to replace the coal-fired water boilers operating in the base load. Limitations on the emissions of pollutants from local and home-based boiler plants are introduced. This creates conditions for pursuing a program to increase the share of co-generation of electricity and heat substantially. At present, less than 30% of heat and 17% of electricity (approximately 25 TWh) are generated in co-generation. The electrical capacity of combined heat and power plants is approximately 6 thousand MW.

On the basis of the analyses conducted by the Warsaw Technical University under engagement from PTEZ and IGCP (the report entitled "Devising the assumptions and key elements for the Co-generation Development Program in Poland"), it is estimated that the current technologies will make it possible to double this share with a moderate level of support funds. In coal and biomass-fired technologies this would require the construction of co-generation sources with 7-8 thousand MW of electrical capacity. Co-generation of electricity will grow to more than 60 TWh and the annual reduction in CO_2 emissions will be at the level of approximately 15-20 million tonnes CO_2. In gas and biogas technologies the electrical capacity of sources has nearly doubled, co-generation will grow to nearly 100 TWh and CO_2 emissions will fall by 50-60 million tonnes. However, one should bear in mind that in both cases there is a change in fuel to a much more expensive one (biomass, gas and biogas cost twice as much as coal). On the basis of tasks reported to the national investment plan prepared for the Polish application for CO_2 derogations, it is estimated that gas technologies will prevail in the development of co-generation (their share may be as high as 70%).

It is estimated that the foregoing potential may be used at the level of approximately 40% by 2020 and approximately 80% by 2030.

Table 4.1 Unit Capital Expenditures for Co-Generation Technologies. Source: Ernst & Young

Unit capital expenditures for co-generation technologies		
#	Unit	Capital expenditures in 000s of EUR/MW of electrical capacity
1	Coal-fired unit 50-150MWe/70-250 MWt	1500-2000
2	Coal and biomass-fired unit 50-150MWe/70-250 MWt	2000-2500
3	Biomass or coal and biomass-fired unit 15-50MWe/20-80 MWt	2500-3000
4	Natural gas-fired unit 50-150MWe/30-120 MWt	900-1200
5	Natural gas-fired unit 15-50MWe/10-40 MWt	1100-1400
6	Natural gas unit 0.5-15MWe/0.4-12 MWt	1400-2000
7	Natural gas unit 0.5-5MWe/0.1-4 MWt with a biogas installation	3500-5000
8	Natural gas unit 0.01-0.5MWe/0.005-0.4 MWt with a biogas installation	4500-6000

Changing fuel to lower emissions

The fundamental technology in this area is co-firing or biomass firing. Co-firing requires inconsequential investment expenditures, generally less than 100 thousand EUR/MW of capacity operating on biomass (e.g. for a 200 MW unit with biomass having a 10% share, the expenditures are generally lower than 2 million EUR). The major cost is to purchase biomass; the cost growth is 3-6 EUR/GJ, which precipitates growth in the costs of generation by 10-20 EUR/MWh. Operating costs also rise. With the current RES support system, the low cost of processing makes it possible to pay relatively high prices for biomass. This makes it possible to achieve a rapid supply-side development by bringing order to the development of energy crops and the forest economy, managing waste in wood processing, managing straw, etc. The national biomass supply may reach 15 million tonnes of dry mass in 2020, with stable RES support systems.

To fire biomass it is necessary to incur at least capital expenditures to rebuild or build a boiler and a conveyor to feed the biomass. These expenditures amount to approximately 500 thousand EUR/MW of electrical capacity.
Implementing co-firing or gas-firing in coal-fired units reduces emissions but it is too inefficient.

Implementing New Generation Technologies

In Poland, condensation (systemic) units operating on hard coal or lignite generate approximately 80% of electricity. The average emissions are at the level of nearly 1 tonne CO_2/MWh, but sources with new technologies are gradually replacing generation in these power plants.

Renewable energy source technologies are growing the fastest, primarily wind power plants. The potential for building power plants that may be built up to 2020 is estimated to be between 10 and 12 thousand MW. At present, nearly 2 thousand MW have been constructed. The Polish Energy Policy calls for attaining approximately 7 thousand MW in 2020.

Photovoltaic technologies are still relatively expensive, as the time for utilizing their installed capacity is about 700-800 hours per year. The Polish Energy Policy does not contemplate any major photovoltaic development up to 2020, but the announcement of changes in the support system has sparked investor interest.

The emission levels of hydro power plants, calculating emissions in the production of plant and in construction, do not exceed some 50 kg CO_2/MWh; however, they have a relatively limited development potential.

Modern condensation coal-fired units with a capacity of 400 to 1000 MW are another group of technologies replacing the generation of electricity in the current condensation power plants. These are units with high parameters, with a much lower emission level (roughly 0.7 tonnes CO_2/MWh). The construction of several such units is in preparation and they will replace the units being decommissioned. Growing environmental requirements will accelerate the decommissioning of units prior to the lapse of the standard operating period. In the EU, the average age of decommissioned units is approximately 55 years. Gas-fired condensation units are also being prepared but decisions to construct them will be made if the possibilities of mining large quantities of shale gas are confirmed.

The third group consists of nuclear technologies. They do not emit CO_2 in the process of generating electricity. When including the construction phase, emissions do not exceed 0.15 tonnes CO_2/MWh. The construction of two power plants with a combined capacity of approximately 6 thousand MW is under preparation. A realistic time for their commissioning would be the mid-2020s, but this will require great determination on the part of the authorities and investors in the light of the expected protests against their construction.

Table 4.2 Unit Capital Expenditures for Condensation Technologies. Source: Ernst & Young

Unit capital expenditures for co-generation technologies		
#	Unit	Capital expenditures in 000s of EUR/MW of electrical capacity
1	Coal-fired unit 400 -1000 MW	1200-1500
2	Unit with coal gasification (IGCC) 400-700 MW	2000-2500
2	Natural gas unit 200-500 MW	700-900
5	Nuclear unit 1000-1500 MW	3500-5000
6	Land-based wind power plant > 10 MW	1400-1600
7	Sea-based wind power plant > 50 MW	3000-4000
8	Photovoltaic power plant 1-5 MW	1500-2000

Carbon Capture and Storage (CCS)

Coal is the primary energy source to generate electricity across the globe and it is not easy to replace it with other sources. In undertaking ambitious objectives focused on reduction in 2007, the EU also endeavored to master low emission technologies, above all the Carbon Capture and Storage – CCS. The EU's flagship program was supposed to entail roughly 12 full-fledged projects (exceeding 300 MWe), to be carried out in various countries with the support of aid funds. The intention was to procure substantial technological progress in low emission technologies, while above all reducing the cost of CCS. At present, the known CCS technologies are expensive, with the cost of reducing one tonne of CO_2 euqaling to approximately 100 EUR. It was assumed that by 2020 the cost of reduction in CCS installations will fall to approximately 40 EUR/t CO_2. A dozen or so projects were tentatively submitted with the bulk being linked to CCS (Poland submitted two projects). At present, some of them have been retracted, including one from Poland, while the others have considerable delays. This has been caused by the lack of technological progress in research installations, the protracted duration of the economic crisis, the lack of global reduction agreements and extensive social resistance to the implementation of the CCS Directive in national legal systems. At present, there are limited chances of a full-blown CCS installation being commissioned prior to 2020. Some projects entailed mastering the construction of an Integrated Gasification Combined Cycle – IGCC, followed by the transport and storage of CO_2. This technology makes it possible to separate CO_2 prior to combustion, which should reduce the cost of CO_2 capture. These projects also face considerable delays.

Mastering CCS was supposed to serve the interests not only of the electricity sector; were it possible to secure similar effects of cutting costs as with sulfur removal technologies, CO_2 capture could also be implemented in the steel, chemical, cement and refinery industries, etc.

4.5. The Level of Capital Expenditures for the Energy Sector Infrastructure to Achieve the Average Level of Emissions in EU Member States. Analyses of Different Scenarios of a Change in the Energy Portfolio (Nuclear Energy, RES, Unconvential Natural Gas, CCS, etc.)

The structure of technologies employed to generate electricity in the EU Member States currently makes it possible to achieve an average emission level below 0.4 tonnes CO_2/MWh (in Poland, the level is more than twice as high). EU forecasts in 2009 contemplate a falloff in emissions to 0.32 tonnes CO_2/MWh in 2020 and 0.29 tonnes CO_2/MWh in 2030. The Polish Energy Policy of that same year forecasts a decline in emissions to 0.66 and 0.57 tonnes CO_2/MWh. This signifies maintaining emissions at double the level and the necessity to incur higher burdens than other countries, as a result of buying allowances.

Poland's gross demand in 2030 is forecasted. to be at the level of 217 TWh, with an allowance price of 20 EUR/MWh; this entails a cost of approximately 1.2 billion EUR more than in case of the average EU emission level. Upon including purchases for heat and other industries, the cost will equal to approximately 2 billion EUR. To balance these costs, a compensation system should be in place. The level of investment required to attain the objectives of Poland's Energy Policy of 2009 is estimated to be approximately 80-90 billion EUR; that is a fairly high level and it will constitute a major burden on the entire economy. The Energy Policy also plans to make a relatively large improvement in energy efficiency.

Table 4.3 Forecast of Electricity Generation Emissions in Poland and the EU in 2010-2030.
Source: Ernst & Young

		2010				2020				2030			
		Poland	EU	Poland	EU	Poland PE2009	EU Ref 2009	Poland PE2009	EU Ref 2009	Poland PE2009	EU Ref 2009	Poland PE2009	EU Ref 2009
Generation units	**CO_2 emission**	**Share of technology**		**Component of emissions**		**Share of technology**		**Component of emissions**		**Share of technology**		**Component of emissions**	
Technology	t CO_2/MWh	%	%	t CO_2/MWh	t CO_2/MWh	%	%	t CO_2/MWh	t CO_2/MWh	%	%	t CO_2/MWh	t CO_2/MWh
Nuclear	0		28	0	0	7	23.9	0	0	17	24.1	0	0
Solid fuels	0.85	89.5	27.6	0.76075	0.2346	73	22.8	0.6205	0.1938	62	21.1	0.527	0.17935
Gas, oil	0.6	3	23.2	0.018	0.1392	6	20.7	0.036	0.1242	7	18.7	0.042	0.1122
RES	0	7.5	21.2	0	0	14	32.6	0	0	14	36.1	0	0
Average emission level				0.78	0.37			0.66	0.32			0.57	0.29

Higher capital expenditures are required to attain emissions in the electricity sector at the average EU level. It will not be possible to reduce the demand for electricity substantially by expanding on measures to enhance energy efficiency. Poland's per capita consumption is nearly 40% lower than the EU average. Other countries are planning a higher growth than Poland in 2030. To illustrate the required capital expenditures to make a more profound reduction in emissions, four scenarios for changing generation technologies in Poland have been devised. The first two call for reaching the EU average in 2030, while the other two reach it in 2040, with emissions in 2030 still being 30% above the EU average.

Table 4.4 Accepted Share of Various Generation Technologies in the Scenarios Prepared for Technological Changes. Source: Ernst & Young

		Poland 2030							
		"EU average nuclear scenario"		"EU average RES scenario"		"Natural gas"		"Nuclear"	
Generation units	**CO_2 emissions**	**Share of technology**	**Component of emissions**	**Share of technology**	**Component of emissions**	**Share of technology**	**Component of emissions**	**Share of technology**	**Component of emissions**
Technology	t CO_2/MWh	%	t CO_2/MWh	%	t CO_2/MWh	%	t CO_2/MWh	%	t CO_2/MWh
Nuclear	0	37.7	0	26.7	0		0	23	0
Solid fuels	0.85	27.3	0.23205	27.3	0.23205	20	0.17	38	0.323
Solid fuels + CCS	0.15	0	0		0	15	0.0225	15	0.0225
Gas, oil	0.6	10	0.06	10	0.06	35	0.21	9	0.054
RES	0	25	0	36	0	30	0	15	0
Average emissions			0.29		0.29	100.0	0.40	100.0	0.40

All the scenarios have assumed the same level of generation as in the Energy Policy in 2030 (217 TWh) with a split into various technologies. After determining the time of utilizing the installed capacity, it is possible to specify the required capacity. RES have a relatively long period of utilization because a large share has been assumed for biofuel-fired units. No reserves have been assumed, as an extensive surplus of coal-fired capacity is expected.

Table 4.5 Demand Forecast for Generation Capacity Split by Fuel, Depending on the Scenario Assumed for Technological Changes. Source: Ernst & Young

Poland 2030													
Electricity generation	[TWh]	"EU average nuclear scenario"			"EU average RES scenario"			"Gas"			"Nuclear"		
Poland	217	Share of technology	Generation	Capacity needed	Share of technology	Generation	Capacity needed	Share of technology	Generation	Capacity needed	Share of technology	Generation	Capacity needed
Technology	Time of utilizing capacity in a year	%	TWh	MW	%	TWh	MW	%	TWh	MW	%	TWh	MW
Nuclear	7000	37.7	82	11 687.0	26.7	58	8 277.0		-	-	23	50	7 130.0
Solid fuels	5000	27.3	59	11 848.2	27.3	59	11 848.2	20	43	8 680.0	38	82	16 492.0
Solid fuels + CCS	6000	0	-	-		-	-	15	33	5 425.0	15	33	5 425.0
Gas, oil	4000	10	22	5 425.0	10	22	5 425.0	35	76	18 987.5	9	20	4 882.5
RES	3000	25	54	18 083.3	36	78	26 040.0	30	65	21 700.0	15	33	10 850.0
Total			217.0	47 043.5		217.0	51 590.2	100.0	217.0	54 792.5	100.0	217.0	37 649.5

The required incremental growth of capacity has been computed for various technologies. For coal-fired technologies, despite the large surplus of capacity, the construction of 5 thousand MW of capacity has been assumed, having regard for the necessity of meeting environmental requirements.

Table 4.6 Forecasted Incremental Growth of New Generation Capacities Split by Individual Fuels Depending on the Scenario Assumed for Technological Changes. Source: Ernst & Young

Poland 2030												
Electricity generation	"EU average Nuclear scenario"			"EU average RES scenario"			"Gas"			"Nuclear"		
Poland	Required capacity	Existing capacity	Incremental capacity growth	Required capacity	Existing capacity	Incremental capacity growth	Required capacity	Existing capacity	Incremental capacity growth	Required capacity	Existing capacity	Incremental capacity growth
	MW											
Nuclear	11 687	-	11 687	8 277	-	8 277	-	-	-	7 130	-	7 130
Solid fuels	11 848	30 000	- 18 152	11 848	30 000	- 18 152	8 680	30 000	- 21 320	16 492	30 000	- 13 508
Solid fuels + CCS	-	-	-	-	-	-	5 425	-	5 425	5 425	-	5 425
Gas, oil	5 425	2 000	3 425	5 425	2 000	3 425	18 988	2 000	16 988	4 883	2 000	2 883
RES	18 083	4 000	14 083	39 060	4 000	35 060	32 550	4 000	28 550	16 275	4 000	12 275
Total	47 044	36 000	11 044	64 610	36 000	28 610	65 643	36 000	29 643	50 205	36 000	14 205

The capital expenditures for various technologies have been determined on the basis of the ones discussed above for co-generation, condensation and RES technologies. For the purposes of aggregate technologies the figures have been averaged.

Table 4.7 Forecasted Level of Capital Expenditures for New Generation Capacities Split by Various Fuels Depending on the Scenario Assumed for Technological Changes. Source: Ernst & Young

Poland 2030												
Electricity generation	"EU average Nuclear scenario"			"EU average RES scenario"			"Gas"			"Nuclear"		
Poland	Capacity growth	Unit capital expenditure	Capital expenditures 2012-2030	Capacity growth	Unit capital expenditure	Capital expenditures 2012-2030	Capacity growth	Unit capital expenditure	Capital expenditures 2012-2030	Capacity growth	Unit capital expenditure	Capital expenditures 2012-2030
	MW	m EUR/MW	m EUR	MW	m EUR/MW	m EUR	MW	m EUR/MW	m EUR	MW	m EUR/MW	m EUR
Nuclear	11 687	4.0	46 748	8 277	4.0	33 108	-	4.0	-	7 130	4.0	28 520
Solid fuels	5 000	1.8	9 000	5 000	1.8	9 000	5 000	1.8	9 000	5 000	1.8	9 000
Solid fuels + CCS	-	3.0	-	-	3.0	-	5 425	3.0	16 275	5 425	3.0	16 275
Gas, oil	3 425	1.2	4 110	3 425	1.2	4 110	16 988	1.2	20 385	2 883	1.2	3 459
RES	14 083	2.5	35 208	35 060	2.5	87 650	28 550	2.5	71 375	12 275	2.5	30 688
Total			**95 066**			**133 868**			**117 035**			**87 942**

In all the scenarios, the level of capital expenditures for generation is higher than planned in the Energy Policy for the entire sector. Grid capital expenditures generally account for approximately 50-60% of the generation capital expenditures, where this share may be even higher with the development of distributed energy sources. The Polish economy is not capable of carrying out such a level of investment.

Moreover, considerable capital expenditures must be planned to rebuild the heat industry on account of reducing CO_2 emissions and pollutants. Extensive implementation of co-generation technologies using bio fuels and gas may greatly reduce the level of capital expenditures in the heat industry. Regulations are needed to compel investments to be made in this direction; at present, too many local governments and firms are converting their coal-fired water boilers into gas-fired water boilers. There are also cases of switching away from co-generation sources to individual or local gas-fired water boilers. This primarily results from heat base loads in large sources at the expense of adjusting to the IED Directive and at the cost of climate protection. Without implementing low emission limitations, the total expenditures to satisfy energy needs will be substantially higher.

4.6. Conclusions – the Impact of the Higher Costs on the Price Level of Electricity, Heat and Selected Commodities (Steel, Cement, Lime, Glass, etc.)

The purchase of allowances in the 3rd period of the EU ETS will encumber electricity and heat generation with costs ranging from 7.5 to 17 billion EUR under the assumption that emission allowances will be priced in the range of 10-20 EUR/MWh. In spite of the derogation, with these amounts, the cost of electricity will grow on average by 30 to 60 PLN/MWh. One should also consider that coal-fired generation will be encumbered to a much higher extent, with allowances priced at 20 EUR/MWh, and at the end of the period the cost burden will be approximately 80 PLN/MWh. The growth of capital costs will amount to 30-50 PLN/MWh under the investment scenario forecast in the Energy Policy. Under scenarios bringing emissions in Poland's generation sector to the average EU level, capital costs may grow to 45-80 PLN/MWh. In total, at the end of the period, electricity prices may grow by 30 to 50%. Similar price growth may affect heat, unless the benchmark changes.

Price growth in other commodities will hinge on maintaining the current list of sectors and commodities at risk of manufacturing emigrating outside the EU (*carbon leakage*). If the current list is maintained, major cost and price growth will be the consequence of higher electricity and heat prices.

5. Indirect Costs of the Obligations of the Climate and Energy Package for Poland

EY Team

5.1. Cumulative Effects of Electricity Cost Growth

Having regard for the coal-driven nature of the electric energy sector and the high level of emissions in the energy generated, the impact of the Climate and Energy Package on the Polish economy is particularly high through growing prices of electricity.

Under derogation Polish generators will probably receive some of their CO_2 emission allowances free of charge. Growth in the costs of the electricity price will stem from the costs of buying the shortfall of these emission allowances and the capital costs of investments in low emission technologies to generate electricity. The preliminary estimates of the authors of this report indicate that as a result of the Package, the average costs of electricity will grow in the period of 2013-2020 by 60-80 PLN/MWh. The projected level of growth in the electricity price largely depends on the price of emission allowances. If the price of emission allowances remains at its current level (roughly 7.5 EUR), the impact on electricity price growth will be smaller. In the light of the actions being taken by the European Commission, the probability of the prices of these rights being at that level after 2012 is low.

Another element contributing to the conditions for changing the price of electricity in Poland is its relative level – at present its price for individual and industrial customers in Poland is among the highest in the EU. Considering purchasing power parity, its cost in the latter half of 2011 was higher than the EU average for these groups of customers by 28% and 46%, respectively.

With regard to purchasing power parity, even without fully implementing the Climate and Energy Package, businesses operating in Poland incur relatively high costs to purchase electricity. NBP forecasts indicate that depending on the scenario used for the price of CO_2 emission allowances in the third ETS period, the wholesale price of electricity may grow in 2020, compared to the reference scenario (assuming no change in the allocation of permits to electricity generators after 2012), by 40-200 PLN/MWh (growth ranging from 10% to 50%).

Chart 5.1 Energy Prices for Retail and Industrial Customers. Source: Eurostat

Price of Electricity for Retail Customers [Consumption Ranging from 2,500 kWh to 5,000 kWh] in H2 2011, PPS/KWh

Price of Electricity for Industrial Customers [Consumption Ranging from 500 MWh to 2,000 MWh] in H2 2011, PPS/KWh

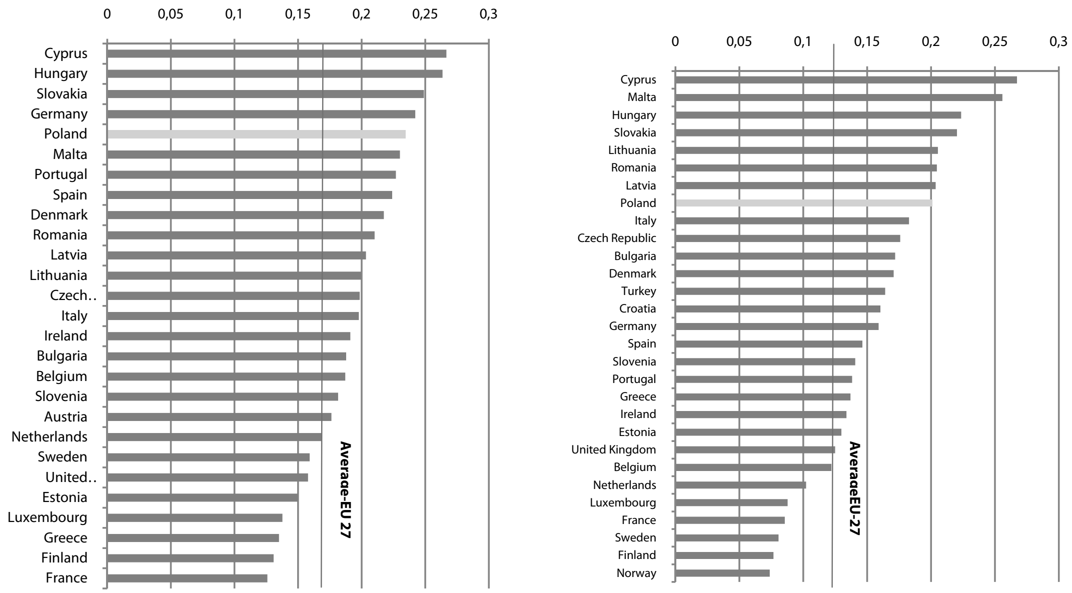
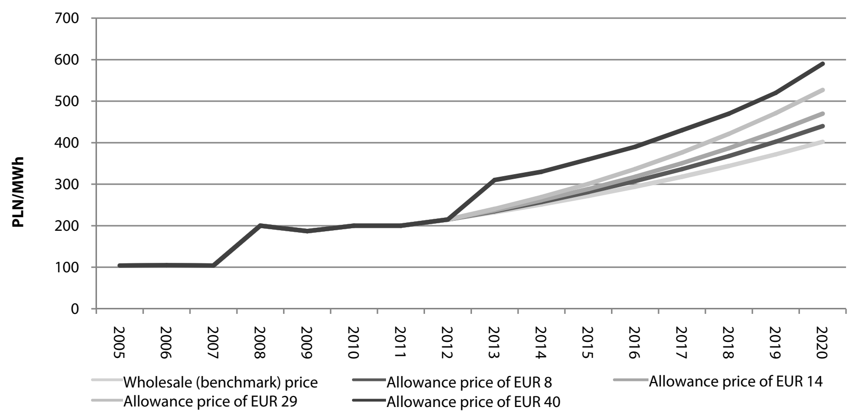


Chart 5.2 Projected Growth in the Price of Electricity Depending on the Price of CO_2 Emission Allowances. Source: Ernst & Young on the basis of NBP analyses



NBP's projections confirm the estimates made by the authors of this report, which have been used to analyze the consequences of electricity cost growth. High growth in the price of electricity for consumers denotes an adverse impact on Poland's economic development. The table below depicts the most significant consequences of growth in the price of electricity.

Table 5.1 Consequences of Higher Electricity Prices as a Result of Climate Policy. Source: Ernst & Young on the basis of NBP analyses

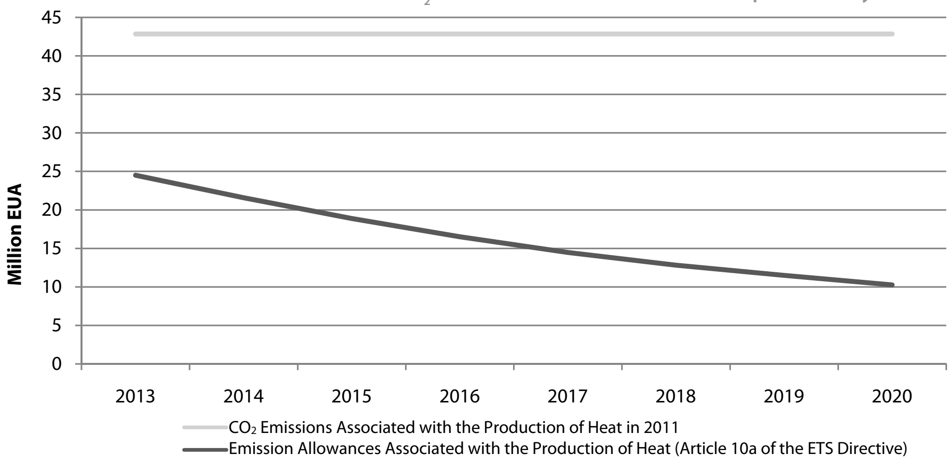
Short-term consequences	Mid-term consequences	Long-term consequences
Higher production costs in Poland	Change in the technology of production	Higher energy efficiency of generation and lower energy consumption among households
Higher prices for the products of businesses	Continued decline in demand for high emission products	Higher share of renewable energy sources in the energy mix
Intersectoral relocation of demand (shift in demand to products manufactured using low emission technologies)	Decarbonization of industry – higher unemployment	Curtailment of generation in coal-fired power plants – development of nuclear energy and RES
Decline in Poland's comparative advantages – (lower exports, higher imports)	Import of know-how concerning low emission technologies	Convergence of the employment structure in the Polish economy towards the EU average (declining significance of industry, higher share of services)
Deterioration in the current account balance	Potential import of electricity	Lower work productivity and higher unemployment in regions where high emission industry has been concentrated to date
Depreciation of the Polish zloty	Additional investments in the energy sector for low emission technologies	
Higher prices	Declining competitiveness in emission sectors – migration of some generation outside the ETS system	
Higher level of energy poverty		

5.2. Cumulative Effects of Higher Heat Costs

Similarly to the price of electricity, the Climate and Energy Package prescribing how the EU ETS will operate after 2012 will form a strong incentive influencing the cost of heat generation. In Poland approximately 90% of heat is generated using coal. Higher costs of generating heat precipitated by the necessity of purchasing the shortfall of CO_2 emission allowances and capital expenditures for investments in low emission technologies to generate energy will be particularly high. In the third settlement period of ETS, a base allocation of free CO_2 emission allowances is determined for heat generators at the level of the standard emission benchmark and the historical level of generation. The base allocation is reduced every year by 0.8 in 2013 to 0.3 in 2020. Moreover, at the overall EU level a sector co-efficient below 1 may be introduced. The heat benchmark was designated at the level achieved by the top 10% of installations in the EU. In reality, this means that it reflects the emissions associated with heat generation using gaseous fuel. As a consequence of the algorithm for the free allocation of allowances, Polish heat generators will have to purchase a large portion of their allowances at auctions or on the open market. A more favorable method of allocating allowances to generate heat for households on the basis of historical emissions would only partially mitigate the adverse impacts of the current allocation mechanism. The EU principles anticipate a more favorable allocation of allowances for the heat used to produce goods at the significant risk of carbon leakage (manufacture migrating outside the EU) – in that instance the allocations are at the level of 100% of the base quantity. In 2020 the allocation of free allowances for heat to all customers will be at an equal level of 30% of the base level.

The emission ratio for hard coal is approximately 95 kg CO_2/GJ (for natural gas it is approximately 55 kg CO_2/GJ). After considering the efficiency of installations (coal-fired installations at the level of 80% and gas-fired ones at the level of 90%), the emissions of generating heat using coal are 118.4 kg CO_2/GJ, while using natural gas are 62.3 kg CO_2/GJ (the level of the benchmark established by the European Commission). The deficit of allowances for coal-fired installations because of the benchmark itself is nearly 50%.This level of deficit will be held by most Polish heat generators and that is why Poland challenged this method of setting the benchmarks at the European Court of Justice. A simplified analysis of the coverage of the projected emission of installations generating heat with free allowances points to the potentially high costs linked to the EUETS after 2012. On the assumption of maintaining the emissions associated with generating heat at their level in 2011 and a preliminary allocation of allowances for 2013-2020 (without adjustment using the sector co-efficient) it is possible to identify the potential scale of the allowance deficit. This deficit will rise in consecutive years of the third EUETS period from approximately 18 million allowances in 2013 to approximately 33 million allowances in 2020.

Chart 5.3 Projected Number of Free CO_2 Emission Allowances after 2012 Compared to CO_2 Emissions Associated With Generating Heat Energy in 2011. Source: Ernst & Young on the basis of the preliminary allocation of CO_2 emission allowances in 2013-2020 published by KOBIZE.

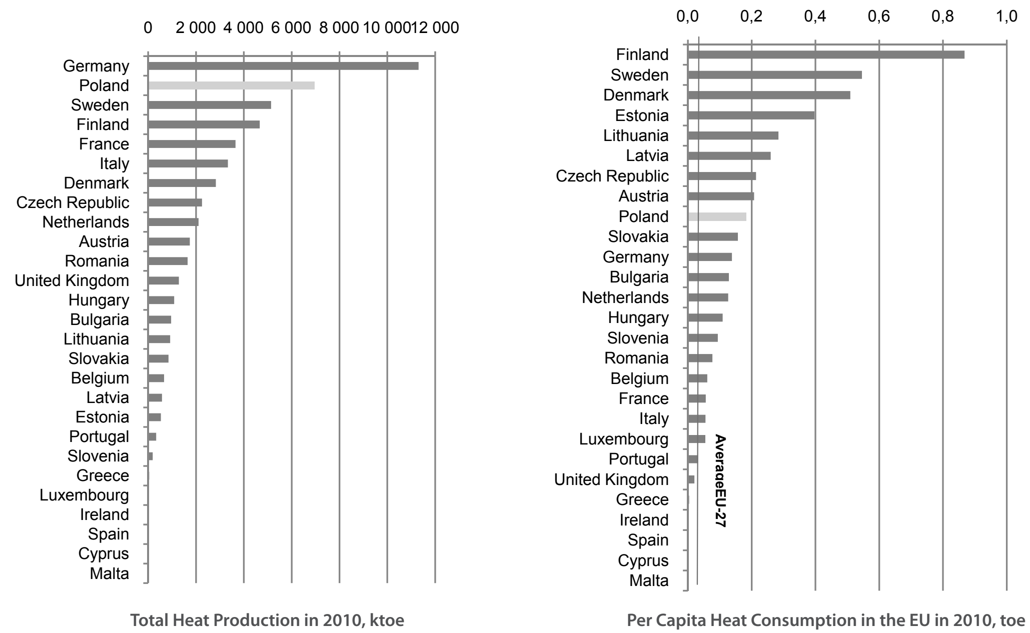


At the EUA price in 2013-2020 of EUR 20 and the EUR/PLN exchange rate of 4.0, the annual cost of covering the heat producers' allowance deficit will increase from 1.5 billion PLN in 2013 to 2.6 billion PLN in 2020. In total, this will result in an increase in the costs of the sector in the third ETS settlement period by 17 billion PLN.

Given the relatively high level of consumption of heat in Poland compared to other EU Member States, an increase in the price of heat energy will contribute to a greater extent to a rise in the product manufacturing costs and a significantly higher amount of household spending. Because one third of the heat is consumed by industrial customers, it will weaken their competitiveness on the international markets. As this level of price increases, the high share of heat consumed by households will dramatically broaden the scale of energy poverty. Assuming that the increase in the heat production costs associated with the EU-ETS after 2012 will be fully transferred to its buyers, the average manufacturing costs will increase by 0.7 billion PLN, while the average annual cost of heat for households will increase by 1.4 billion PLN. In practice, this means an annual average increase in the costs of heat for households in the third EUETS settlement period by 7.3 PLN per GJ which, given the current prices (approximately 25PLN per GJ), will translate into an increase of approximately 30%.

The effects of such heat price increases on the economy will be comparable with the effects of rising electricity prices, adversely affecting the level of economic development in Poland. An additional element of the potentially heavy burden associated with heat production after 2012 will be the escape of heat producers outside the EU ETS through developing small production units (of less than 20 MW). Examples of the application of such solutions are already being noticed.

Chart 5.4 Heat Production and Consumption in the European Union. Source: Eurostat



5.3. Cumulative Effects of Cost Growth of Other Commodities

In addition to electricity and heat, businesses manufacturing construction materials (such as steel, cement, lime, glass, etc.) and refining petroleum oil have a material share of the costs of buying CO_2 emission allowances. The anticipated growth in the prices of these commodities (including the cost of buying CO_2 emission allowances in the price of the finished good) contributes to raising the costs of companies operating both in the industrial sector and in the transport sector.

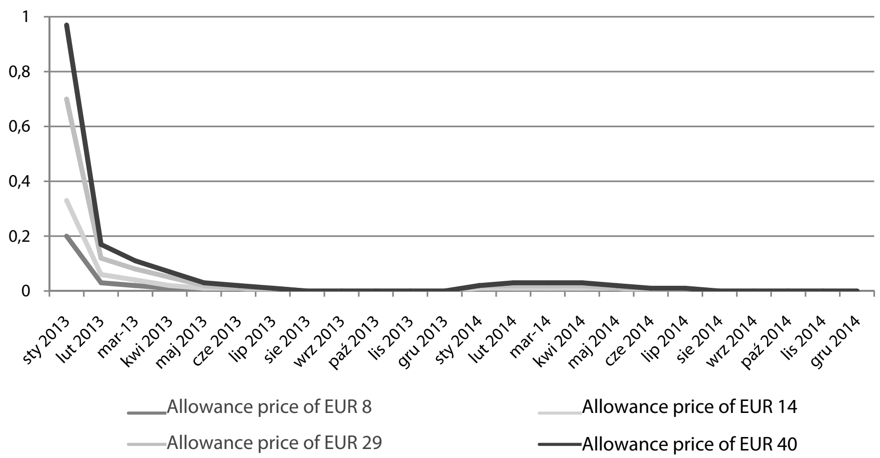
As a result, higher prices of energy and the commodities used in industry will in particular be reflected in the growth of the overall level of prices in the economy.

The analysis conducted by NBPaimed at identifying the strength of the impact exerted by higher costs of energy generation and other commodities on the prices of goods and services in 2013-2014 points to a CPI (consumer price index) level increase at the outset of the third ETS settlement period.

Figure 5.1 How the Obligation of Buying CO_2 Emission Rights Influences CPI. Source: NBP

The costs of emission allowances for heat and other commodities contribute to higher inflation in a similar manner. Chart 5.5. below depicts the impact exerted by the costs of buying emission allowances leading to higher inflation.

Chart 5.5 Impact Exerted by the Third ETS Settlement Period on Changes in CPI m/m in Percentage Points. Source: Ernst & Young on the basis of NBP analyses

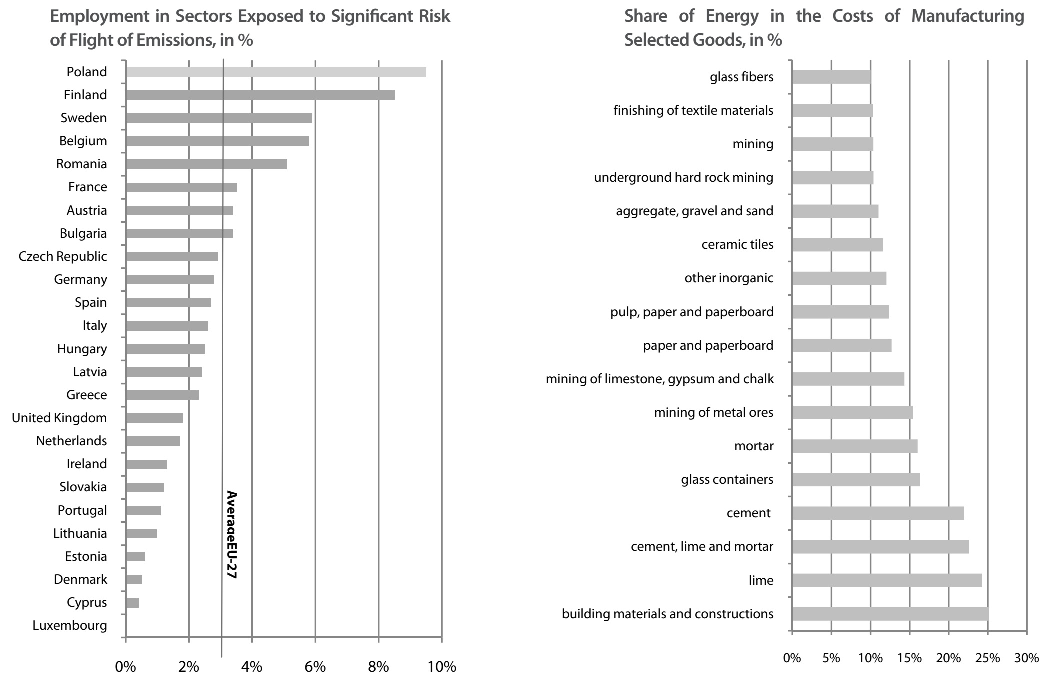


5.4. Migration of Production away from Poland on Account of CO_2 Costs

The costs associated with the purchase of emission allowances or with the power rehabilitation projects may lead to the carbon leakage effect, i.e. the transfer of manufacturing of a significant number of products outside the EU. Poland belongs to the group of countries with the highest risk of carbon leakage for the following three main reasons:

- determinants of the electric energy sector (the dominant share of high emission technologies in energy production and the current relatively high electricity prices);
- a large percentage of the population working in sectors considered as exposed to the risk of carbon leakage (above 9.5%, where the EU average is only 3%);[1] and
- a high share of energy-intensive industries in the GDP (in Poland, the industrial, manufacturing and construction sectors contribute in aggregate to more than 51% of the total value added, compared to the EU average of 41%).[2] According to ESPON[3] estimates, sectors of the economy for which the share of energy costs in the total costs exceeds 10%, are energy-intensive industries,which are exposed to the risk of carbon leakage (in the case of Poland, a significant share of Polish companies operating in the industrial, manufacturing and construction sectors operates in industries with the relatively highest energy-related expenditures).

Chart 5.6 Employment in Sectors Exposed to Significant Risk of Flight of Emissions and Share of Energy in the Costs of Manufacturing Selected Goods. Source: "ReRisk Regions at Risk of Energy Poverty", ESPON 2010

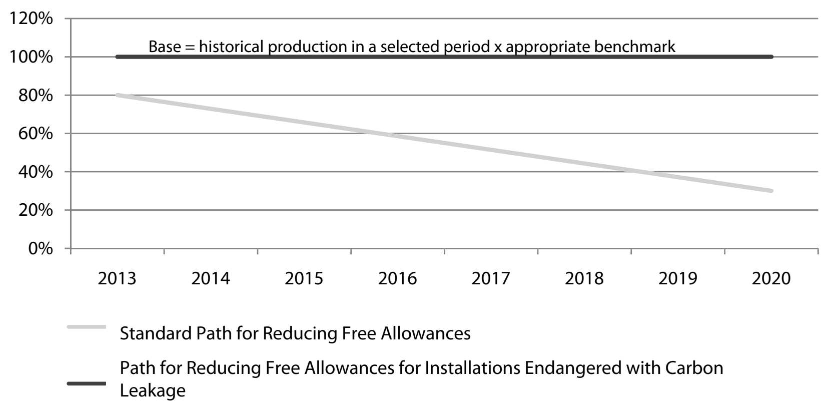


The combination of these factors means that the effects of implementation of the Climate and Energy Package may cause a greater extent of relocation of production from factories located in Poland to outside of the EU, than would be the case in the economies of other Member States. According to World Bank's estimations,in the event of a forced liquidation of emission-intensive industries in Poland due to the Climate and Energy Package, Poland's GDP would decrease by an average of 1% per year until 2030 (as compared to baseline scenario GDP).

1 "ReRisk Regions at Risk of Energy Poverty", ESPON 2010.
2 Eurostat, 2011 data.
3 EU research program on European spatial development.

For the period up to 2014, a list of sectors and commodities endangered with the relocation of production outside of the EU has been prepared, for which emission allowances have been allocated at the base level, i.e. without any reductions in 2013-2014. Such an allocation of emission allowances has reduced greatly the adverse effects of the Climate Package, since it covers the commodities entailing high possible costs of purchasing of CO_2 emission allowances or commodities heavily traded with third party states. What is particularly important is to ensure that the current list of such sectors does not change materially in subsequent periods (especially in the period of 2015-2019).

Chart 5.7 Paths for Reducing the Number of Free CO_2 Emission Allowances for Sectors Exposed to the Risk of Carbon Leakage Compared to the Standard Trajectory for Curtailing Free Allocation. Source: Ernst & Young



If non-EU countries do not carry out comparable programs to reduce emissions of GHG, the problem of the flight of manufacturing away from the EU will continue to be material.

5.5. Impact on Disrupting Competition, Including the Threat of Energy Generators' Windfall Profits

The term *"windfall profits"* refers to incremental profits stemming from including the cost of purchasing CO_2 emission allowances received free of charge by the power plants in the costs of energy electricity.

The possible allocation of free CO_2 emission allowances to energy generators in the 3rd settlement period of the ETS may create the risk of disrupting competition (at the national and international levels), including the threat of energy generators' windfall profits.

The possibility of using free emission allowances for energy generators is connected with the obligation to incur expenditures for the construction or modernization of the energy infrastructure. Energy generators in Poland may fulfil this obligation by:

- incurring expenditures for their own investment tasks which were qualified for the National Investment Plan,
- co-financing the investment tasks already qualified for the National Investment Plan and carried out by electricity and/or gas transmission system operators.

Accordingly, all energy generators in Poland have equal opportunity to benefit from the free allowances. The rules for allocating free allowances according to historical emissions for electricity generators are the same for all the installations that were operational in the base period (2005-2007). Equal benchmark-based allocation rules also apply to the remaining generators, including any physical installations launched by the end of 2008. This virtually eliminates the risk of possible disruption of competition between electricity generators in Poland as a result of a receipt of free allowances.

The use of the optional allocation of free allowances by generators in Poland will not lead to disruption of competition between Polish and foreign electricity generators. The potential competitors of Polish companies will experience lower growth of electricity generation costs due to allowance purchases, since they already have a lower-emission generation structure. Through the free allocation of emission allowances, Poland's biggest energy generators will only slow down the increase of costs associated with the Climate and Energy Package, but they will not benefit in competition with foreign generators.

Table 5.2 Impact Exerted by Derogation on the Disruption of Competition Between Polish and International Energy Generators. Source: Ernst & Young

Company	Electricity generation split by technology [2010]					Average emission level [Mg CO_2/MWh]	Average cost of emission allowances in 1 MWh of electricity generated for a given emission allowance price [EUR/MWh]								
							Without free emissions allowances	With free emission allowances							
								2013	2014	2015	2016	2017	2018	2019	2020
	Total [TWh]	Coal [TWh]	Gas [TWh]	Atomic [TWh]	RES/ Hydro [TWh]			Emission allowance price 20 EUR/EUA							
PGE	57.20	54.10	2.10	0.00	1.00	0.96	19.21	9.27	10.03	11.43	13.25	14.64	15.69	16.59	19.21
TAURON	23.50	23.00	0.00	0.00	0.50	0.98	19.57	9.45	10.22	11.65	13.50	14.92	15.99	16.91	19.57
RWE	223.10	126.20	42.80	45.20	8.90	0.64	12.85	12.85	12.85	12.85	12.85	12.85	12.85	12.85	12.85
EON	275.50	77.10	96.40	71.60	30.30	0.42	8.40	8.40	8.40	8.40	8.40	8.40	8.40	8.40	8.40
Vattenfall	172.50	75.90	13.80	43.10	39.70	0.47	9.44	9.44	9.44	9.44	9.44	9.44	9.44	9.44	9.44
CEZ	68.40	37.40	0.00	28.00	3.00	0.55	10.94	5.28	5.71	6.51	7.54	8.33	8.93	9.45	10.94

Moreover, the integration of the Polish market with the continental electricity market is relatively limited, while procuring the possibility of high flows of electricity abroad would demand additional investments.

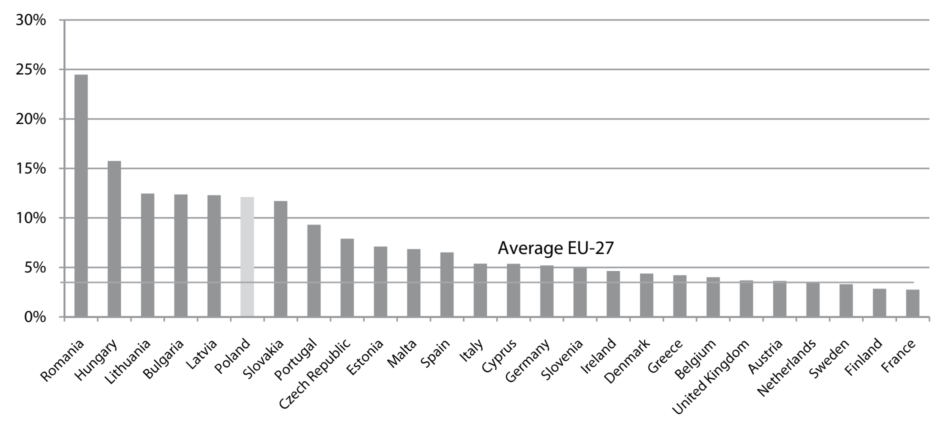
The rules of allocating free emission allowances make the allocation of emission allowances for a given year dependent on producing proof of the capital expenditures incurred to perform the tasks covered by the National Investment Plan. This in practice eliminates the risk of windfall profits arising.

5.6. Analysis of Household Energy and Heat Cost Growth

The high growth in the prices of electricity and heat in Poland will affect households significantly, creating the danger that a substantial number of Polish households will be in a state of "energy poverty". Energy poverty is defined as a situation in which a household is not capable of maintaining a sufficient level of heating in residential space or availing itself of other necessary energy services at moderate prices.According to the definition in the United Kingdom, one may speak of energy poverty if a household must allocate more than 10% of its disposable income to maintain a sufficient level of heating. The prices of electricity and heat are the fundamental factors contributing to the appearance of energy poverty (the other factors are the level of income and the energy efficiency of a home or apartment).

Statistical data indicate that the average share of expenditures for electricity in the income of an average household is much higher in Poland and other new Member States than on average in the EU. In Poland, this share is 12%, while the EU average is 5%. This prompts a high level of sensitivity on the part of poorer households in Poland to high energy cost growth.

Chart 5.8. Share of Expenditures for Electricity and Heat in the Income of an Average Household. Source: Eurostat



The results of the analysis done by the Central Statistical Office in 2010 indicate that 44.5% of households in Poland spend more than 10% of their disposable income on energy sources; 16.3% declare that their apartments do not have enough heat in the winter, 5.8% suffer from a lack of warm water, while 3% indicate that both of these factors are present concurrently. 33% of the population suffers from the lack of heating (warm water, gas) or excessive moisture in residential quarters. Thereby, the currently high percentage of households covered by energy poverty may surge up significantly, as a result of higher electricity and heat prices in the third ETS settlement period. A simplified identification of the level of energy price changes points to potentially high growth caused by the Climate Package after 2012 (roughly 10-50% for electricity and roughly 30% for heat).

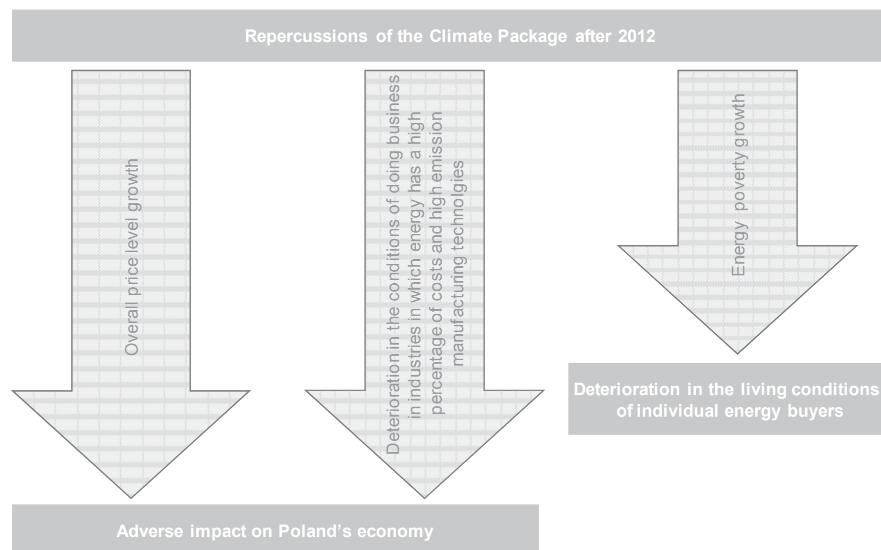
The extent of growth in the area of energy poverty has been identified in the research of the Economic Institute of NBP. Their analysis shows that the growth in the prices of energy plus the cost of purchasing emission allowances after 2012 may increase the percentage of households subject to energy poverty from 1.1% to 5.3%, depending on how the price for CO_2 emission allowances moves.

5.7. Conclusions – Levels of Indirect Cost Growth

The growth in the overall price level illustrates the indirect consequences of cost growth in the economy related to the operation of the Climate and Energy Package after 2012. According to NBP's analyses, the inflationary impulse created this way will contribute to incremental price level growth of 0.3-1.5 p.p. and 0.03 p.p. in years 2013-2014, respectively. In addition to the adverse effects on the entire economy, growth in the costs of energy and manufacturing goods for industry and construction in emission technologies will exert strongly adverse consequences for some of the industrial sectors. Implementing additional burdens on these sectors will hinder further development and competition with businesses located in countries with different determinantsof the energy system, contributing to the potential migration of manufacturing outside the EUETS system (third countries), which in turn will lead to deterioration of economic development in Poland.

Individual energy customers will clearly notice higher energy costs (the estimated price growth for electricity is 10-50%, while the price of heat may be approximately 30% higher), which will lead to a higher level of energy poverty.

Figure 5.2 Simplified Analysis of How Higher Costs of Energy and Producing Goods in Emissions Technologies Influence the Economy and Living Conditions in Poland. Source: Ernst & Young



6. Opportunities for the Polish Economy to Generate Profits on Implementing the Climate and Energy Package

EY Team

6.1. Higher Output by Manufacturers of Plant and Equipment for the Energy Sector and Consumers

There were relatively few investments in the Polish and European energy sector over the past twenty-some years. Climate policy will induce a change in this state of affairs. Considerable expansion of energy investments is being planned over the next twelve to fifteen years, which will lead to a change in the scale of operations of companies engaged in the execution of such tasks. According to the investment plans reported by energy generators under the national investment plan, RES and grid development plans for 2013-2020, the intention is to incur capital expenditures in the electricity energy sector surpassing 150 billion PLN. Capital expenditures may exceed 250 billion PLN if the heat and natural gas industries are included.

Among them, by 2020 approximately 5-7 thousand MW of new generation capacities will probably be commissioned in systemic units in coal-fired and perhaps gas-fired technologies. In co-generation, the forecast entails the construction of new units with a capacity of roughly 3-5 thousand MW, of which natural gas technology will account for the largest share (roughly 40-50%). The remaining portion will utilize biogas technologies (roughly 30-40%) and coal-fired technologies (approximately 20-30%). The quickest growth will take place in the renewable energy sources space. Further incremental growth in the installed capacity of windmills may lead to substantially overstepping the 6 thousand MW level of capacity in 2020, as planned in the Energy Policy. Several hundred MW of capacity are under preparation or construction in biogas sources. The falloff of unit capital expenditures and changes to the support system will probably spark photovoltaic-related investments. Grid-related capital expenditures are needed, both stemming from the change to the generation structure and for the purpose of facilitating unfettered supplier selection; capital expenditures in this area will exceed one half of the capital expenditures in generation. In the natural gas industry the largest capital expenditures will be related to mastering the extraction of shale gas in Poland. At present, 111 concessions have been allocated allowing their holders to conduct exploration. Possible success in searching for unconventional gas sources will contribute to further investments and higher headcount in the gas extraction sector.

A significant portion of the amount associated with these investments and actions taken in the energy space may be spent in Poland, supporting local businesses producing plant, equipment and materials. This applies to the manufacture of generation, grid and metering plant and equipment as well as construction materials, etc. At present, we are not fully utilizing the capabilities of Polish companies – for instance, based on the analyses conducted by Ernst & Young, at present only approximately 25% of the amount invested in the wind energy space remains in Poland. The forecast for rolling out at least 5 thousand MW in the wind energy sector makes it possible to identify the scale of potential for the development of manufacture and services in this space in Poland.

In their investment activities businesses should give consideration to the fact that in the event of substantial utilization of domestic potential, the high capital expenditures incurred by the energy sector will exert a positive impact on the overall economy. Unfortunately, this aspect is taken into account to a limited extent at the stage of preparing investments; moreover, public procurement regulations will hinder the incorporation of domestic manufacturing much more severely than in most EU Member States.

Electricity consumers may derive benefits from greater investments in the sector indirectly as a result of the higher level of activity of many businesses. The development of distributed energy generation with the household energy sector having a special share (individual installations in photovoltaic and wind energy technologies) signifies the possibility of households generating additional income. The appropriate grid infrastructure and smart energy meters are needed, which will make it possible to make settlements of the electricity generated. Smart energy meters will also make it possible to achieve savings and enhance energy efficiency. In the development of wind energy an extraordinarily important topic is the issue of the additional revenues obtained from private individuals making sites available to build wind parks. In addition to these benefits, local communities will obtain additional income in the form of taxes paid by the generation companies which elect to roll out new capacities in their location.

6.2. Extended Scopes of Work of Construction and Assembly Companies

Construction and assembly services have a significant share of the capital expenditures in the energy sector. At least 50 billion PLN should be spent in Poland on these services. The possibilities of tapping into domestic potential are not always being fully used, though. The reasons are the same as in the case of the supply of plant and equipment – a large number of tasks is being done on a turnkey basis, which means that one entity is responsible for the entirety of the investment (when large investments are considered, there are mostly foreign suppliers or consortia of Polish and foreign companies).

Another factor prompting higher demand for construction and assembly services entails actions to save energy and fuel, which follow from achieving the objective of increasing the efficiency of energy consumption by 20% in 2020. For this reason, a national action plan was devised to improve energy efficiency throughout the economy. A significant area of this plan is devoted to enhancing energy efficiency in the residential housing sector. This sector has relatively higher importance in pro-efficiency measures than on average in the EU (in Poland it is responsible for 32% of final energy consumption, while it is only responsible for 27% on average in the EU).[1] The national plan anticipates among others:

- certifying new and existing residential buildings (energy assessment system of buildings);
- conducting thermal modernization projects for residential buildings;
- promulgating rational usage of energy in households.

These measures are supported by the state with funds for investors who undertake projects to make savings in insulating buildings, heating, warm utility water, etc. The execution of these types of programs should contribute to increasing the activity of construction and assembly companies. In addition, investments in higher energy efficiency contribute to work on new construction materials and changes in the technology of their manufacture.

6.3. Development of Energy-Related Agriculture

One of the objectives of the Climate Package is to increase by 20% the share of renewable energy sources (RES) in gross energy consumption in 2020. Having regard for historical, geographical and economic determinants, the objectives defined as a percentage vary by Member State. Poland's objective is to achieve a RES share of 15% in final gross energy consumption. In Poland, biomass offers the greatest potential in the RES space. The types of biomass that may be used in the energy sector are as follows:

- wooden biomass, among other waste timber in forestry and in the timber industry,
- agricultural biomass, among others the byproducts and waste products of agriculture and the food and agricultural processing industry (straw, seed, and pressed oil plants) and energy-related plant crops (wood and fast growing grass).

On account of the limitations in using biomass originating from the forest, substantial growth is anticipated for agricultural biomass. Even though the biomass potential in Poland is seen as high (approximately 40 million tonnes per annum), the actual quantity of biomass available on the domestic market is not able to meet the energy sector's demand, which reached some 5 million tonnes in 2010. Experts estimate the growth in domestic demand for biomass at approximately 8 million tonnes by 2020.[2] That is why actions focused on increasing the degree of utilizing Poland's potential in energy-related crops will be necessary. Moreover, some of this potential will be used for crops to produce biofuels.

An important element shaping the development of energy-related crops in Poland consists of subsidies and support mechanisms. The area of energy-related plant crops which received subsidy support in 2008 was at the level of 44 791 ha, which represented 0.28% of total arable land. In 2009 this area fell to the level of 16 122 ha. The greatest share of this production was held by oil plants (rapeseed) – 15 302 ha. Corn and grains occupied in this period an area of 459 ha. In turn, permanent plantations, grasses, root vegetables and other crops occupied an area of 459

1 2010 data, Eurostat.
2 "Outlook for the development of energy-related crops", Agricultural Report, 2009

ha.[3] In total, in 2009, energy-related plant crops occupied 29.2 thousand ha, which accounted for 0.18% of arable land. In 2010, when subsidies were retracted for these types of crops, their area contracted by 20%, and the share in Poland's arable land fell to 0.15%. Furthermore, work on changes to the energy support system in RES contributed to these changes.

Figure 6.1 Structure of Crops Designated for Energy-Eelated Purposes in 2009-2010. Source: GUS (Central Statistical Office), "Periodic progress reports in 2009-2010 on advancing and utilizing renewable energy sources in Poland", Ministry of the Economy, 2012

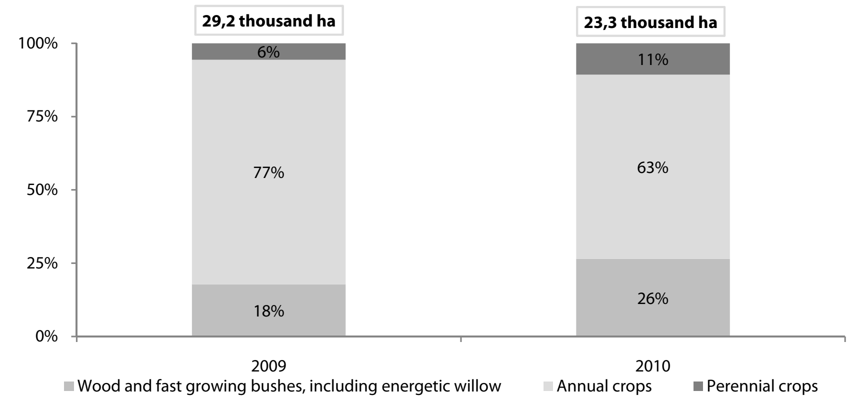
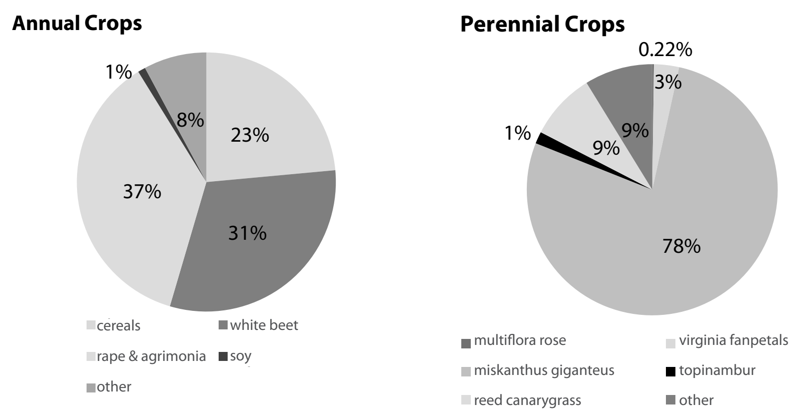


Figure 6.2 Structure of Annual and Perennial Crops in 2010. Source: GUS (Central Statistical Office), "Periodic progress reports in 2009-2010 on advancing and utilizing renewable energy sources in Poland", Ministry of the Economy



For several years in Poland demand has outstripped supply and has been covered by imports (this state of affairs may not change in the near future on condition that new regulations do not eliminate co-firing). The co-firing of biomass is the least expensive method of raising RES generation, primarily tapping into domestic resources. The lower cost of conversion makes it possible to direct more funds to the biomass supply space and may stimulate the development of energy-related crops.

3 "National action plan on renewable energy sources", Ministry of the Economy, 2010

Energy-related crops require a long payback period in plantations; that is why stable legal regulations are needed, as is the possibility of entering into long-term contracts with energy generators or intermediaries. Energy generators also need stability in regulations and somewhat more lenient requirements for the competitive procurement of biomass. A well-developed biomass supply coming from crops will form a good basis for the development of local heat and electricity sources requiring extensive capital expenditures, while their development will take many years.

Strong development impulses for energy-related crops are important, having regard for soil conditions in Poland, which may not be counted among ones supporting the production of plants for energy-related purposes. Soil supporting energy-related crops account for 50% of the crop land and must first be earmarked for the production of food and feed. This is necessary to preserve the appropriate level of food self-sufficiency. That is why lower quality soil[4] is most frequently earmarked for energy-related crops.

With a large share of biomass in RES generation, more than 1300 thousand hectares should be earmarked in 2020 for biomass to generate electricity and for the heat industry.[5]

According to analyses conducted by the Institute of Crops, Fertilization and Soil Taxonomy in Puławy, Polish agriculture may designate 600 thousand hectares for energy-related purposes up to 2020 to produce grain for bioethanol production, 400 thousand hectares to produce rapeseed for biodiesel production and approximately 1,000 thousand hectares to produce biomass for the professional energy sector's needs.[6] At present, these opportunities are being exploited to a symbolic extent while the bulk of funds in the support system is being used to purchase plant and equipment from other countries.

Faced with an insufficient biomass supply for the energy sector, the role of imports is constantly on the rise. The global market in 2010 traded more than 5 million tonnes of biomass. Europe is a large biomass importer with biomass exports outside the EU generally being non-existent. At present, the EU, including Poland, is importing biomass primarily from the U.S,, Canada and Russia. However, in the future, biomass imports may entail regulatory risk. One cannot preclude that the EU will in the future strive to curtail biomass imports from outside the Community and to shorten the distance over which biomass is transported. At a meeting of the EU Member States' ministers of agriculture held in Sopot, it was agreed that agricultural biomass imports for energy-related purposes should be curtailed to the rational supplementation of needs without being the basis for attaining the objectives laid down in the energy and climate policy.[7]

For the purpose of developing energy-related agriculture and elevating the usage of biomass originating from energy-related crops, it is necessary to create a stable system encompassing

4 "Biomass Market in Poland – Strengths and Weaknesses" R. Jaworska, 2011
5 "Plausible Scenarios For Agricultural Development in Poland and Their Repercussions For the Production of Solid Biomass in Respect of Energy-Related Objectives", A. Faber, 2008
6 "National Action Plan on Renewable Energy Sources", Ministry of the Economy, 2010
7 Address by the Minister of Agriculture and Rural Development Marek Sawicki

the production, distribution and utilization of biomass. The first part of this system must take the form of domestic legal regulations and in some areas also EU regulations.

6.4. Development of Services to Source and Process Biomass and Biofuels

The development of energy-related agriculture and the growing demand for biomass drives market and technologies development related to biomass processing and generating biogas and biofuels.

Raw biomass may be subjected to a process of technological conversion to improve its physical and chemical attributes facilitating transport and firing. At present, solid biomass earmarked for firing in professional and industrial power plants and combined heat and power plants is usually converted into briquettes or pellets. Biomass gasification or carbonization (a product similar to charcoal) technologies are in their test phase in Poland.

Briquette plants are as a rule small establishments with a capacity not exceeding several thousand tonnes per annum and it would be difficult to estimate their total conversion capacity. The largest ones are capable of manufacturing a total of 70-80 thousand tonnes of briquettes a year. The product of a briquette plant may not be homogeneous and can differ depending on the manufacturer. In Poland there are tens of pellet plants. Most producers are plants with a capacity of no more than 30 tonnes per annum. The total production potential of pellet plants in Poland is approximately 800-850 thousand tonnes per annum.

The current potential of pellet plants has grown since 2010 by 160-200 thousand tonnes. In the entire EU in 2010, there were approximately 500 pellet producers with a total production capacity of 14.8 million tonnes of pellets per annum (including Poland). The utilization of the capacity of these plants was on average 65%, which means that the total production in the EU was 9.2 million tonnes of pellets.[8] The ratio in Poland in 2010 was only slightly lower at– 64%.

Table 6.1 Pellet Market in Poland (000s of tonnes). Source: Ernst & Young on the basis of proprietary analyses and Annual Statistical Report, European Biomass Association, 2011, Pellet market country report, Pelletsatlas, 2009

	2007	2008	2009	2010	2011
Production capacity (yearend)	545	644	644	640	825*
Production	329	378	410	410	Data unavailable
Exports	Data unavailable	Data unavailable	30	143	Data unavailable
Imports	Data unavailable	Data unavailable	61	35	Data unavailable
Consumption	60	120	441	302	Data unavailable

*Estimates for Q2 2011

Along with the development of biomass processing, the demand for storage and logistics services is also on the rise. Pellet plants as a rule produce biomass throughout the year, warehousing a quantity of biomass corresponding to several days of production in silos located on the premises of the processing plant. Product logistics must therefore be handled on an ongoing basis. Biomass transports are dispatched daily to end-users. That is why an important aspect of the operation of a pellet plant is the necessity of properly storing the raw material and finished product, as improper storage and wet biomass or raw material may require additional drying leading to a decline in quality.

6.5. Enhancing the Efficiency of Procuring and Utilizing Energy

According to EU plans, the energy sector is to undergo significant transformation to enhance the efficiency of energy conversion. In Poland, energy efficiency measured by the ratio of final energy consumption to gross energy consumption is at the EU's average level (approximately 65%), which is nevertheless a relatively poor result compared to the leading countries in this area. Analysis of the share of energy consumption in the energy sector in relation to gross energy consumption indicates that it is relatively higher than the EU average (Poland is a leader in this energy with a share topping 10%).

This means that in subsequent years in the framework of replacing generation capacities and modernizing infrastructure in Poland, special significance will be attributed to incorporating energy efficiency and the best available technologies, which is being stimulated by EU regulations in this area.[9]

The development of highly efficient co-generation in energy generation is of great consequence among the solutions that should enhance the efficiency of acquiring energy. The European Commission's proposals indicate that in favorable conditions the requirement for obtaining a permit by a new heat power plant should be to connect it with systems enabling the utilization of heat, while the operators of electricity distribution systems should procure the priority availability of energy originating from co-generation.

The development of energy co-generation may be of great value to local communities, as the thermal energy obtained from utilizing such a technology may be substantially less expensive than other methods of its generation.

Identifying the prospective methods for enhancing energy efficiency should be carried out within the framework of regular energy audits, which should be compulsory as of 2014.

Enhancing the utilization of energy through greater energy efficiency means for Poland the achievement of two objectives in the energy space, as set by the European Commission:

- raising the level of energy security (limiting dependence on energy fuel supplies from third countries) by reducing the economy's relative energy needs,

8 "Annual Statistical Report", European Biomass Association, 2011

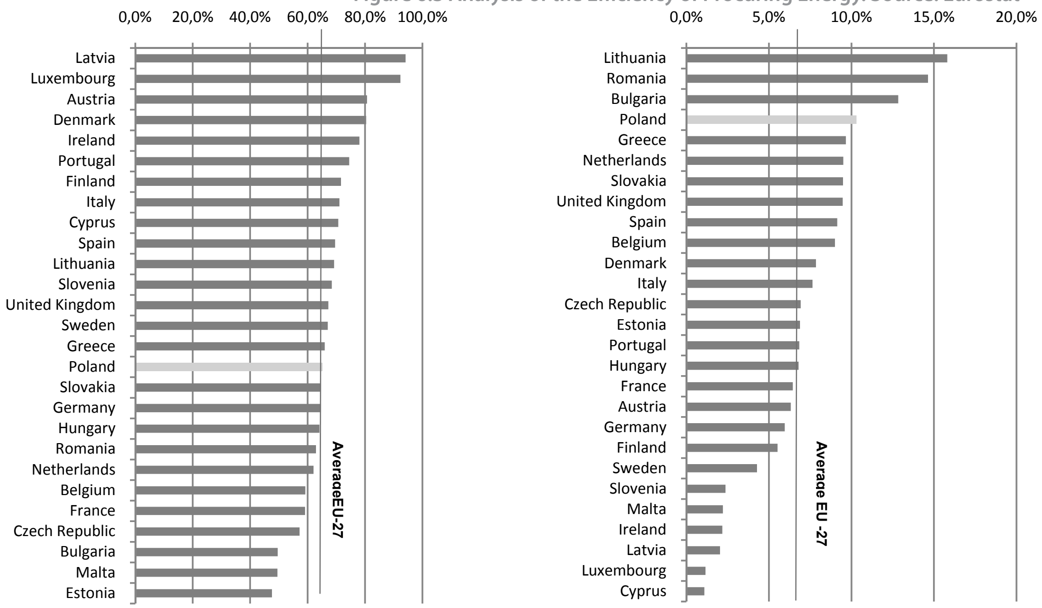
9 According to the draft version of the Directive of the European Parliament and of the Council on energy efficiency, regulations concerning the emissions trading system, and the Industrial Emissions Directive.

- enhancing the competitiveness of the generation industry in Poland by cutting the quantity of energy required to produce goods.

Work on new technologies to facilitate higher energy efficiency is being supported with EU funds, which may be used by research facilities situated in Poland, stimulating the development of the know-how related to the products of advanced technology.

The World Bank Report estimates the high potential for improving energy efficiency and indirectly reducing CO_2 emissions in Poland. It points to a number of actions to cut GHG emissions without incremental costs, especially in the heating sector

Figure 6.3 Analysis of the Efficiency of Procuring Energy. Source: Eurostat



Ratio of final energy consumption to gross energy consumption in the EU in 2010 in %

Ratio of energy consumption in the energy sector to gross energy consumption in the EU in 2010 in %

6.6. Conclusions – There is Considerable Potential for Profit

Climate policy exerts a number of adverse impacts on the economies of countries with high coal consumption. Poland is one of these countries. Climate policy also creates a considerable potential for the Polish economy to gain benefit, but it is being utilized only to a symbolic degree. This leads to curtailing the possibilities for compensating for the adverse impact.

This state of affairs should change rapidly. First, the regulatory obstacles and hurdles should be eradicated. It is necessary to create stable regulatory conditions for many decades and to support action with compensatory funds, e.g. originating from auctions of emissions allowances. The full utilization of the changes and opportunities associated with the EU's climate policy will make it possible to mitigate the adverse impacts to a substantial extent.

In respect of tender regulations, changes and the practice of oversight should provide investors with conditions no worse than the ones in other EU Member States. It is recommended that legal conditions stimulate the development of partnership relations between the professional energy sector and the scientific research, generation and service communities. Mastering new technologies entails great risk and the standard public procurement procedures do not foster entering into long-term contracts to rationalize risk. Moreover, the State Treasury's ownership oversight pays insufficient attention to the development of innovativeness. It is much harder to create conditions conducive to cooperation in the area of supplying plant, equipment and services but the example shown by Germany and France indicates that such conditions may be created within the realm of EU regulations.

The stability of regulations is the fundamental issue in energy-related crops as changes in agriculture necessitate long-term measures.

7. Cost-Benefit Balance of Implementing the Climate and Energy Package in Poland

EY Team

7.1. Energy Sector Balance Analysis

Environment preservation requires several modifications in the energy sector, although it can be stated that it is more challenging than the inclusion of the energy sector in the free market – (marketization), which took place 20 years ago. Experience gained during marketization indicates issues arising from the rapid pace of change as a result of regulatory constraints. A good example is the energy crisis in California at the turn of the century. Experiences gained during marketization should be more often used during implementation of the EU climate policy and other regulations development (especially in market section of the ETS).

Again, there is a rapid pace of change, reliance on a long-term forecasts and sometimes too much optimism when evaluating technological change potential. Currently almost 90% of the CO_2 emissions are associated with energy production and all issues arising from the climate policy affect the energy sector. Consequently, the energy sector faces high risk that is difficult to manage. As a result, the market capitalization of European energy firms decreased by two-thirds in the last 5 years, which is more the market average.

The Polish energy sector is in a distinctive position, as the EU regulations do not consider its specific fuel-mix. On the one hand, the internal electricity market is developed, while on the other, a paratax burden is introduced. This burden is imposed on particular technologies from 0 (e.g. nuclear and RES) up to 100% (e.g. coal) of the emission allowances price. Compensating different effects is limited and possible only during the transitional period. Power technologies are capital-intensive and can be exploited for 60-80 years. The Climate and Energy Package fosters replacement of selected technologies, which might be too costly for the Polish economy. Similarly, allocation algorithm in the heat sector (only one benchmark) puts unequal burden on individual heat producers. It is possible, as the unit emissivity of heat produced in the coal technology is twice as high as emissivity in the gas technology. Coal dominates in the Polish heat sector.

Cross-sectoral correction factor for heat at the EU level has not been determined yet. Assuming that it will be close to 1 and the carbon leakage list will not change till 2019, with the EUA price presented in the Table 7.1, the cost of purchasing emission allowances will reach 5-6 billion EUR. This cost can change, due to higher consumption fluctuations in the heat sector depending on weather conditions. Moreover, the Polish government filed a lawsuit against the European Commission, asking the European Court of Justice to annul the rule of only one heat benchmark that can also influence estimated cost of EUA purchase.

Table 7.1 The Impact of the Climate Policy on the Energy Sector in Poland. Source: Ernst & Young

EUA balance	Unit	Year								
		2013	2014	2015	2016	2017	2018	2019	2020	Total
Gross electricity consumption	TWh	159,5	161	162,5	164	165,5	167	168,5	170	1787,5
Emissivity	t CO_2 /MWh	0,744	0,732	0,72	0,708	0,696	0,684	0,672	0,66	0,7
CO_2 emissions	t, million	118,7	117,9	117,0	116,1	115,2	114,2	113,2	112,2	1285,0
Derogation	EUA, million	78	72	67	60	52	43	32	0	404,7
EUA purchase	EUA, million	40,9	45,6	50,3	56,1	62,9	70,9	81,0	112,2	519,8
EUA price	EUR/EUA	10	12	15	16	17	18	19	20	15,9
Purchase vale	**EUR, million**	**408,5**	**547,1**	**754,5**	**897,3**	**1070,0**	**1275,7**	**1538,9**	**2244,0**	**8736,0**

The electricity and heat sectors face a considerable investment programme in the following years – till 2020, 200 billion PLN spending in these sectors is expected. One-third of this amount is required by the climate policy, one-third by other EU-wide regulations and only the rest will be spent on the replacement investments and capacity increase.

If this sectors transfer higher production costs to the energy price, no disruption of their functioning should be observed, although significant issues may arise, in particular for energy companies and local heating systems. It should be noted that higher electricity and heat prices will have a negative impact on the GDP growth and will lead to a higher inflation. As a result, the number of orders for a broad range of products will diminish, which will decrease the revenues for these sectors.

7.2. Industry Sector Balance

The scale of the Climate and Energy Package's impact on the industry sector in years 2013-2020 can be identified by evaluating potential benefits associated with the development of the business size and capturing modern technologies, as well as higher energy efficiency and broadening the range of products. Inversely, the negative impact of the Package is correlated with higher energy costs, purchasing shortages of emission allowances and higher costs of intermediates used in the production process, which follows from the combination of previous factors.

In general, the possibility to take advantage of the high investment programme in the energy sector in the coming years is a positive effect for Polish companies. The value of these investments is expected to reach ca. 250 billion PLN. Significant part of this amount can be spent in Poland, which could create a strong impulse for business in the manufacturing industries.

Assuming that one-third of the total value of investment in the energy sector (ca. 75 billion PLN) is associated with the Climate and Energy Package (additional investments, separate from the routine replacement or modernization programmes), Polish companies can exploit this and develop their business scale. It is necessary to create conditions where technologies that can be performed inland will be preferred.

Costs associated with the Package imposed on the industry will diminish benefits acquired from investments in the energy sector. Therefore, the balance could be significantly negative. If the CO_2 emissions of the industry sector remain at the 2011 level and the current carbon leakage list does not change, this sector will receive sufficient emission allowances allocation. However, the new carbon leakage list will be released in 2014 and it is difficult to forecasts which sectors it will cover.

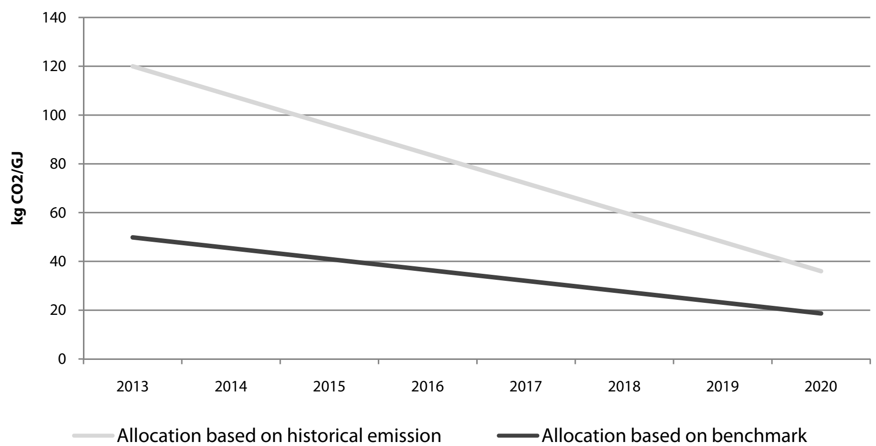
Furthermore, the industry will face higher electricity costs and in many cases higher heat costs. The increase in energy prices can reach 30%, which could result in a loss of competitiveness on the European and global markets.

It is also negative that RES technologies support is not harmonized within the EU. In many European countries taxes serve as sources of such support, yet in Poland it comes from proceeds achieved by selling electricity through the system of certificates of origin. For energy-intensive businesses, e.g. non-ferrous metal smelter, costs associated with purchasing colour certificates are too high. By 2020, Poland will at least double the RES share in the energy fuel-mix and issues for energy-intensive industries arising from this should be eased, or else many factories will have to be closed.

7.3. Household Balance

The cost of energy carriers in disposable income of Polish households reaches ca. 12%, while the EU average is 5%. A further energy price rise may increase the number of households in energy poverty. The free emission allowances allocation for households based on the heat produced will ease the negative effects of the Climate and Energy Package, although still almost two-thirds of the required allowances will have to be purchased. A more favorable algorithm is the free emission allowances allocation for households based on the historic emissions.

Chart 7.1 Free Emission Allowances Allocation for Heat Produced for Households. Source: Ernst & Young



The forecasts show that at the end of the 3rd ETS period, the price of the emission allowances will reach 15 EUR. As a result, a 30% increase in energy carriers' price for households is expected. A higher price of goods and services will be followed by cumulative effects. The price level increase is anticipated to exceed 1%, which can have a negative impact on households.

The positive effect of the Package is higher employment rate in the economy, due to the investment program in the electricity and heat sectors. Nevertheless, this will not counterbalance the negative effects, as it will take place only locally. It should also be noted that even the supporters of the rapid pace of the CO_2 emission reduction estimate that GDP will be lower than in the baseline scenario by 1%. Due to this, average household income will be lower.

It is necessary to prepare support programs for low-income households. These may be financed from auctioning emission allowances, thereby reducing the amounts spent on supporting economic reconstruction and development.

7.4. Macroeconomic Effects Analysis

Economies with a significant coal share in their energy fuel-mix will face a high burden associated with implementing the Climate and Energy Package. Direct costs include purchasing shortages of emission allowances, while indirect relate to the reconstruction of the economy towards a low emission economy. The Climate and Energy Package contains a compensation of these costs:

- a direct form is more favorable allocation of allowances dedicated for auctions, while
- an indirect form is a possibility to apply for an optional derogation.

The majority of analyst agree that implementing the Climate and Energy Package in Poland without a specific compensation mechanism will decrease the level of economic growth, especially in the 2013-2020 period. To illustrate this potential implication, a simplified analysis of the difference between values of the GDP was prepared. The model is based on an assumption that without the Climate and Energy Package the GDP growth would equal 4% for the whole period. Due to this, the analysis provided two variants:

- CP (Climate Package) – low impact. Price of the emission allowance is low, there are efficient programmes aimed at CO_2 emission, early replacement of the installed capacity is minimized, steady RES development. This variant is close to the forecasts presented in the Energy Policy of Poland – GDP is lower by 0.5 p.p. each year when compared to the baseline scenario (without the Climate and Energy Package);

- CP (Climate Package) – high impact. Price of the emission allowance is high, the number of programmes aimed at CO_2 emission reduction is maximized, early replacement of the installed capacity covers 10 GW, rapid pace of the RES. This variant is close to the forecasts presented in the World Bank report: Transition to a Low Emission Economy in Poland. GDP is lower by 1 p.p. each year when compared to the baseline scenario (without the Climate and Energy Package).

Table 7.2 Analysis of the Potential Impact of the Climate Policy to GDP in Poland. Source: Ernst & Young

			2012	2013	2014	2015	2016	2017	2018	2019	2020	Total	Difference in 2013-2020 period
Baseline scenario (without CP)	GDP value	EUR, billion	390	406	422	439	456	474	493	513	534	3 737	
	GDP decrease	%		0,5%	0,5%	0,5%	0,5%	0,5%	0,5%	0,5%	0,5%		
CP – low impact	GDP value	EUR, billion	390	404	420	437	454	472	491	511	531	3 719	19
	GDP decrease	%		1%	1%	1%	1%	1%	1%	1%	1%		
CP – high impact	GDP value	EUR, billion	390	402	418	434	452	470	489	508	528	3 700	37

The GDP in the CP-low impact variant is lower than in the baseline scenario by 20 billion EUR, while in the CP-high impact by almost 40 billion EUR.

Direct compensation of the lower GDP growth is ca. 250 million allowances, which Poland will receive as a result of earmarking 10% of the emission allowances pool for auctioning (a result of GDP per capita proportion) and 2% as a result of the CO_2 emission reduction relative to baseline year. With the allowance price between 10-20 EUR, the value of compensation is close to 2.5-5 billion EUR. The derogation enables transferring a number of allowances to the energy sector, with a commitment to investment programs. At the maximum level, derogation could cover 400 million allowances, which would be worth 4-8 billion EUR (with the prices presented in Table 7.2). The real value of this compensation could be identified by decreasing cumulative costs associated with electricity price increase and an impulse for economic development due to the energy sector investment program. As the derogation diminishes budget revenues, the actual value of the compensation is only 5% of the allowances value (0.2-0.4 billion EUR).

As a result, the balance is significantly negative (it reaches 15-30 billion EUR after taking into account direct compensation) and should be compensated in other areas, i.e. introducing compensation mechanism under the new EU budget in 2014-2020.

7.5. Summary – the Balance is Significantly Negative

The analysis shows a negative impact of the Climate and Energy Package's implementation on the Polish economy. Poland's loss due to the lower GDP growth would reach 15-30 billion EUR till 2020. The World Bank report[1] assessed that a similar decrease when comparing the baseline scenario is possible by 2030 and only after that year there are prospects for further economic growth. In the energy sector in Poland, the burden associated with purchasing emission allowances shortage will be higher than in other countries. As a result, considerable cumulative costs

1 World Bank, *Transition to a Low Emission Economy in Poland*, 2011.

for the economy will arise. The Polish heat sector is highly centralized and installations covered by the EU ETS will not be able to compete with small heat producers. Therefore, stranded costs will appear, which will impose an additional burden on the economy. The impact on the industry depends on the new carbon leakage list, which will be released in 2014.

However, it should be noted that from 2027 onwards all the allowances will have to be purchased – if the general rule does not change, a significant number of factories may be transferred outside the EU. In many industries it is impossible to further decrease CO_2 emissions and the carbon capture and storage (CCS) technology is not expected to be fully developed before 2027.

8. The Situation on the Ground in Various Member States

Adam Łazarski

8.1. Energy Mix and Economics: The Situation on the Ground in Various Member States

Taking a closer look at the energy mix of the EU-27, rather than simply scrutinizing a declared outlook for the future, Member States can be broken down into five categories (1) green leaders; (2) countries with energy sectors undergoing slow transition; (3) coal-dependent Member States; (4) nuclear powers; and (5) countries entirely dependent on energy imports. One thing to keep in mind about this division is that it is purely indicative. Even more importantly, categories are not exclusive, which means that their membership often overlaps. For instance, coal-dependent countries may also be classified as undergoing slow transition. Moreover, some of them additionally use nuclear power to generate energy, which makes their membership fall into three groups (Bulgaria, Czech Republic, and Romania). Other examples of dual membership include "green leaders", which are at the same time nuclear powers (as in the case of Sweden); and nuclear powers which undergo slow transition (Hungary, Slovakia, Slovenia).

(1) Firstly, the so called "green leaders" category can be characterized as involving those countries which have invested relatively large sums in renewable energy: biomass, biofuels, geothermal, hydro, solar, and wind. They have also made an extensive use of support mechanisms, such as feed-in-tariffs, so that they could move from solid fuels to cleaner, but more costly technologies. Examples here include the Nordic countries: (1) Finland, (2) Sweden, and (3) Denmark; but also (4) Germany; (5) Austria; (6) Latvia; and (7) Portugal.

The GDP per capita of the first five of these relatively eco-friendly countries is above the European average, whereas the remaining two are small Member States "well poised to be a guinea pig", because they have good access to cost-effective renewable resources and their energy demand has been relatively low.[1] Sweden, Latvia, and Austria generate more than 50% of their electricity from renewables.[2] Adequately, the share of green energy in final energy

1 E. Rosenthal, *Portugal Gives Itself a Clean-Energy Makeover,* the New York Times http://www.nytimes.com/2010/08/10/science/earth/10portugal.html?_r=2, (access: 92.08.2012).

2 Latvia is an exceptional case as the share of renewables in the Baltic state is falling due to halting investment in hydropower.

consumption in these Member States and in Finland oscillates between 30% and 47%.3 This is to compare with Malta (0.2%), the United Kingdom (2.9%), or the Netherlands (4.1%).[4] In Portugal and Latvia almost all energy produced domestically comes from renewable sources.

One of the most interesting cases here is Germany. The country has moved quickly in terms of reducing its carbon footprint, although it is still responsible for roughly one-fifth of the EU emissions, by far the largest share of all Member States.[5] Berlin was the biggest producer of renewable energy in the Union in 2009.[6] According to a recent study, "renewables accounted for fully 20.8% of [German energy] production during the first six months of 2011".[7]

Germany's well-balanced energy mix has so far relied on domestic production of solid fuels and nuclear energy. But investments in renewables gathered pace at the expense of coal extraction and nuclear energy, the latter to be phased out before 2022. Unsurprisingly, therefore, Berlin insists on implementing similar costly standards in other Member States. Having the potential for becoming one of the largest beneficiaries of exporting green technologies, Germany has been labeled as part of the Green Troika [together with Denmark and the Netherlands], which "pushed hardest for [GHG abatement] legislation at the European level".[8]

(2) On the other side of the spectrum are those countries which often find green technology too expensive, or which prefer to rely on market-based mechanisms. I will refer to them as to countries with energy sectors undergoing slow transition. This group is less homogenous than the one previously described. It simultaneously encompasses some of the richest economies from Western Europe (the Netherlands, the United Kingdom), and almost every new Member State (all except Latvia). But even within these two subgroups, the degree to which changes in energy outlook have been implemented and rationale behind the processes vary greatly.

One example here is the United Kingdom. Thanks to relying on gaseous fuels, London performs well in terms of emissions per capita, representing the 17th lowest score in the EU.[9] However, the country has also been constantly noting one of the lowest scores with regard to the share of renewables in final energy consumption. Standing at below 3%, the UK will have to increase its figure five-fold to meet the national target of 15%, provided for in the Climate Action and Renewable Energy Package (CAREP).[10] No other European country will need to multiply its efforts to a higher extent in that regard. This owes to the fact that London, as opposed to Berlin, has adopted a market-based approach called 'the renewable portfolio standard'. Both instruments have so far proved disappointing: "[while] the German system seems to create booms in demand that threaten runaway costs for the government, the British system results in missed targets, delay and under-development".[11]

Together with Germany, other Western European Member States within this group, such as Spain and Italy, embraced feed-in tariffs. In the case of Madrid, the move was so spectacular that the country not only has continued to reduce its emissions from 2008 onwards, which may be predominantly attributed to the economic crisis, but also estimated that it will exceed its target for renewables under CAREP.[12] Although the center-right government had to slash the tariffs due to the rising costs of subsidies and poor condition of public finances, Spain's energy mix is still reasonably diversified, with consumption fuelled predominantly by oil, gas, and nuclear heat.

Italy, which just like Spain is very much dependent on energy imports, is in a more difficult situation than its Mediterranean neighbor, mainly due to phasing out nuclear power. Renewables account there for as much as 54% of domestically produced energy and 9.4% of the final inland energy consumption, slightly below the EU average.[13] Ambitious targets set by CAREP will most likely be missed by Rome, especially that cuts in feed-in-tariffs have already been introduced.[14] Interestingly, moreover, Italy was concerned about the costs implied by the new legislation from the early period of negotiations over the Package. According to government officials, there has been "little potential for renewable energy and an already good record (…) concerning the ratio of energy intensity or CO_2 emissions".[15]

Cuts to feed-in-tariffs are omnipresent not only in Southern Europe. They were also introduced by a right-wing government in the Netherlands, the country which has recently decided to reorient its energy policy in favor of nuclear heat.[16] Although often pushing for green legislation in the past, the Netherlands has not given a good example for others. Its share of renewables in final gross inland consumption accounts for a mere 4.1%, more than two times below the EU average of 11.7%.[17] Moreover, GHG emissions per capita are among the highest in the entire Union, which confirms what "the Economist" has written about "the green image of the Dutch" – that it is "at odds with the reality".[18]

3 Eurostat.
4 Eurostat (05.08.2012).
5 European Environment Agency, Report *Greenhouse Gas Emission Trends and Projections in Europe 2011*.
6 http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Renewable_energy_statistics.
7 Spiegel, *Green Energy Use Jumps in Japan*, http://www.spiegel.de/international/0,1518,783314,00.html (access: 29.08.2012).
8 Desmond Dinan, *Ever Closer Union*, Palgrave MacMillan, London: 2010, p. 473.
9 European Environment Agency, Data1: http://www.eea.europa.eu/data-and-maps/figures/greenhouse-gas-emissions-per-capita-1 (access: 29.08.2012).
10 Eurostat (03.08.2011).
11 Aedan Kernan, Leonardo Energy, UK's *Offshore Wind Incentive Falls Short*, http://www.leonardo-energy.org/uk%E2%80%99s-offshore-wind-incentive-falls-short (access: 29.08.2012).
12 European Commission, *Summary of the Member States' Forecast Documents*, http://ec.europa.eu/energy/renewables/transparency_platform/doc/0_forecast_summary.pdf, (access: 29..08.2012).
13 Eurostat (08.03.2012).
14 P. Gosselin, "Arrivederci Solare!", http://notrickszone.com/2011/03/07/arrivederci-solare-italy-pushes-to-cut-solar-subsidies/, (access: 29.08.2012).
15 International Energy Agency, "Italy: 2009 Review", p. 25, http://www.iea.org/textbase/nppdf/free/2009/italy2009.pdf, (access: 29.08.2012).
16 Energia a Debate, *The Dutch Lose Faith in Windmills*, http://energiaadebate.com/the-dutch-lose-faith-in-windmills/ (access: 29.08.2012).
17 European Energy Agency, GHG Trends and Projections for the Netherlands, http://www.eea.europa.eu/publications/ghg-trends-and-projections-2011, (access: 29.08.2012).
18 The Economist, "Netherlands Energy: Dirty Dikes", http://www.eiu.com/index.asp?layout=ib3Article&article_id=1548792539&pubtypeid=1142462499&country_id=1400000140, (access: 29.08.2012).

As far as the Central and Eastern European countries (CEECs) are concerned, Hungary, Slovakia and Slovenia all produce nuclear energy domestically. Their carbon footprint, by EU standards, is therefore low, while energy mix remains fairly diversified. In the case of Hungary, for instance, gross inland energy consumption comprises natural gas (36.1%), oil (28.6%), nuclear heat (15.7%), solid fuels (10.1%), and renewables (7.2%).[19] Therefore, it is not difficult to argue that "Hungary has less reason to panic than, say, coal-burning Poland and the Czech Republic, about the carbon constraints of the new EU climate program".[20]

According to official documents issued by the Commission, "in the directive including national commitments, Hungary's targeted 2020 share of energy generated from renewable energy sources is set at 13%".[21] The government raised this target even further, to 14.65%, which means that the country will need to double its score, but is determined and feels capable of achieving the goal.

(3) The third group – coal-dependent Member States – needs to be distinguished from the broader circle gathering countries undergoing slow transition. This is because the reliance on hard coal and lignite-fired power plants may have severe consequences with regard to affecting public and private finances under CAREP. Therefore, the focus of this paragraph is on several coal-dependent Member States, the list of which includes, above all, Bulgaria, the Czech Republic, Greece, Poland, and Romania. Furthermore, adopting a broader perspective requires taking a closer look at Estonia, the case of which is truly exceptional due to the heavy reliance of the Baltic state on oil shale, a highly polluting fuel.

Starting with Poland, the CEEC has the highest share of energy produced from solid fuels (83.5%) and is the largest producer of hard coal among all Member States.[22] Moreover, 90% of Polish electricity comes from coal, whereas in France this figure stands at 4%.[23] One benefit of this is Poland's relatively low, as compared to the EU average, level of external energy dependence (31.7%).[24] Referring to the share of renewables in final energy consumption, they currently account for 8.9%, that is 6.6% short of the declared target.[25] Finally, Poland provides shelter for some large industries, which will be allocated free emissions under the European Trading Scheme (EU ETS), but may still be vulnerable to relocation. The long list here includes, but is not limited to, the following GHG-intensive sectors: metal, cement, steel, chemical, coal gas, paper and coal.[26]

19 Eurostat.
20 David Buchan,. *Eastern Europe's Energy's Challenge: Meeting Its EU Climate Commitments*, The Oxford Institute for Energy Studies, July 2010.
21 Renewable Energy – Hungary's Renewable Energy Utilization Action Plan, 2010-2020, 19.05.2011.
22 Eurostat (06.08.2012).
23 European Commission Staff Working Paper, *The Market for Solid Fuels in the Community in 2009 and Prospects for 2010*, http://ec.europa.eu/energy/observatory/coal/doc/solid_fuels/2009_report.pdf, (access: 29.08.2012).
24 Ibidem.
25 European Commission, *Summary of the Member States' Forecast Documents*, http://ec.europa.eu/energy/renewables/transparency_platform/doc/0_forecast_summary.pdf, (access: 29.08.2012).
26 Forbes, *Pakiet Klimatyczny Moze Kosztowac 22 mld zl*, 07.02.2012.

In a somehow different case, Estonia has based its energy sector on oil shale, which accounts for a striking 79.2% of its domestic energy production".[27] Applied to inland energy consumption, oil shale provides for 50% of the pie, and for more than 90% of electricity supply.[28] These numbers may even rise in the future, as the Baltic state has embarked on plans to open new power units fuelled by oil shale, although together with investments in renewables.[29] What is noteworthy as well, is that Estonia's emissions per GDP unit are some of the highest in the EU (second only to Bulgaria). As of 2009, they stood at 880g CO_2/kWh, which is to be compared with 340 CO_2/kWh average for the EU-27.[30] On the other hand, however, the country is among the least dependent on external supplies, together with Denmark, Romania, and the Czech Republic.[31] Changing the energy mix in favor of cleaner fuels may have a negative effect on dependency rates and energy prices.

Bulgaria's energy mix seems to be more balanced than in the cases of Poland and Estonia. Sofia's domestic production rests both on solid fuels (47%), and on nuclear power (40.8%).[32] Energy consumption is driven by coal (38% in 2009), followed by oil (24%), nuclear energy (21%), and natural gas (15%).[33] It is estimated that decommissioning of four small units of the Kozloduy nuclear plant will lead to an increased reliance on coal. The country is also the poorest and the most energy-intensive member of the Union.[34]

According to Eurostat figures, the Czech Republic is the third largest EU producer of coal, after Poland and Germany. More than two-thirds of domestic energy production in the CEEC concentrates on hard coal and lignite. The energy mix is more balanced than in any other new Member State, owing to 22.6% of the total energy production which comes from nuclear power, and further 11.6% derived from renewable sources. This, however, does not help to drastically reduce the country's carbon footprint as "electricity generation is largely composed of coal (60%)".[35] Consequently, GHG emissions per capita are exceptionally high. The official stance of the government in Prague for the forthcoming years is thus to rely more on nuclear power and renewables. However, due to large reserves of hard and brown coal, solid fuels are likely to remain the primary source of energy consumption.[36]

27 Radovic, L.R. and Schobert, H.H., *Energy and Fuels in Society*, McGraw-Hill (College Custom Series), 1992, http://www.ems.psu.edu/~radovic/Chapter10.pdf, (access; 29.08.2012).
28 Eurostat.
29 Baltic News, *Giving Free Quota to EESTI Energia Not Certain*, http://www.tuuleenergia.ee/en/2011/10/giving-free-carbon-quota-to-eesti-energia-not-certain-estonian-state-audit-office/, (access: 29.08.2012).
30 ABB, *Estonia: Energy Efficiency Report*, http://www05.abb.com/global/scot/scot316.nsf/veritydisplay/0fb7b8f1625a2b8ac12578b100236669/$file/estonia.pdf, (access: 29.08.2012).
31 Eurostat.
32 Ibidem.
33 The Economist Intelligence Unit, Energy Report: Czech Republic, http://www.eiu.com/index.asp?layout=ib3Article&article_id=257908410&pubtypeid=1142462499&country_id=1870000187&category_id=775133077&rf=0.
34 Eurostat, (29.06.2012).
35 International Energy Agency, *The Czech Republic: 2010 Review*, http://www.iea.org/textbase/nppdf/free/2010/CzechRepublic2010.pdf, (access: 29.08.2012).
36 The Economist Intelligence Unit, Energy Report: Czech Republic, (access: 29.08.2012).

Interestingly, coal has also played an important role in the Greek energy mix. More precisely, as much as 81.1% of Athens's domestic production of energy should be attributed to solid fuels, the second largest fraction after Poland. This places the Southern European country among the five biggest producers of solid fuels in the EU, after Poland, Germany, the Czech Republic, and the United Kingdom.[37] Greece is in possession of large reserves of lignite, but even now it "accounts for around one-third of total energy consumption and is responsible for generating 58% of electricity".[38] As one would have thought, therefore, "lignite power generation is the largest single source of emissions, accounting for 35% of the total in Greece".[39]

Compared to Greece, not to mention Poland, Romania's domestic production is focused to a smaller extent on solid fuels. Nevertheless, the latter, especially lignite, still account for almost one quarter of the production and one-fifth of the inland energy consumption. Despite such reliance, Romania makes an extensive use of renewables, which make up 22.4% of final gross inland consumption. As a result, GHG emissions per capita are second lowest in the EU.[40]

(4) The fourth group of countries comprises nuclear powers. Although many small Member States and a majority of big Member States (all except Italy and Poland) generate some portion of their energy from nuclear heat, two EU countries clearly stand out here. These two cases are Belgium and France. They are noteworthy because nuclear power accounts in both of them for more than 80% of the domestic production of energy (respectively: 83.7% and 82.3%), which meets most of their demand for electricity: 75% in the case of France, and more than 50% in the case of Belgium.[41] Relatively little solid fuels are imported and the remaining part is largely made up of imports of natural gas. What distinguishes these states from each other, however, is that while Belgium plans to discontinue using nuclear energy between 2015 and 2025 and replace it with renewables,[42] France is likely to remain where it stands, especially taking into account the fact that Paris is a major exporter of reactors and nuclear fuel.[43]

(5) Finally, the last group of countries which needs to be mentioned comprises small Member States, almost entirely dependent on imports of energy. In all four cases of Cyprus, Ireland, Luxembourg, and Malta the energy dependence rate is above 85%.[44] The first three Member States have been some of the largest emitters in the EU per capita, mainly due to their reliance on fossil fuels. In Ireland, for instance, oil and gas account together for more than 80% of gross inland consumption, whereas solid fuels and renewables for 14% and 4% respectively.[45]

37 Eurostat, (26.07.2012).
38 The Economist Intelligence Unit, Greece: energy Report, http://www.eiu.com/index.asp?layout=ib3Article&article_id=1327929117&pubtypeid=1142462499&country_id=1370000137&page_title=&rf=0, (acces: 29.08.2012).
39 McKinsey & Company, *Greenhouse Gas Abatement Potential in Greece*, http://www.mckinsey.com/Client_Service/Sustainability/Latest_thinking/Costcurves, (access: 29.08.2012).
40 European Energy Agency, GHG Trends and Projections for Romania, http://www.eea.europa.eu/publications/ghg-trends-and-projections-2011.
41 Eurostat (04.09.2012).
42 F. Robinson, The Wall Street Journal, *Belgium to Phase Out Nuclear Power*, http://online.wsj.com/article/SB10001424052970204394804577009971447347782.html, (access: 29.08.2012).
43 World Nuclear Association, http://www.world-nuclear.org/info/inf40.html (access: 29.08.2012).
44 Eurostat.
45 Ibidem.

8.2. Consequences of Implementing the Climate and Energy Package: the Energy Sector, Industry, Households

Energy Sector

Implementing CAREP will have a profound impact on the European energy sector and on numerous industries. Consequently, the execution of its provisions will not pass unnoticed by an average citizen, who will see his electricity bills rise drastically in the forthcoming years. This impact will be spread unevenly among Member States and citizens, depending on factors such as wealth, state of infrastructure, and extent to which countries depend on renewable energy or particular fossil fuels.

With regard to the CEECs, many of whom are coal-dependent, it is important to mention that they will see their costs increase progressively, but sharply, after 2013. For instance, it is estimated that the legislation will cost the Polish energy sector PLN 2 billion in 2015, a sum which might quadruple to PLN 8 billion in 2020, followed by a surge to PLN 15 billion in 2030, reaching an equivalent of 4.8% of Poland's GDP.[46]

Such a rapid increase is explained by the fact that the European Commission has granted ten Member States the right to apply for a certain number of free emission allowances until 2019 for their power plants (under the so-called 'derogation 10c' or 'optional derogation'). The number of allowances distributed without charge will be diminishing on a yearly basis. In the case of Poland, it will account for 405 million tonnes of CO_2 in total, dropping from 77 million produced by power stations in 2013 to 32 million in 2019.[47]

Other Member States which were given the possibility to obtain temporary reductions were Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, and Romania.[48] Malta and Latvia have decided not to apply for exemptions.[49] Not taking them nor Poland into account leaves us with seven Member States that were given a sum of 673 million of free allowances.[50]

The supranational Commission requires countries to spend at least 50% of the money gained from selling free allowances on upgrading power generation installations and on cleaner technologies. This process will be very costly. For Poland it may mean expenditures of between

46 EnergSys Energy Report in: Ernst & Young, *Synteza Analiz Dotyczących Skutków Społeczno-Ekonomicznych Pakietu Energetycznego*, 2008, http://archiwum-ukie.polskawue.gov.pl/HLP/files.nsf/0/9499346B1D9B2F6FC125764E00310EB0/$file/Ernst&Young.pdf, (access: 29.08.2012).
47 Energia News, *Energetyka Nie Dostanie Darmowych Uprawnień do Emisji CO_2*, http://www.ekonomia24.pl/artykul/918546.html (access:293.08.2012).
48 European Commission, Emissions Trading Memo.
49 Anne Eckstein, *Warsaw May Allocate Free Allowances After 2012*, http://www.europolitics.info/sectorial-policies/ets-warsaw-may-allocate-free-allowances-after-2012-art340216-15.html (access: 29.08.2012).
50 European Commission Memo: *Emissions Trading: Commission Rules on Temporary Free Allowances for Power Plants in Poland*, Brussels, 13.07.2012.

9.3 billion EUR until 2015 (Fitch ratings estimate) and 34 billion EUR until 2020 (according to Societe Generale).[51]

Furthermore, it is estimated that in some cases a large chunk of investments will go to new and existing coal-fired plants. For instance, this share is projected at 46% in the case of the Czech Republic. Thus, it is possible that this will indirectly contribute to an increase of CO_2 emissions in the future.[52] As a consequence, the costs of CAREP will be felt even more painfully after depriving Prague and other CEE capitals of free quotas, i.e. after 2019.

Further difficulties may arise from the provision stating that "under EU rules, exemptions from the EU ETS until 2020 can only be granted to power plants if their investment process was "physically initiated" before 31 December 2008, and if their GHG permits were issued before 30 June 2011".[53] Although all the CEECs had been planning their investments in advance, it is not hard to imagine a situation in which new opportunities arise but they will need to be hampered due to additional costs that will be too difficult to bear.

Industry

The EU legislation will affect sectors falling into two groups: (1) ETS – such as iron, steel, mineral, pulp, paper, and cement; and (2) non-ETS – "small-scale emitters such as transport, buildings, services, small industrial installations, agriculture and waste".[54]

Concerning the ETS sectors, which comprise energy intensive industries, a study conducted by the UK Department for Business, Innovation and Skills (BIS) shows vast discrepancies with regard to future costs of electricity for manufacturers, not only between Member States and outsiders, but also among EU Member States. As of 2020, the authors of the report argue, "the cost of electricity in the UK will rise by 28.30 GBP per MWh (…) due to climate change policies, including the carbon floor price and the EU emissions trading scheme (EU ETS)".[55] This is compared with much smaller increases in Germany (17.30 GBP/MWh), Denmark (15.70 GBP/MWh) France (15.20 GBP/MWh), China (10.30 GBP/MWh), and India (1 GBP/MWh), as well as falls in Russia and in the U.S.[56]

It is a truism to say that differences in pricing stemming from EU legislation will make industries in certain countries uncompetitive vis-à-vis the outsiders. Consequently, because it is often a zero-sum game in which industries search for most favorable conditions to invest, relocation of capital will be hard to avoid. Examples of sectors endangered by the so-called "carbon leakage" – that is "the increase in emissions outside a region as a direct result of the

51 NewsBase, *Poland's Bittersweet Victory in the Battle for CO_2 Permits*, http://www.newsbase.com/newsbasearchive/cotw.jsp?pub=energo&issue=622 (access: 29.08.2012).
52 EUrActiv, *Prague Feels the Heat over €1.9ilblionn Carbon Credit Application*, 02.03.2012.
53 EUrActiv, *Poland Demands Free Carbon Allowances for Ghost Coal Plants*, 11.07.2012.
54 DG for Climate Action, http://ec.europa.eu/clima/policies/effort/faq_en.htm, (access: 29.08.2012).
55 Sarah-Jayne Russell, The Environmentalist, *Industry Fears over UK Electricity Prices*, 13.07.2012.
56 Tamara Cohen, *Soaring Green Energy Taxes Could Force Firms Out of UK as Industry Becomes Uncompetitive*, 14.07.2012.

policy to cap emissions in this region" linked to "the off-shoring of high-emissions production" – are plentiful.[57]

In the UK it is the steel industry that is likely to be affected most negatively. But similar challenges will have to be faced in many other Member States who lag behind the green leaders, especially in the CEECs. As for Estonia, "firms using heavily carbon-intensive fuels could experience variable cost increase of up to 100%" and "the biggest impact would hit the country's mineral sector, where carbon intensive manufacturing faces on average a 20% variable cost change".[58] The Baltic case is prone to relocation of capital both due to its proximity to Russia and its dependency on highly polluting oil shale.

Similar worries exist in other Member States located on the outskirts of the EU, as in Romania, where "investors in the metallurgy and the cement sector might prefer to relocate their business to neighboring non-EU countries, such as the Republic of Moldova or Ukraine".[59]

In this context, one needs to mention that CAREP provides for up to 100% of the benchmarked allocations for free to sectors "deemed at significant risk of relocating production outside of the EU due to the carbon price".[60] It also guarantees allowances of 80% of industries' benchmarked allocation as of 2013, "declining to 30% in 2020 and 0% in 2027" for sectors "not deemed at significant risk of carbon leakage".[61]

Nevertheless, a major problem here is that "a product benchmark is based on a value reflecting the average greenhouse gas performance of the 10% best performing installations in the EU", rather than within particular Member States.[62] The new Member States, with their old infrastructure and large industrial base, are thus put at a serious disadvantage under the mitigation mechanism. According to a study prepared by the University of Oxford, "almost invariably" these 10% of the most efficient operators will be based in Western Europe, thus "even when companies in Eastern Europe appear to be getting a free ride, the reality is that they will have to do some of buying of allowances on the ETS".[63]

Countries with a high proportion of workers employed in GHG-intensive industries should be concerned. According to the OECD, it is the Czech Republic which "has the highest share of employment in polluting sectors" among the organization's members.[64] Various reports also mention Poland and Finland as two countries likely to be "most affected by the risk of carbon leakage"[65]; or the Czech Republic and Italy as those countries which host regions "with

57 Julia Renaud, *Climate Policy and Carbon Leakage*, http://www.iea.org/papers/2008/Aluminium_EU_ETS.pdf, (access: 29.08.2012).
58 J. Kleesma, M. Viding, E. Latosov, *Implications for Competitiveness of the Estonian Carbon-Intensive Industry Post-2013*, http://www.biceps.org/sites/default/files/bje/Marko.pdf, (access: 29.08.2012).
59 M. Constantin, *Implementing the Third Energy Package and the Climate Change Package in Romania*, in: http://mem-envi.ulb.ac.be/Memoires_en_pdf/MFE_09_10/MFE_Milcu_09_10.pdf. p. 48, (access: 29.08.2012).
60 United Kingdom Department of Energy and Climate Change.
61 Ibidem.
62 European Commission, Directorate General Climate Action.
63 David Buchan, op. cit.
64 OECD Economic Surveys: Czech Republic, Nov. 2011, p. 90.
65 ESPON, *Regions at Risk of Energy Poverty*, Final Report, 05.11.2010.

the most unfavorable position in terms of economic vulnerability (>10% of employment in industries with high energy spending).[66] Other CEECs, for instance Bulgaria, may be affected due to a relatively high share of energy intensive industries in energy consumption.

As for non-ETS sectors, the CEECs were permitted to increase their emissions. Their allocations are often higher than projected emissions, especially in the case of Bulgaria, the Czech Republic, and Poland.[67] Thus, unsurprisingly, some new Member States "are projected to overachieve their 2020 targets for emissions from the non-ETS sectors without additional efforts beyond business as usual [i.e. no further policy changes]".[68]

Social Vulnerability

Rising energy prices will affect consumers across the Old Continent, although in a disproportionate manner. Above all, a study prepared by the UK Department of Energy and Climate Change predicts that "the revised ETS directive and the renewable energy target will have impacts on the number of people defined as being in fuel poverty", i.e. those who need to spend more than 10% of their income on energy bills in order to warm their houses.[69]

There is therefore little doubt that low-income households will be most affected. Only in the rich United Kingdom, CAREP policies are likely to "add an additional 0.2-0.4 million fuel-poor households by 2015 and an additional 0.7-1.4 million by 2020".[70] According to Open Europe estimates, "the CAREP will cost the equivalent of 150 GBP per person per year, or 600 GBP per family of four per year (700 GBP if technology remains at current levels)".[71]

Similar scenario applies to several other Member States, especially in Central and Eastern Europe, where household income is low, heating and insulation standards poor, and energy prices already high (when measured by purchasing power parity).[72] One example here is Bulgaria, the poorest and the most energy intensive Member State. As the European Observation Network for Territorial Development and Cohesion (ESPON) has noted in its report, "people living in the poorest region [of] Severozapaden earn less than 12% of the average income in Inner London – measured in PPS, which takes into account different price levels – but Bulgarians pay on average 17.07 PPS for 100 kWh of electricity, while the British pay 15.37 PPS".[73]

The ESPON's study also points to several regions, located within the boundaries of new Member States, which are more socially vulnerable to changing energy prices. The reasons given are low levels of economic activity and long-term unemployment, from which parts

66 Ibidem.
67 Richard Tol, S.J, *Intra-Union Flexibility of non-ETS Emission Reduction Obligations in the European Union*, Working Paper, Dublin, 2008.
68 David Buchan, The Oxford Institute for Energy Studies, *Eastern Europe's Energy's Challenge: Meeting Its EU Climate Commitments*, July 2010.
69 UK Department of Energy and Climate Change, *Impact Assessment of EU Climate and Energy Package, the Revised EU Emissions Trading System Directive and Meeting the UK Non-Traded Target Through UK Carbon Budgets*, Final Proposal, 22.04.2009.
70 UK Department of Energy and Climate Change, op. cit.
71 N. O'Brien, H. Robinson, Open Europe, *The EU Climate Action and Renewable Energy Package: Are We About to be Locked into the Wrong Policy?*, Oct. 2008, p. 3.
72 European Fuel Poverty and Energy Efficiency, *Tackling Fuel Poverty in Europe: Recommendations Guide for Policy Makers*, Sep. 2009.
73 ESPON, op. cit.

not only of Bulgaria, but also of Eastern Germany, Hungary, Slovakia, and Southern Italy suffer heavily. Poland and Romania are also predicted to be touched due to low levels of disposable income.[74]

In a nutshell, energy poverty should be treated as a bigger concern in the CEECs. Member States where inhabitants already suffer disproportionately from inadequate heating, energy bills arrears and energy-related housing defects as compared with the EU-27 average are: Bulgaria, Hungary, Latvia, Lithuania, Poland, Romania, and Slovenia.[75]

8.3. Estimated Costs of Implementing CAREP: Selected Cases

In this section of the paper the aim is to present and compare various estimations concerning expected costs resulting from implementation of the Climate and Energy Package. In order to do so, three comprehensive studies are brought into light: (1) Impact assessment of 2008 prepared by the European Commission; (2) Report measuring the impact of the climate and energy policies on public budgets prepared by the European University Institute in Florence; and (3) estimations made by Open Europe, a British think tank. Other reports are also scrutinized with the intention to complement the above-mentioned series and provide for a more detailed study of particular Member States.

One major feature of these assessments is that they vary greatly in their methodology, goals, and predictions. They also focus on different aspects of the balance sheet, for instance on direct costs, indirect costs, or impact on public budgets. This makes the picture even more complicated and results in a situation in which figures are difficult to compare across studies. Still, in order to preserve the clear structure from the first part of this analysis, some of the most interesting facts about estimated costs will be grouped by Member States.

Estonia

According to Open Europe's estimates, the total cost of the new legislation in Estonia will amount to 104 million EUR per annum.[76] Nevertheless, the European University Institute (EUI) is more skeptical in its approximations. It predicts that the Baltic state's budget will be among two most negatively influenced in the regional organization (taking into account an aggregate of direct and indirect costs). Under each scenario considered in the analysis (high, medium, and low abatement costs), Estonia's public finances are affected negatively by the new legislation, with a possible decrease in the net public revenues of up to 1% GDP.[77] No other Member State except Bulgaria is expected to lose from the game to such a high degree.

These predictions are also confirmed by an analysis made by the European Commission, which projected the increased direct cost of achieving the GHG and RES targets to account

74 Ibidem.
75 David Buchan, op. cit.
76 Open Europe, op. cit., p. 44.
77 Pippo Ranci et al., *The Impact of Climate and Energy Policies on the Public Budget of EU*, Final Report, June 2011, http://www.eui.eu/Projects/THINK/Documents/THINKPublicBudgetReport.pdf, (access: 29.08.2012).

for up to 1.6% of the Estonian GDP in 2020. It thus might be the second highest cost after Bulgaria, putting the EU-average of 0.58% GDP in shade.[78] To be fair, it is necessary to add that the Commission expects that the negative effects in the case of new Member States can be mitigated by reducing GHG emissions outside the EU (e.g. by using the Joint Implementation and Clean Development Mechanism), redistributing auctioning rights back to consumers, and with the help of redistribution of renewable targets.

If all mechanisms except the latter work as predicted by the Commission, the country may still be more affected than an average EU Member State. There is only one scenario in which Tallinn is to experience net public revenues: with full redistribution of auctioning rights for RES; by using statistical transfers, joint projects and joint support schemes. However, the UK's Department of Energy and Climate Change rightly points out that a "considerable uncertainty surrounds how the mechanism could work in practice," as neither statistical transfers nor joint projects have been used so far, and only one project of joint support schemes is known to date.[79] There is also an unspoken consensus in the EU that the RES trade arrangement has been abandoned by the regional organization.

Consequently, studies under consideration explicitly suggest that in the cases of the new Member States in general, and the Baltic state and Bulgaria in particular, "more solidarity might be needed" among the EU countries, as they may be affected in a disproportionately negative way in relation to most Western European countries.[80]

Such a depressing result for Estonia is a result of its heavy reliance on oil shale, a highly polluting hydrocarbon. But as Elnari Kisel, the Secretary General of the Estonian Ministry of Economic Affairs put it, "although from the purely economic standpoint of the Package the use of oil shale in the production of electricity should be stopped, it is extremely important for Estonian energy security that production of electricity using such a guaranteed resource continues".[81] The latter may be explained by the fact that in terms of electricity networks, Estonia is extensively interconnected with Russia. Hence, the Baltic state can be supplied with energy produced from coal externally, but it will lead to more dependence and to an overall increase of GHG emissions (most Russian installations are outdated). Finally, several companies relying on high levels of energy consumption, above all in the cement, chemical, and paper sectors, may seek to relocate their businesses outside the EU.[82]

Bulgaria

As it has already been indicated, Bulgaria may find itself among the countries most vulnerable to the consequences of adopting the Package. According to Momchil Merkulove from the Associate of Producers of Ecological Energy, "if the country doesn't introduce a radical

78 SEC (2008) 85, vol. II, p. 42.
79 Herbert Smith, *Renewable Energy Trading within the EU: DECC Issues a Call for Evidence*.
80 Ibidem.
81 E. Kisel, *Developing Estonian Energy Policy Hand in Hand with EU Energy Packages*, http://web-static.vm.ee/static/failid/122/Einari_Kisel.pdf, (access: 29.08.2012).
82 Ibidem.

expansion of solar and wind power it will miss its 2020 target".[83] To avoid that, it will have to reduce its dependence on solid fuels, accounting for 47% of the domestic production of energy.

Thus, Sofia will be obliged to cut its emissions, which are currently the highest in the EU when measured by GDP unit, increase the share of renewables in the final energy consumption from 11.6% in 2009 to 16%, and rise the use of biofuels in the transport sector from as little as 0.6% today to 10% in 2020.[84] Some, if not all of these targets, "are projected at levels well above the country's potential".[85]

The EUI and the European Commission both agree in their documents that Bulgaria might struggle to fulfill its obligations, as it may be subject to some of the highest costs in relation to the size of its economy. More precisely, the former study predicts that the new policies will have a negative net public budget impact of up to 1% GDP, which would be more than ten times higher than the EU-27 average.[86] The reason given is that the Member State is categorized as having "a small, highly carbon-intensive (traditional) economy, and a low GDP per capita".[87]

Adequately, as stated by the European Commission, the implementation of the legislation may generate additional direct costs of up to 2.2% of the country's GDP, as compared to the business as usual scenario (BAU).[88] The indicator given under the cost reference option has the highest value in the Union, and is four times higher than the EU-27 average of 0.58%. Bulgaria's low starting point means that although some standards may be improved rapidly and relatively cheaply in the beginning, these costs will rise sharply after the initial phase of the investment.

Czech Republic

The Czech Republic is the third largest producer of coal and lignite in the EU after Poland and Germany, which makes its industry and consumers vulnerable to the new regulations. This feeling is reinforced by the fact "the Czechs use relatively more energy, and have a relatively more energy-intensive industry than the Poles".[89] Studies also indicate that increasing the share of renewables may prove difficult in the future, as main deficiencies in the country's abatement plan include limited potential in connection with wind energy ("the least windy country in Europe"), forestry (small territory), and biofuels (3.4% share in the transport sector as of 2009).[90]

83 Reuters, *Bulgaria Could Miss Green Energy Targets: Industry*, http://www.reuters.com/article/2010/10/28/us-bulgaria-renewables-idUSTRE69R2QN20101028, (access: 29.08.2012).
84 Eurostat, (28.03.2012).
85 Ibidem.
86 Pippo Ranci, op. cit.
87 Ibidem.
88 SEC (2008) 85, vol. II, p. 42.
89 David Buchan, op. cit.
90 McKinsey and Company, *Costs and Potential of Greenhouse Gas Abatement in the Czech Republic – Key Findings*, op. cit.

A study conducted by Open Europe estimates costs arising from CAREP to account for 1.1 billion EUR p.a., a similar amount as in the cases of Denmark or Sweden.[91] The European Commission indicates that Prague will need to face increased direct costs of achieving renewable and ETS targets of up to 1.1% of GDP of 2020, which can be even two times higher than the EU average (without mitigation mechanisms).[92] The case has been studied in detail by McKinsey & Company, a consultancy, which argues that the overall cost of achieving emission reductions of 30%, thus 10% higher than envisioned for 2020, could account for 1,5 billion EUR per year, "which translates into 0.8% of Czech GDP or 0.40 EUR per citizen daily".[93]

The Czech Republic has reserves of lignite which could cover its demands for roughly 20-30 years under the current legal setting, or even 200 years provided a major legal reform is introduced.[94] Although improving or maintaining current levels of extraction would have been a cheaper option, Prague will be required to increasingly embrace renewables and nuclear energy.

According to Paul Zagame, a professor from Universite Pantheon-Sorbonne, the situation of the Czech Republic, and other new Member States, will change drastically depending on how they decide to spend their auctioning revenues. In a scenario in which the money is used to reduce the national debt, as opposed to being recycled through public investments or redistributed to private agents, all new Member States perform poorly. While the EU would experience a decrease in GDP accounting for 0.65% in 2020, Prague would suffer from a slightly greater decrease (0.78%), but still much smaller when compared to other CEECs, such as Slovakia (2.27%), or Romania (2.20%). In the opposite case, however, i.e. when auctioning revenue is recycled to employers' social contributions and to subsidize private R&D, new Member States would be able to show some potential for growth.[95]

Putting cases into perspective: other Member States

Furthermore, a study conducted by EnergSys for the Office of the Committee for European Integration (now part of the Foreign Ministry of the Republic of Poland), enumerates Member States which may be disproportionately affected by the Package in terms of adaptation costs. According to Polish researchers, two European Member States – Estonia and the Czech Republic – may be harmed even more than Poland. These three countries are followed by Finland, Bulgaria, Denmark, Greece, and Slovenia, and due to various factors: energy intensity, low GDP, reliance on solid fuels, or high levels of industrial or household consumption.[96]

91 Open Europe, op. cit., p. 44.
92 SEC (2008) 85, vol. II, p. 42.
93 McKinsey and Company, *Costs and Potential of Greenhouse Gas Abatement in the Czech Republic – Key Findings*, October 2008,. (access: 29.08.2012).
94 Petr Binhack, Jakub Jaros, *Wyzwania Polityki Energetycznej Czech*, http://ik.org.pl/cms/wp-content/uploads/2011/07/BEZPIECZENSTWO_ENERGETYCZNE_V4.pdf. p. 58, (access: 29.08.2012).
95 Paul Zagame et. al., *Macroeconomic Assessment for the EU 'Climate Action and Renewable Package'*, Erasme, Ecole Centrale Paris.
96 Marek Niemyski, Adam Umer, *Konsekwencje Budżetowe Wprowadzenia przez Komisję Euroepjskę Pakietu Energetyczno-Klimatycznego. Ocena Możliwosci Walki ze Zmianami Klimatycznymi poprzez Obecne Polityki UE*, Warsaw, Sept. 2008.

Most analyses also confirm that the CEECs will suffer from relatively greater costs than most Western European countries. The main reason for this has to do with facing possibly bigger cuts in sectors covered by the ETS, including the electricity sector.[97]

Also, several reports point out that the Impact Assessment made by the European Commission miscalculated the pressure the legislation will put on domestic budgets, employment, consumption, and inflation.[98] While in some Member States, such as Slovakia or Italy, the debate over implied costs has not attracted much attention, in others there is a growing awareness that the climate effort may be more expensive than it had been expected.

One of the most-well researched cases is the United Kingdom. The Commission projected the overall costs of CAREP for London to fall between 0.34% and 0.49% of UK GDP in 2020.[99] But others argue that the institution "has underestimated the relative proportion of the costs that will be faced by the UK, [calculated] at around 11 billion EUR per year (9 billion GBP), or about 16% of total EU-wide costs" – suggests Open Europe, a think tank.

The UK is required by the provisions of the Package to deliver a 15% share of renewables in its final energy consumption by 2020. As of 2009, this share was only 2.9%.[100] Therefore, "considering the EU Renewables Directive alone, it is clear that the UK will be at a considerable cost disadvantage compared with other EU members".[101] This led Poyry, a consultancy, to estimations that "the annual cost to the UK in 2020 of meeting its burden share [concerning solely renewables] is between 5 billion EUR (least cost trading) and 6.7 billion EUR (domestic constraints).[102]

Consequently, the British Department of Energy and Climate Change calculated that "domestic retail gas prices are estimated to be 18% higher and retail electricity prices 33% higher in 2020 due to energy and climate change policies (compared to prices in 2020 without new measures)".[103] In the case of non-domestic retail gas prices, these costs would be, accordingly, 24% and 43% higher than in the BAU scenario.[104] Unsurprisingly, therefore, Civitas, another think tank, predicts shutting down "steel, paper, glass, and cement industries" which is only

97 Narodowy Bank Polski (NBP): Instytut Ekonomiczny, *Krótkookresowe Skutki Makroekonomiczne Pakietu Energetyczno-Klimatycznego w Gospodarce Polski: Wnioski dla Polityki Pieniężnej*, Warszawa, 2012, s. 5.
98 European Commission, *Impact Assessment to Package of Implementation measures for the EU's objectives on climate change and renewable energy for 2020*, SEC(2008) 85 , http://ec.europa.eu/transparency/regdoc/rep/2/2008/EN/2-2008-85-EN-1-0.Pdf, (access: 29.08.2012)
99 Ibidem.
100 Eurostat.
101 R. Lea, J. Nicholson, *British Energy Policy and the Threat to Manufacturing Industry*, 2010, http://www.civitas.org.uk/pdf/EnergyPolicyApril2010.pdf, (access: 19.08.2012).
102 Poyry, "Compliance Costs for Meeting the 20% Renewable Energy Target in 2020", 2008, http://webarchive.nationalarchives.gov.uk/+/http://www.berr.gov.uk/files/file45238.pdf, (access: 29.08.2012).
103 UK Department of Energy and Climate Change, *Estimated Impact of Energy and Climate Change Policies on Energy Prices and Bills*, http://www.decc.gov.uk/assets/decc/what%20we%20do/uk%20energy%20supply/236-impacts-energy-climate-change-policies.pdf, (access: 29.08.2012).
104 Ibidem.

"the tip of the iceberg (…) because they facilitate and support dependent British "downstream" industries which would probably also close if they closed".[105]

8.4. Poland and the European Union

Poland's targets agreed with the European Commission are not less ambitious than in other cases. Most widely commented obligations encompass a 15.5% share of renewables in the final energy consumption; a positive limit of 14% increase in GHG emissions in sectors not covered by the ETS (2005 baseline); reduction of GHG emissions in the ETS sectors using a decreasing number of free allowances; 10% share of biofuels in the transport sector, and a 20% increase of energy efficiency (the last target is non-binding, the rest must be achieved in 2020, with annual checks held between 2013 and 2020).

It is perhaps important to mention that Poland has been on track to comply with some of those targets. Most importantly, the country predicts a surplus with regard to RES (currently accounting for 8.9% of consumption), which it was willing to sell to Western European Member States. Nor does it predict a deficit in biofuels (current 4.8% of consumption is above the European average of 4.2%).[106]

There are countries struggling more to fulfill their respective obligations in these fields, notably the United Kingdom and Ireland, which rely on market-based mechanisms, as opposed to public subsidies. On the other hand, however, Poland, due to its history of recent transition, is in a radically different situation than Germany or the Nordic countries. Berlin, being an economic engine of Europe, is also one of the three biggest investors in RES in the world, together with China and the United States. Countries such as Sweden, although less powerful in economic terms, have been prioritizing green technologies since the oil crisis in the early 1970s.[107]

However, it is hardly debatable that Poland, with its economy based on coal, will be among the most affected. Open Europe has estimated that cost of reaching the RES, ETS, and non-ETS targets may surge to approximately 2.557 billion EUR per year.[108] This excludes grid connection costs, such as grid extensions or staff costs. Only in the case of wind farms, their developers can participate in a scheme which allows them to apply for a grant covering 40% of the cost of connecting wind farms with the grid. The total value of the grant in Poland stands at 100 million EUR.[109]

Some of the other projections are perhaps even more pessimistic. The World Bank estimates that the total GDP-impact of implementing the measures will account for -1.4% GDP in 2015 (according to the main scenario). At the same time the EU-26 (EU-27 excluding Poland) is

105 R. Lea, J. Nicholson, op. cit.
106 European Commission, *Summary of the Member States' Forecast Documents*, http://ec.europa.eu/energy/renewables/transparency_platform/doc/0_forecast_summary.pdf, (access: 29.08.2012).
107 S. Seth, *Sustainable Sweden*, http://gulfnews.com/gn-focus/sweden/sustainable-sweden-1.815778, (access: 29.08.2012).
108 N. O'Brien, H. Robinson, Open Europe, *The EU Climate Action and Renewable Energy Package: Are We About to be Locked into the Wrong Policy?*, Oct. 2008, http://www.openeurope.org.uk/Content/Documents/PDFs/carep.pdf p. 44, (access: 29.08.2012).
109 Marcin Czekanski, Wind Power Monthly, *Poland Lunches €100 million Grid-Connection Fund*, 22.08.2011.

expected to be affected to a much lesser extent (-0.55% GDP).[110] According to the Kwiatkowski Institute, the loss may be as high as 2.2% of Polish GDP if we look at the number of industries at risk of carbon leakage.[111] Only Finland, with 2.1% at risk, follows closely. The list of the most endangered CEECs also includes Romania and the Czech Republic.

Intriguingly, the National Bank of Poland looked at short term consequences of CAREP. The conclusions were unequivocal: only in 2013 the legislation may cause the country's GDP to shrink between 0.1% and 0.3%, as well as have a negative impact on production (-0.1%), employment (-0.3%), and disposable income of Polish households (-0.4%).[112]

These simulations stand in stark contrast with the estimations prepared by the European Commission which projected the cost of implementing the Package in Poland to account for between 1.24% of the country's GDP in 2020 under the cost reference option to a negligible 0.02% under the one which presupposes auctioning allowances under the ETS, full RES trade, and the use of the Clean Development Mechanism.[113]

The data presented in 2008 was criticized in Poland and treated as a serious underestimation. Above all, as the Polish Chamber of Commerce has pointed out, the mechanism of trading of "guarantees of origin" of renewable energy was practically abandoned by the EU. This means that the most favorable scenario scrutinized in the Impact Assessment will be impossible to implement and lower income countries will be disproportionally harmed by the new legislation. This applies strongly to Bulgaria, Estonia, Lithuania, Poland, and Slovakia, which expected a surplus in RES that they will be able to sell to Belgium, Italy, Luxembourg or any other Western European country unable to meet its more ambitious RES target.[114]

The impact of CAREP on the CEECs' GDP is likely to fall between 0.23% (with compensation mechanisms) and 0.35% (without compensation mechanisms), as opposed to, adequately, 0.27% to 0.29% for high-income EU countries. The costs of its implementation for Poland, in both cases, are estimated at 0.52% of GDP, that is almost two times higher than the EU-27 average of 0.28%.[115]

8.5. Conclusions: Common Goals, Worries and Adaptation Prospects

Firstly, specialists emphasize that decarbonization of an economy which produces more than 90% of its electricity from coal is extremely difficult to achieve. One needs to

110 The World Bank, *Transition to a Low Emissions Economy in Poland*, http://siteresources.worldbank.org/ECAEXT/Resources/258598-1256842123621/6525333-1298409457335/report_2011.pdf, (access: 29.08.2012).
111 Krzysztof Zmijewski, *Zagrożenie Problemem Carbon Leakage* w Polsce, Instytut Kwiatkowskiego, 03.2011, http://k.wnp.pl/f/021/309/Raport%20carbon%20leakage.pdf.
112 Narodowy Bank Polski, op. cit.
113 European Commission Staff Working Document, *Impact Assessment: Package of Implementation Measures for the EU's Objectives on Climate Change and Renewable Energy for 2020*, 2008, http://ec.europa.eu/energy/climate_actions/doc/2008_res_ia_en.pdf, (access: 29.03.2012).
114 David Buchan, op. cit., p. 32.
115 Polish Chamber of Commerce, *Energy Roadmap 2050 – Co Dalej?*, Informacja Prasowa, Warszawa, 01.06.2012.

remember that the Polish energy mix is an anomaly from the Western European perspective. Sweden and Austria generate more than 50% of their electricity from renewables; Belgium and France get more than a half of it from nuclear energy; whereas Italy, Ireland, and the Netherlands, are predominantly dependent on gas, all of which are cleaner fuels.

Secondly, Polish infrastructure is among the most outdated, and thus among the least efficient in Europe. According to experts, "the country needs to spend about 50 billion EUR over the next 10 years [and 90-100 billion EUR by 2030] if its electric energy grid is to remain operational".[116]

It has been calculated that "37% of installed capacity is between 30 and 40 years old; [and] 20% is as old as 40 to 50 years".[117] Not only power plants in Poland are much less efficient than in Western Europe (33% versus 45%),[118] but also line losses, accounting for 9.36% (8.29% according to the World Bank), have been record high.[119] Altogether, "generation and line losses constitute 25% of the country's total energy production", which puts Warsaw in a relatively weak position under the current GHG regime.[120]

When one compares electric power transmission and distribution losses, it is clear that the CEECs stand out. The figures for transmission losses in 2009 were as high as 12.17% in the case of Romania, 10.65% in Bulgaria, and 10.04% in Hungary; and as low as 4.26% in Germany or 3.88% in the Netherlands.[121]

Thirdly, as it has already been indicated, Polish and other CEEeconomies have so far provided safe havens to energy intensive industries. One example is the cement industry (including clinker, an intermediary product). Production of one tonne of this binder "requires 60 to 130 kilograms of fuel oil or its equivalent, depending on the cement variety and the process used, and about 110 KWh of electricity".[122] Due to potentially high costs of emissions under the ETS and the danger of capital relocation, the industry was given free allocations of 100% for the most efficient installations, subject to benchmarking based on the best 10% of installations in 2007-2008.

Nevertheless, the legislation still increases the risk of losing competitiveness against external competitors. The limits of CO_2 emissions imposed, based on CAREP, are now set at 766 kilograms of CO_2 per ton of grey cement clinker. Polish production, although reliant on new technologies and less pollutant than the EU-average, exceeds this limit by 60 kilograms, which may translate into an obligation to buy between 3 and 4 million tonnes of CO_2 permits.[123]

Further reductions, without wide access to an expensive carbon capture and storage technology (CCS), will be very difficult.[124] This in result may create a risk of carbon leakage, especially that Poland is a border state and cement prices in Belarus and Ukraine are relatively low.

Moreover, one cannot forget that the economies of the CEECs have been developing faster in recent years than those of Western Europe. Therefore, the demand for energy-intensive products is on the rise, especially in the East: in Poland demand for cement is expected to account for 22-23 million tonnes in 2018, up from 16.7 million tonnes in 2011.[125] Due to the ETS legislation, growing needs might not be matched by production capabilities. According to experts, "the ETS has [already] hindered investment in the EU", and fearing of eventual future costs, "there is, at present, not a single decision to invest into new capacity in the EU".[126]

Industries in other European countries will also be affected, although disproportionately. That is because in many cases "the European countries lack significant domestic cement production and as such, they rely on their non-EU partners to supply cement to meet their needs".[127] States such as Italy or Spain not only have seen their domestic cement production decrease due to economic slowdown, but they also rely on imports. Thus, some of the main beneficiaries of the new regulations may appear not in Europe, but in China, Turkey, and in North Africa.[128] For British consumers and producers, the possible alternative between imports and domestic production is even less clear-cut: transportation of cement could make it only slightly less expensive than if it was produced domestically.

Cement sector is just one example of an energy intensive industry prone to implications of CAREP, but other sectors, such as paper, steel, aluminum, and non-ferrous metals, may face similar difficulties. Strict adherence to benchmarking will mean that, for instance, only 5% of producers of fertilizers may get free emission allowances. As in the case of the cement industry, "global market supply and demand dictates fertilizer prices, so many European manufacturers in the OECD are unlikely to be able to pass on the significant additional environmental costs and will lose out to competitors, typically in non-OECD regions including North Africa, Russia, and parts of Asia".[129]

Finally, surging energy prices for households, analyzed briefly in the second part of the chapter, as well as other consequences that have been brought into light, notably energy

116 Martyna Olik, *Massively Underinvested in Energy Infrastructure*, Warsaw Business Journal.
117 E. Molenbroek, K. Blok, ECOFYS, *Saving Energy: Bringing Down Europe's Energy Prices*, May 2012, p. 10.
118 Narodowy Bank Polski, op. cit.
119 Bob Schwieger, Giorgio Dodero, Nuovo Energia, http://www.nuova-energia.com/index.php?option=com_content&task=view&id=3209&Itemid=113 (access: 29.08.2012).
120 Ibidem.
121 World Bank data.
122 The European Cement Association.
123 WNP Portal Gospodarczy, *Limity Emisji CO_2 Zagrażają Polskiemu Przemysłowi Cementowemu*, 16.01.2012.
124 AGGNet, *Cement Industry Concerns Over EU-ETS Plans*, 30.01.2008.
125 Polish Cement Association, *Przemysl Cementowy: Charakterystyka i Wplyw na Srodowisko*, p. 8.
126 *ICIS Heren, Cement Industry Says Free EUA Carbon Rules are 'Impossible'*, 03.04.2012.
127 David Merlin-Jones, CIVITAS, *Rock Solid? An Investigation into the British Cement Industry*, Nov. 2010.
128 Ibidem.
129 Business and Industry Advisory Committee to the OECD, *Carbon Leakage and Competitiveness Impacts*, 2010, p. 10.

security, together indicate that CAREP may contribute to slowing down growth prospects of CEEC economies, especially those reliant on coal, as well as cause increasing energy dependence.

It is also in Eastern Europe where industry accounts for a higher proportion of GDP than in the West and more emissions are caught in the system.[130] Thus, as prof. Zmijewski of Warsaw Technical University has put it, it is difficult to avoid the feeling that "EU policies have been created to satisfy the needs of the postindustrial economies, while hurting those which rely on traditional industry production".[131]

130 David Buchan, op. cit.
131 WNP Portal Gospodarczy, *K. Zmijewski: Polityka Klimatyczna tylko dla Bogatych*, 10.03.2012.

9. Guidelines for the Implementation of Measures to Ease the Negative Effects of the Climate and Energy Package

9.1. An Analysis of Possibilities to Review the Provisions of the EU Climate and Energy Package within the Existing Legal Framework – *Piotr Szlagowski*

Introduction

The corpus of EU climate law consists of dozens of various legal acts (from directives to regulations and decisions) and their scope ranges from promotion of renewable energy and its integration into energy markets of Member States, through GHG emissions reduction, to energy efficiency. The multitude of legal acts that together form the EU Climate and Energy Package allows to state that there is no single measure that would provide for revision of the whole corpus of law. Therefore, the analysis of possible actions that would lead to the review of the Package under the existing legal framework shall commence with indicating the legal bases of the EU climate law at the treaty level. This will allow us to indicate the immediate legal context within which the possible actions shall be defined.

The most relevant legal acts of the Climate and Energy Package include:

- Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC;

- 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;

- Directive 2006/32 of the European Parliament and of the Council of 5 April 2006 on energy end-use efficiency and energy services and repealing Council Directive 93/76/EEC;

- Directive 2010/31 of the European Parliament and of the Council of 17 May 2010 on the energy performance of buildings and its amendment;

- 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;

- Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009 on the geological storage of carbon dioxide and amending Council Directive 85/337/EEC, European Parliament and Council Directives 2000/60/EC, 2001/80/EC, 2004/35/EC, 2006/12/EC, 2008/1/EC and Regulation (EC) No 1013/2006.

The enumerated legal acts were adopted on the basis of two treaty provisions entitling the EU institutions to undertake legislative measures:

- Article 175 (1) of the Treaty establishing the European Community (hereinafter referred to as 'TEC') or Article 192 (1) of the Treaty on Functioning of the European Union (hereinafter referred to as 'TFEU'), which is an equivalent of the former;

- Article 194 TFEU.

Article 192 TFEU

Article 192 TFEU (ex Article 175 TEC) shall be interpreted jointly with Article 191 TFEU, since it stipulates that the European Parliament and the Council, acting in accordance with the ordinary legislative procedure and after consulting the Economic and Social Committee and the Committee of the Regions, may decide on taking legislative (or other) actions by the Union in order to achieve the objectives referred to in Article 191. These objectives are: preserving, protecting and improving the quality of the environment, protecting human health, prudent and rational utilization of natural resources, promoting measures at international level to deal with regional or worldwide environmental problems, and in particular combating climate change. Therefore, whenever their actions may be justified by the enumerated objectives, the EU institutions may decide to undertake specific actions, such as those making up the Climate and Energy Package.

Moreover, it shall be noted that combating climate change is one of the aspects of the EU's environmental policy that is inherent to the TFEU. Article 191 TFEU stipulates that promoting measures at international level to deal with regional or worldwide environmental problems, and in particular combating climate change, is one of the EU's objectives. However, the letter of the discussed provision does not provide for explicit statement that combating climate change is the EU's objective with respect to its internal affairs, and it only says that promotion of adequate measures shall be carried out at international level. Nevertheless, the contextual interpretation should rather direct us towards a conclusion that TFEU not only provides for climate-oriented internal EU policy but also extends this policy onto the EU's international agenda.

The above discussion of the content of the legal norm derived from Article 192 (1) TFEU in relation to Article 191 (1) TFEU leads us to a conclusion that climate change mitigation is among the values protected by the TFEU. Therefore – as such – it shall be pursued and it shall not be abandoned in its entirety. Thus, from the point of view of potential revision of the EU Climate and Energy Package within the existing treaty law, one ought to seek measures that would counterbalance its provisions on environmental protection and climate change mitigation.[1]

TFEU sets out a number of values that it shall protect and/or pursue to fulfill, including environmental protection and climate change mitigation.[2] The values may remain in various relations towards one another. E.g. climate change mitigation may lead to improvement of energy security, as well as work to its detriment, depending on particular circumstances.

A certain measure that should serve such balancing of values protected by the TFEU is incorporated into Article 192 itself. Section 5 reads that if a particular measure involves costs deemed disproportionate for the public authorities of a Member State, such measure shall lay down appropriate provisions in the form of:
- temporary derogations, and/or
- financial support from the Cohesion Fund.

In view of practical implications of Article 192 (5) for the political aim of reviewing the provisions of the Climate and Energy Package, it is worth emphasizing that measures set out therein may serve as a basis to counterbalance adverse effects of measures newly introduced under Article 192 (1) or (2). However, they may as well be used in order to provide for new measures that mitigate the unwanted results of measures adopted in the past. Therefore, Article 192 (5) could serve as an *ex post* softener of climate change mitigation measures that are currently in place.

Article 194 TFEU

Article 194 TFEU is a provision that was absent from the EU treaty law prior to the adoption of the TFEU. It stipulates that in the context of the establishment and functioning of the internal market and with regard for the need to preserve and improve the environment, the Union policy on energy shall, in a spirit of solidarity between Member States, aim to:
- ensure the functioning of the energy market;
- ensure security of energy supply in the Union;
- promote energy efficiency and energy saving and the development of new and renewable forms of energy; and
- promote the interconnection of energy networks.

In view of the above, it is clear that Article 194 has particular significance for two areas of the EU climate policy: energy efficiency and development of renewable forms of energy. The remaining aims enumerated in the Atricle are primarily related to other policies. Ensuring

1 J. Staniszkis, *Antropologia władzy*, Warsaw 2009, p. 208.
2 The notion of values is used in this text in a sense similar to Dworkin's notion of principles.

the functioning of the energy market, as well as promoting the interconnection of energy networks contribute to integration and well-functioning of the internal market of energy. Simultaneously/At the same time, ensuring security of energy supply in the Union is an important policy area *per se*. What is noteworthy, none of the mentioned policy areas shall be deemed privileged in relation to to other policy areas. In other words, under Article 194 TFEU all policy areas, for the purpose of which this provision was included in the text of TFEU, should be implemented on an equal footing. Hence the need for balancing the discussed policy areas. For instance, promotion of renewable forms of energy should not adversely affect security of energy supply in the EU; it should be implemented in such a manner and to such a degree that the state of energy security is at least not deteriorated.

Importantly, TFEU provides for one more constraint regarding implementation of the EU policies on the basis of Article 194. It stipulates that – in principle (we shall deal with a certain seeming deviation from this norm later) – measures adopted under this provision shall not affect a Member State's right to determine the conditions for exploiting its energy resources, its choice between different energy sources and the general structure of its energy supply. This provision refers to a rule of customary international law – sovereignty over natural resources. In line with the said rule, any measure that affects a Member State's right within the designated scope shall require consent of the given Member State. Consequently, introduction of such measures at the EU level requires unanimous support on the part of Member States.

However, as it was signaled earlier, there is a *prima facie* deviation from the TFEU rule reflecting the sovereignty of Member States over natural resources. At the end of Article 194 (2) *in fine* reads that the sovereignty of Member States over natural resources shall be without prejudice to Article 192(2)(c), which directs our analysis towards the question of relations between Article 192 TFEU and 194 TFEU.

Relations between Article 192 TFEU and 194 TFEU

Article 194 (2) TFEU limits the scope of sovereignty of Member States over their natural resources so as not to allow for arisal of a conflict between this provision and Article 192(2)(c). The latter stipulates that measures significantly affecting a Member State's choice between different energy sources and the general structure of its energy supply (i.e. measures contrary to the sovereignty of Member States over natural resources) may be adopted in order to achieve objectives set out in Article 191 TFEU (ex 174 TEC), i.e. (i) preserving, protecting and improving the quality of the environment, (ii) protecting human health, (iii) prudent and rational utilization of natural resources, and (iv) promoting measures at international level to deal with regional or worldwide environmental problems, and in particular combating climate change. This would suggest that, unlike in the case of a balancing mechanism for implementation of various policy objectives within the field of energy incorporated into Article 194 TFEU, the relation between Article 194 and Article 192 (2) is hierarchical. However, Article 192 (2) allows for adoption of a measure limiting the sovereignty of Member States over natural resources only if a given decision is made unanimously by Member States. This in turn undermines the hypothesis of limitation of Member States' sovereignty over natural resources by Article 192 (2) TFEU.

The above considerations lead us to a conclusion that relation between Article 194 and Article 192 is not of a hierarchical nature; one may say that – on the contrary – the character of this relation is to be negotiated *ad casum* and in such a way that both elements are fulfilled to such an extent that they do not cause adverse effects on each other.

In the context of legal measures to review the Climate and Energy Package, it can be said that although under TFEU there is no direct possibility to abandon climate policy, its impact may be counterbalanced by highlighting two policy areas protected by Article 194 (1) TFEU, i.e. functioning of the internal market of energy and ensuring security of energy supply in the Union.

Argumentation in defence of Poland's coal-based energy mix may be one practical example of such a balancing approach. Although it is the Union's objective to protect environment and mitigate the climate change, introduction and implementation of overly radical measures leading to this end may (in short and medium term) result in insufficient supply of electricity, thus adversely affecting the value of the Member States' security of supply in energy.

Conclusions

In order to conclude this part of the chapter, we shall note that since the Climate and Energy Package consists of a number of legal acts, there is no single measure that would provide for revision of the whole Package. We have shown, however, that the relevant legal acts were adopted on the basis of two treaty provisions entitling the EU institutions to undertake legislative measures, i.e. Article 192 and Article 194 TFEU. In consequence, actions aimed at revision of the Package should be directed at and based upon interpretation of these two TFEU provisions and – in particular – the relationship between them.

It shall be emphasized that combating climate change is one of the aspects of the EU's environmental policy that is inherent to the TFEU. Nevertheless, as it was demonstrated in this analysis, neither the environmental policy in general, nor the objective of climate change mitigation in particular are hierarchically superior to other values/principles protected by TFEU, such as functioning of the internal market of energy or ensuring security of energy supply in the Union. Consequently, a favorable method for revision of the legal approach towards the Climate and Energy Package is to apply a Dworkinian approach of balancing principles of TFEU; in particular – counterbalancing the principle of climate change mitigation with principles of functioning of the internal market of energy and/or ensuring security of the energy supply in the EU.

9.2. Analysis of Options to Increase the Polish Compensations Provided by the Climate and Energy Package within the 2014-2020 Budgetary Period – *EY Team*

The Climate and Energy Package introduces certain preferences and compensation mechanisms for the less developed countries that would face severely negative impacts of the new regulations. The renewable energy targets were decreased for some of the countries (including Poland) from 20% to 15%. With regard to GHG emissions generated within the sectors not covered by the EU ETS, a 14% rise is allowed.

Certain preferences were granted when union-wide GHG emissions limit was established. Poland will receive 250 million emission allowances, worth between 2.5 and 5 billion EUR (10-20 EUR each). Allocation of free emission allowances to the energy generators is being granted from the auctions' pool and that is why it is not considered an additional compensation for Poland and other countries. Granting preferences and compensations may be responsible for lowering GDP (when compared to the baseline scenario) by 1% per annum for the next 20 years and until 2020, the amount will reach 20-40 billion EUR.

The possibilities for increasing preferences and compensations on the basis of the Climate and Energy Package have been limited so far. In practice, introduction of any other (additional) compensation mechanisms requires revision of some parts of the Climate and Energy Package. Given the EU incentives for increasing reduction targets, it is likely that an attempt at revising the legislation may cause an opposite effect. Nevertheless, revision of some selected regulations should be considered, i.e. a duty to perform '*CCS Ready*' assessment for operators of new combustion plants with a rated electrical output of 300 MW (mostly plants based on coal and gas)and if conditions are met, responsibility to ensure suitable space for carbon capture and storage installations.

Current regulations provide that the European Commission is in the possession of a reserve of allowances for the new installations covered by the ETS (excluding electricity generators). 300 million EUR from this reserve is allocated to the CCS development program. Since most of the CCS projects have been delayed, it is expected that some funds may be reallocated to compensation mechanisms.

If Poland won the case before the European Court of Justice regarding the benchmark level set for the heating industry, considerable ease for the heat industry would be introduced. The aforementioned benchmark was stipulated by the European Commission's Decision 2011/278/EU for all sectors excluding electricity producers. The legal authority for the Commission to issue such decision was granted by the Article 10a of the ETS Directive. Benchmarks for various types of goods were set, based on the average of 10% of the most GHG-efficient installations, regardless of other technologies and resources used. In the heating industry a benchmark was set on discriminatory basis, as the heat produced in gas technology emits only half of the heat produced in the coal technology. Poland brought a case before the European Court of Justice in Summer 2011, arguing lack of proportionality and the fact that the Commission was imposing discriminatory measures. The charges seem to be particularly appealing when it comes to granting allowances for the heating industry. However, it ought to be noticed that even winning the case would not cause an immediate and automatic modification of the benchmark levels, nor would it increase the quantity of the allowances. A judgment in favor of Poland would only mean that the Commission would have to revise the rules that were used while setting benchmarks and better explain the application of such rules. A similar scenario took place when Poland won in the Court of First Instance and then before the Court of Justice of the European Union in the case regarding rejection of the National Allocation Plan 2008-2012 (judgments T-183/07 CFI of 23rd September 2009 and C-504/09 P CJEU of 29th March 2012). Nevertheless, winning the case on benchmark levels would create better conditions for negotiation of compensation in other sectors in the 2014-2020 budget.

Works on the new budget are now being conducted and this is the last moment to consider inclusion in the budget of the compensation for the consequences of the implementation of the Climate and Energy Package. Proposed changes on the revenue side caused by the new tax from financial transactions may help to support compensation claims. The new stream of revenues from that tax is expected to decrease the level of fees payable by each Member State but such reduction can be delayed. It would allow creating a compensation fund which would be used to increase economic growth and development in economies based on coal energy. It is also in favor of well-developed countries because fees are calculated on the basis of GDP. Considering EU plans, stated as a draft plan for the period up to 2050, creation of such a system could prove an effective solution for many years to come.

Compensation may be accomplished by increased subsidies for infrastructure or environment projects. Such propositions must be included in the Polish proposal which is partially prepared by way of introduction of investment into distribution systems. Enforcement of distributed generation would require reconstruction of the power grid and measurement-payment systems into a smart grid. For Poland, the most important thing is to support building CHP installations, which will substitute water boilers fueled by coal. It may remove obstacles caused by introduction of the Climate and Energy Package and the Industrial Emissions Directive. Another area which requires support is the renewable energy sector. It is worth thinking about exceeding the established goal of 15% RES share in 2020 by using funds from the EU budget for 2014-2020. The other area is the development of low-carbon coal combustion technologies. Poland and Germany should be clear market leaders in that area.

Achieving our goals in the course of drafting the budget will not be an easy task, although the first step towards success must be taken domestically. It has to be decided in which areas Polish national economy should particularly grow between 2014-2020.

Certainly, rebuilding of the energy sector should be one of the se crucial areas, given the assumptions of the Climate and Energy Package.

9.3. Establishment of a Coalition of EU Member States for the Review of the EU Climate and Energy Package – *Piotr Szlagowski*

Introduction

The analysis carried out in the previous part of this chapter demonstrated that under the existing legal framework there is no direct way to undermine the legitimacy of the EU Climate and Energy Package at length. In turn, an analysis of interests of different Member States demonstrates[3] that although various aspects of the Climate and Energy Package raise concerns among a number of Member States, they do not add up to an overall rejection of its premises and objectives. In consequence, formation of a general coalition of Member States in opposition to the Package does not seem viable. In the absence of a chance for a far-reaching solution, in this analysis we will focus on limited and fragmented areas to which the balancing of TFEU principles and/or changing the direction of the EU climate policy discourse can be applied. We will attempt to define several exemplary thematic areas in which implementation of such an approach could be undertaken. Having pointed out those areas, in the next step, we shall indicate potential coalitions of EU Member States that could be established, taking into account objectives of *ad hoc* coalitions and interests of particular Member States.

Reconstruction of the EU Climate Policy Discourse

In order to determine how the EU climate policy discourse may be altered in such a manner as to serve the purpose of limiting the ambitious targets of the Package, first we shall describe the functions of this discourse and indicate its core elements. This will unveil before us the conditions, which need to be taken into account when building coalitions against the deepening of the EU climate commitments on the case-by-case basis.

The EU climate policy discourse stands on three pillars. The first is related to perception of the climate change as a threat to biological existence of man and his environment, and a conviction that this change results from human actions (antropogenic climate change).

The second pillar is based on a conviction that the economic development should be sustainable and thus any disruption of this progress is seen as a threat to existence of the community and its way of life (in Foucaultian sense). In order to prevent this threat, the discourse of the knowledge-based economy offers the development of innovative technologies in order to sustain the comparative advantage of postindustrial economies. Green and other low-carbon (or no carbon) technologies constitute a significant part of such innovative industry.

The third and last pillar of the EU climate policy discourse is energy security. The development of renewable energy sources and increase of energy efficiency are to contribute to the independence from supply of energy (or energy products such as natural gas) from third countries. Furthermore, according to this view the increased energy independence should pay a significant role in decreasing energy prices.

The following analysis will focus on five selected areas that will serve as examples of (i) how to address the EU climate policy discourse in order to review its content and (ii) indicate what possible coalitions may be built for this purpose:

- the use of coal;
- carbon leakage;
- adjustment of the EU climate policy to diversity of EU Member States' economies;
- support for renewable energy development;
- post-Kyoto international commitments.

Problem: the Use of Coal

One of the most natural potential issues, around which a coalition of Member States disapproving the Package could be built, is the use of coal as a primary energy source. This group comprises Poland, Greece, Estonia (oil shale), the Czech Republic, Bulgaria and Romania. For instance, Greece will replace old coal-fired power plants with new ones within five years, in order to secure its supply of electricity. For this reason it is expected not to be able to reduce its GHG emissions. Also Poland, which has the highest share of energy produced from solid fuels (83,5%) and is the largest producer of coal among all Member States (55077 toe), will build new coal-fired power plants that will allow it to meet the domestic demand for electricity.

From the point of view of the EU climate discourse – as well as in the light of Article 194 TFEU – an emphasis on the role of coal for energy security of certain Member States is essential. Departure from the use of coal will cause not only its substitution with renewables but these, in turn, will require backup power generation. This role is likely to be played by gas, because gas-fired power plants allow for immediate commencement of power production, should the demand not be met by the production from renewables. The effective substitution of coal with gas may lead to further increase of dependency rate of the EU on Russian gas, thus increasing vulnerability of these Member States to energy imports from outside the EU which, in turn, is the opposite of the objectives of the Package.

There is yet one more aspect concerning the problem of the use of coal under the Climate and Energy Package – promotion and development of the carbon capture and storage (CCS) technology. The EU climate discourse does not unconditionally eliminate coal as a primary source of energy. It does allow for its use, provided that it would encompass use and development of new technologies, i.e. CCS. This position aims at achievement of two of the main goals of the discourse: (i) gaining a comparative advantage through development of innovative technologies, (ii) mitigation of climate change. In fact, the development of CCS could be a silver bullet for the EU's climate policy and its opponents. The only problem is that the development of CCS is likely to be a fiasco. Most of the EU-supported pilot projects were suspended.[4] Probably none of the 9 projects of the NER 300 (*New Entrants Reserve*) list will deliver a success. From further 6

3 See in particular chapters 2 and 8.

4 Energate, 20.03.2012.

projects supported under the auspices of EEPR (*European Energy Programme for Recovery*), only one installation is to be completed (in Dutch Maasvlakte, in 2015). Main obstacles to the use of CCS on industrial scale are low efficiency and high capital intensity. From the perspective of the coal-dependent Member States, it should be argued that special temporary measures (e.g. derogations under Article 192 (5) TFEU) should be introduced until a proper technology allowing for clean use of coal is developed; otherwise the Package fails to address issues of energy security and comparative advantage with respect to these countries.

Moreover, in the context of the use of coal, it shall be noted that recently Poland and Estonia won their cases against the Commission before the European Court of Justice. The dispute concerned alleged incompatibility of the Polish national allocation plan for distribution of emissions allowances with the Directive 2003/87/EC of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community. The Commission claimed that the amount of allowances allocated to certain installations exceeded their needs and thus infringed the Directive. The Court did not share this view and decided that "the review power conferred on the Commission under Article 9(3) of Directive 2003/87 is limited to review of the conformity of the data in each national allocation plan with the criteria set out in Annex III to that directive and that the Commission is not entitled to replace the data inserted by the Member State in its plan with its own data".[5] Furthermore, the Court stated that "[t]he Member States alone have the power to draw up a national allocation plan and to take a final decision on the total quantity of allowances to allocate".[6] From the point of view of this analysis, it is important to emphasize that the Court restrained the Commission's attempt to interpret the legislative acts included in the Climate and Energy Package in a manner leading to maximization of their effects.

Problem: Carbon Leakage

Carbon leakage resulting from relocation of GHG emission-intensive production from EU Member States to other countries (not necessarily remote ones) is a phenomenon that in the most direct way contradicts two areas of the climate policy discourse. It demonstrates the inadequacy of the energy and climate policy measures (at least in case of several Member States) to secure the comparative advantage of the EU economies and to achieve the ecological objective of global reduction of GHG emissions.

The Member States most vulnerable to the effect of carbon leakage are Greece, Romania, Bulgaria and other Central and Eastern European countries. The Member States that acceded to the EU in 2004 or later were beneficiaries of low labor costs and thus absorbed a significant part of production relocated from Western European countries. Moreover, they – and Greece alike – are bordering states and their location results in ease of production transfer to non-EU countries that are not subject to emission allowances.

The Member States that to the greatest extent may be vulnerable to relocation of production as a result of the rise of energy or emission costs in connection to the EU energy and climate policy, should

5 Case C-504/09 P, para. 61.
6 Ibidem.

point to the fact that preservation of the overall comparative advantage by the EU Member States in relation to other economies is one of the major tasks of the Climate and Energy Package. Therefore, the policy should be amended in such a way (for instance by means of derogations), as not to cause carbon leakage. Should that not be possible, an alternative solution is to delay the implementation of the Climate and Energy Package provisions until an international agreement on the reduction of GHG emissions – and thus leveling the playing field – is in place. The latter argument can be raised in particular by these Member States in relation to proposals to raise the EU commitments concerning GHG reductions, as well as production of energy from renewable sources.

This argument can be strengthened by a claim referring to the strictly ecological purpose of the Package, i.e. mitigation of the climate change. The goal of the climate policy is not to relocate GHG intensive production but to cut the emissions. Therefore, any measures that result in relocation of production only, do not lead to achievement of the ecological objective; moreover, they adversely affect the competitiveness of Member States. Hence, the overall balance of such measures is negative for the EU economies.

Problem: Adjustment of the EU Climate Policy to the Diversity of EU Member States' Economies

The problem of carbon leakage is closely related to the issue of diversity of EU Member States' economies, since it stems from the structure of these economies. In this light the economies of Central and Eastern European countries, i.e. the typically industrial economies, are far more vulnerable to adverse effects of the energy and climate policy. Although in the case of postindustrial economies of Western European countries the Package may contribute to their comparative advantage on the global markets through its influence on the development of innovative low-carbon technologies, the situation is different with regard to the industrial economies of their Eastern counterparts.

As it was shown when discussing the problem of carbon leakage, due to this inadequacy of the climate policy for the CEE states, it may fail to result in a global reduction of GHG emissions, while adversely affecting the competitiveness of these EU Member States. Moreover, the energy security may be compromised due to two factors. Firstly, the energy security is about securing the supplies at affordable prices for the given economies and this may not be possible to achieve (as shown with respect to particular countries in the previous chapters of this study). Secondly, a departure from the use of coal will cause not only its substitution with renewables but these, in turn, will require backup power generation. This role is likely to be played by gas, because gas-fired power plants allow for immediate commencement of power production, should the demand not be met by the production from renewables. The effective substitution of coal with gas may lead to further increase of dependency rate of the EU on Russian gas.

The coalition of the CEE countries should postulate a departure from the one-size-fits-all energy and climate policy of the EU and altering it in such a way that would enable them to benefit from their stage of economic development. This would require a greater flexibility on the part of Member States with postindustrial economies, as development of their export of low-carbon technologies to these EU Member States would, in consequence, be held.

Problem: Support for Renewable Energy Development

Another problem that a number of Member States are facing is financing of the renewable energy development at the time of economic crisis. The review of energy portfolios and policies carried out in the previous chapters showed that four countries in particular – Spain, Italy, Greece and the United Kingdom – may need to deal with the aforementioned problem.

Spain's targets include 20% share of renewables in final energy consumption, and 10% reduction of GHG emissions in non-ETS sectors. The share of renewables in 2009 was 13,3% and Madrid told the European Commission that it would have a surplus by 2020, but these ambitions have failed, since the economic crisis forced Spain to cut financial support for renewable energy. However, the lack of cost-efficiency is one thing, and yet another is the overestimation of the energy consumption by the previous government, which resulted in a growth of generating capacity to about twice of Spain's peak demand.

The similar case is with Greece. Among its major challenges with regard to fulfilling the targets is the lack of financial resources for investments in renewable energy. Although Athens proposed to raise its targets, at the same time it has cut its subsidies to solar panels by 12,5%. Also attracting the capital by offering 20-year supply contracts at guaranteed prices may result in overinvestment and an increased financial burden.

In Italy, renewable energy sources account for only 8,9% of domestic production, which is below EU standards. And although for the time being statistics are slowly improving, this path may be abandoned for the same reason as in the case of Spain or Greece – in the nearest future, as the government in Rome may be obliged to slash its subsidies in order to balance the budget.

The United Kingdom, where renewables make up just 2,2% of energy mix (as of 2008), is in a similar situation. The UK intends to fulfill the Renewable Energy Strategy, which aims to increase the total participation of renewables to 15% by 2020, however, accomplishment of this target remains doubtful at best. Again, this uncertainty stems from the fact that in 2011 London decided to cut down its public energy subsidies for renewable energy sources.

This sketch allows us to suggest that crisis-affected Member States may potentially participate in coalitions aimed at either maintaining targets at their current level or even their reduction (should the economic crisis become yet more severe).

With reference to the discourse of climate and energy policy in the EU, it can be said that the negative impact of financial support for renewables on economies of Member States contradicts the promise of sustainable development inherent to this discourse, which should stem from the innovative nature of the technologies.

Problem: Post-Kyoto International Commitments

The implementation of the Climate and Energy Package by the EU alone has two main results. Firstly, it does not lead to a global reduction of GHG emissions, due to the effect of carbon leakage (i.e. GHG emission intensive production is relocated to non-EU states, where no emissions allowances are required and thus overall costs of production are lower). Secondly, the impact of this policy on a number of EU Member States' economies is negative. These two reasons underlay the EU's desire to conclude an international agreement containing commitments on GHG emissions reductions for non-EU economies. Such an agreement would – at least to a certain extent – level the playing field for competition between the EU and non-EU economies with respect to costs of climate policies.

The most advanced negotiations are conducted at the forum of parties to the United Nations Framework Convention on Climate Change. It is in the interest of all the EU Member States to finalize the international agreement leveling the playing field with regard to GHG emissions reduction costs, hence this is a unique area where building a wide coalition is possible. However, due to reluctance of non-EU parties, the EU is unlikely to succeed if it insists on too far-fetched conditions. To demonstrate an example of the mentioned reluctance to introduce restrictive climate policies is the U.S. fierce reaction to the inclusion of the aviation sector in the EU ETS. In October 2011 The U.S. House of Representatives passed the European Union Emissions Trading Scheme Prohibition Act, which, if passed by the U.S. Senate and signed into law by President Barack Obama, would oblige the U.S. Department of Transportation to prohibit U.S. aircraft carriers from participating in the EU ETS. This example shows that it is essential for the EU to adopt such a negotiating position that would be acceptable to non-EU countries.

This context may be favorable to those EU countries that remain highly dependent on coal, suffer from or are vulnerable to carbon leakage or have difficulties with achieving targets for production of energy from renewable sources (for instance, due to the economic crisis). The situation would allow them to argue for a necessary amendment (or at least for restraining from further radicalization) of the hitherto Climate and Energy Package, in order to produce a coherent negotiating position for international negotiations at the UNFCCC parties forum. Such a tactic would allow these Member States to use to their own advantage at least two of the main elements of the Package's discourse – it would be with benefit to the global GHG emissions reduction and, thus, to the climate change mitigation and it would allow the EU to maintain its comparative advantage in economic terms.

9.4. Recommendations for Government and Industries

The analysis of opportunities and risks posed by CAREP's (the EU Climate Action and Renewable Energy Package) implementation for Poland carried out in response to the needs of this report allows for the formulation of a number of recommendations for the government and industry sectors in order to mitigate the risks and fully utilize the potential of emerging opportunities. The recommendations have been divided according to the issue they relate to.

GHG abatement targets	
Issue	The EC and some EU Member States are aiming for more ambitious EU climate policy targets.
Recommendations	▶ Activities related to the development of the "Roadmap 2050": • Obtaining the approval of EU Council for prolonging the stage of working draft creation. • Carrying out a detailed analysis of the GHG abatement potential in the context of economic capabilities. • Linking targets for particular years to accept binding and globally recognized obligations that, in particular, relate to those developing countries that Poland is in direct competition with regarding the employment market and sectors of the economy generating low-processed products. • Accepting the assumption of not raising the 2020 targets. ▶ Suggested actions: • Establishing within the EU at least three facilities that would create projections and assess the impacts of GHG reduction for the entire EU and individual countries. It is recommended that countries participate in those facilities. • Creating suitable R&D domestic structures to cooperate with the EU facilities and support the government. • Building or reinforcing the alliance of EU states and industries put at risk by the EU CAREP. • Stimulating the national and pan-European PR and lobbying campaign: · Ad-hoc creation of coalitions to meet the needs of particular solutions. · Using the economic crisis as an argument in favour of the streamlining of the EU climate policy and the need to link the climate/environmental policy with the cohesion policy. • The Minister of the Environment should take the lead in coordinating government policy and the activities being undertaken by industries. • The Minister of the Treasury should take advantage of proprietary supervision mechanisms in order to coordinate the lobbying activities of the leading treasury companies. • Launching an informed discussion with environmental organizations about the actual conditions on satisfying the requirements of the Package. Initiating direct discussions, as opposed to Brussels' mediation, appears to be a better solution.
Counteracting the weakening of EU companies' position on the global market and carbon leakage	
Issue	The lack of binding and globally recognized obligations with regard to the reduction of GHG emissions clearly creates disproportionate conditions for running businesses in the EU, which may result in production being relocated outside the EU.
Recommendations	▶ Monitoring of conditions for business running that hamper competition and carbon leakage in the EU which take into account individual differences between Member States. ▶ Seeking ways to extend the period of validity of free allowances and to maintain/expand the range of allocations of free emissions for sectors particularly affected by the relocation of production outside the EU. ▶ Correlation of compensation mechanisms with the levels of intensity of carbon leakage in individual Member States. ▶ Developing a proposal between 2015-2017 to carry out an analysis of the level of implementation of international GHG abatement obligations and including the results in the creation of regulations which would help maintain the reduction targets at levels that minimize the risk of carbon leakage. ▶ Voicing arguments about the social effects of closing down and relocating whole industry sectors outside the EU and their impacts on economic growth and the unemployment level.

Balancing the effects of disproportionate costs caused by the EU climate policy implementation	
Issue	The EU climate policy implementation costs are disproportionately distributed among individual Member States. Poland belongs to a group of states that will bear the highest cost of CAREP implementation.
Recommendations	▶ Developing a proposal for the EC to draw up an intermittent assessment report on the distribution of CAREP's implementation costs among individual Member States. It is necessary that an agreement be reached between all Member States (not just being limited to the EC level) regarding the methodology being used for the assessment, so that no costs are purposefully lowered and no unrealistic revenues are promised that could be derived from the creation of new jobs or the export of technology. ▶ Developing a proposal to develop a fixed funding mechanism based on the solidarity principle that would help mitigate the disproportionate distribution of costs that the implementation of CAREP entails. ▶ Putting an emphasis on the fact that because of the coal-dependent energy mix, which stands out among other EU countries, Poland needs to be treated separately in light of the current climate policy (e.g. by introducing transitional periods). ▶ Aiming for the differentiation of economy development models among EU regions. These models should take into account the situation in particular Member States or their groups, so that they better suit their conditions. ▶ Maintaining the mechanism that differentiates GHG abatement targets within the EU, based on the level of development and the energy mix of individual countries.
Promoting and supporting the development of innovative technologies in Poland	
Issue	Polish companies do not participate in the production market and delivery of low-emission technologies.
Recommendations	▶ Promoting and supporting R&D collaboration between universities and the leading domestic companies. ▶ Analysing the potential for formulating principles for cooperation between R&D facilities and domestic companies that would be preferential to the public contract regime. ▶ Supporting the development of markets for high-processed products that could be produced in Poland. ▶ Promoting the international collaboration that aims at developing and mastering new clean coal technologies (low emission coal processing) and CCS. ▶ Developing a proposal to remove the obligation of performing CCS ready analysis (as an unwarranted cost incurred by investors) until credible results from research and pilot installations are obtained. ▶ Indicating the need to review the EU climate policy assumptions, taking into account the lack of positive results in the CCS technology implementation deemed to be one of the basic instruments that would ensure the abatement of negative socio-economic impacts under CAREP.
Supporting the development of energy infrastructure in Poland	
Issue	The level of investment in the Polish energy infrastructure required to achieve CAREP's target is among the highest in the EU.
Recommendations	▶ Ensuring in the subsequent EU financial perspective funds are allocated to investment projects in the energy industry, especially the transmission network, improving the efficiency and modernization of coal-fuelled power units, as well as R&D projects pertaining to the development of unconventional gas and its use for electricity generation.
Supporting the development of RES relying on biofuels and energy agriculture.	
Issue	Low stability of RES support systems, lack of RES incentives for biofuels (the most advantageous technology in the case of Poland) or the development of the resource base through the support of energy farming.
Recommendations	▶ Include in the new RES act long-term support mechanisms for the development of biofuels which would facilitate the transition process to energy crops in farming. ▶ Devising a strategy for agriculture development that would allow for partial transition to energy crops. ▶ Supporting biomass processing technology. ▶ Embracing active policy on the UN and EU forums that leads to the system of free emission allowance allocations being expanded and include activities in agriculture and forestry that reduce CO_2 emissions (e.g. new woodland areas that actively reduce emissions should be included in the system).

Counteracting energy poverty	
Issue	The projected increase in the prices of electricity and heating will lead to a growth in the number of households affected by energy poverty.
Recommendations	▶ Implementing support mechanisms funded at the EU level for households affected by energy poverty. ▶ Developing a proposal for the EC to monitor the pace of energy poverty development. ▶ Aiming for the EU to consider CAREP's social impacts to be of equal rank to climate targets. ▶ Propounding a postulate to condition the intensity of GHG abatement activities upon the capability to counteract the increase of energy poverty by introducing EU-level protection programmes and allocating special funds to the EU budget.
Climate discourse correction	
Issue	The prevailing discourse of EU institutions perceives climate issues as independent and isolated from others, which does not give room for the balancing of disparate interests (e.g. environment protection versus social or economic cohesion).
Recommendations	▶ Aiming for the integration of the EU environmental and socio-economic policies, so that GHG abatement efforts are accompanied by mechanisms ensuring social cohesion. This can be achieved for instance by highlighting the social aspect of the sustainable development doctrine following the developing countries that managed to bring about the correction in the environmental discourse on the UN forum by adopting the Rio Declaration. ▶ Propounding a postulate to re-evaluate the EU strategy applied so far in negotiations of binding international obligations with regard to the reduction of GHG emissions. The strategy used so far to create an image of a leader combating climate change that sets a good example for other partners does not seem to be bringing the expected results. ▶ The decarbonization process should be linked to the pace of the economic development and the level of wealth of the EU and non-EU countries. ▶ Maintaining the status of the climate policy as a shared competency of the EU and Member States, which will allow the Member States to preserve a direct influence over the direction of international negotiations concerning commitments regarding GHG emission reductions.

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This report presents a comparative analysis of the impact exerted by the implementation of the European Union's Climate and Energy Package in selected EU Member States. It offers a comprehensive summary of its indirect and direct short- and long-term consequences as well as a broader view on the premises of the Package. The analysis has been carried out focusing on the interests of Poland and other EU countries most exposed to the high implementation costs of the climate-related commitments. The report takes into account the profits and losses to be made by the economies of the countries surveyed while also providing valuable information and arguments feeding into the ongoing debate concerning the future of the EU climate policy.

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