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The EU's Greenhouse Gas emission challenges

Abstract
Fossil fuels have to be subsidized by renewable sources of energy, not to generate greenhouse gas emissions (GHG). The EU has a real commitment to struggling against greenhouse gas emissions. At first all over the world, implemented emission market, which values the price of emission and their mitigation effects.

Keywords: fossil fuels, greenhouse gas (GHG), mitigation effects, renewable energy, non-renewable energy.

1. Introduction

In 1996 the European Union become the first significant political body to suggest that the goal of preventing dangerous anthropogenic interference in climate to which the world had signed on at the Rio Earth summit of 1992, keeping global warming below 2°C relative to the late 1800s. This two-degree limit has been an informal measure of the point where climate change gets serious since the 1970s. William Nordhaus, a pioneer of climate economics, who at the first week of October 2018, shared Nobel prize for his efforts have been the first to use it as such.

2. Challenges of global emissions — main issues

At the Paris climate summit of 2015, though, this changed. In light of both new evidence and new concerns, notably, those of low lying countries, that might not survive the amount of sea-level rise two degrees would bring, the nation of the world agreed to a new target: keeping warming "well below" 2°C above pre-industrial temperatures. Indeed they urged themselves to "pursue efforts towards 1.5°C".

Recent decades have seen increasing climate impacts, many of which science is now able to attribute to anthropogenic carbon dioxide emissions and consequent global warming (King, Donat, Fisher, Hawkins, Alexander, Karoly, Ditttus, Levis, & Perkins, 2015). Ongoing temperature increase will escalate these impacts on the ecological and human systems (IPCC, 2014). It has made climate change a political issue of central importance.

At the Paris climate conference (COP21) in December 2015, 195 countries adopted the first ever universal, legally binding global climate deal.

The agreement set out global action plan to put the world on the track to avoid dangerous climate change by limiting global warming to well below 2°C.

There are four elements of the Paris Agreement:

1. Mitigation-reducing emission:
   – a long-term goal of keeping the increase in global average temperature to well below 2°C above — pre-industrial levels,
   – to aim to limit the increase to 1.5°C, since this would significantly reduce risks and impact of climate change,
   – on the need for global emissions to peak as soon as possible recognising that this will take longer for developing countries,
   – to undertake rapid reductions thereafter by the best available science,
   – before and during the Paris conference, countries submitted comprehensive national climate action plans (INDCs).

   These are not yet enough to keep warming below 2°C, the agreement traces the way to achieving this target.
2. Transparency and global stocktake:
   – strengthen society ability to deal with the impacts of climate change,
   – report to each other and the public on how well they are doing to implement their targets,
   – track progress towards the long term goal through a robust transparency and accountability system.
3. Role of cities, regions and local authorities. The agreement recognises the role of non-Party stakeholders in addressing climate change, including cities, other sub-national authorities, civil society, the private sector and others. They are invited to:
   – scale up their efforts and support actions to reduce emission,
   – build resilience and decrease vulnerability to the adverse effects of climate change,
   – uphold and promote regional and international cooperation.
4. Support:
   – the EU and other developed countries will continue the support climate action to reduce emissions and build resilience to climate change impacts in developing countries,
   – other countries are encouraged to provide or continue to provide such support voluntarily,
   – developed countries intended to continue the existing collective goal to mobilise $100 billion per year by 2020 and extend this until 2025. The new and higher goal will be set after this period.

The last goal has the main objection from the USA and has been the main subject to pull out the Paris climate change agreement two years later during President D. Trump's governance.

Otherwise, the Trump administration was seeking to stop the UE, UK and Japan and other developing countries from striking trade deals with China, as it tried to impose economic isolation on its Asian partner.

The US stance does have a recent parallel, in a different settings. In September 2018, Emmanuel Macron, the French President, said his country would not accept trade deals with countries that did not abide by Paris climate accord — a thinly veiled reference the US, which has pulled out of the pack.

The achievement of these ambitious goals would require many actions to reduce global greenhouse gas (GHG) in all branches of economics and needed energy efficiency.

The Paris Agreement on Climate Change 2015 largely celebrated as a historic breakthrough in international climate negotiations. But it will need to be followed by ambitious mitigation policies to be successful.

Climate change is a threat of sustainable development. After the years of extensive research, the scientific community agrees that manmade greenhouse emissions are a dominant cause of Earth's average temperature increases over the past 250 years.

3. The greenhouse gas market and trade system of allocation of carbon in the EU

The EU emission trading system (EUETS) is a cornerstone of the EU's policy to combat climate change and its key tool for reducing greenhouse gas emissions cost-effectively. It is the world's first major carbon market and remains the biggest one. Set up in 2005, the EU ETS is the world's first international emissions trading system. It remains the biggest one, accounting for over three-quarters of international carbon trading.

The EU ETS works on the cap and trade system:

1. A cap is set on the total amount of certain greenhouse gases that can be emitted by installation covered by the system. The cap is reduced over time so that total emissions fall.
2. Within cap, companies receive or buy emission allowances which they can trade with one another as needed. They can also buy limited amounts of international credit from emission saving projects around the world. The limit on the total number of the allowances available ensures that they have values.

The EU ETS results:

– operates in 31 countries (all 28 EU countries plus Iceland, Liechtenstein and Norway),
– limits emission from more than 11,000 heavy energy-using installations (power station & industrial plants) and airlines operating between these countries,
– covers around 45% of the EU's greenhouse gas emission.

The implementation of the system has been divided up into distinct trading periods over time, known as phases. There are four phases, and the current phase of the EU ETS began in 2013 and will last until 2020.

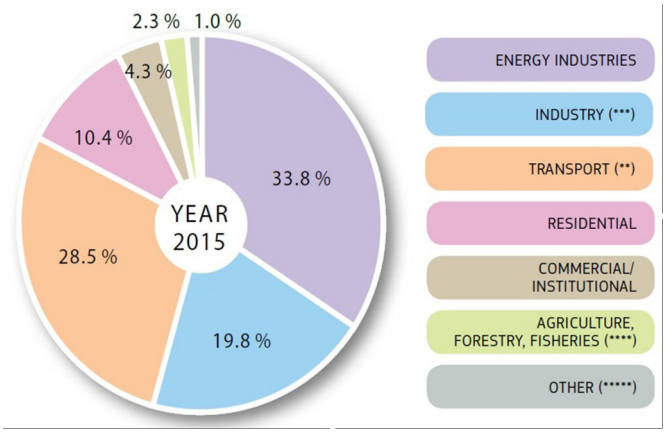
The EU chose a "cap-and-trade" structure as the best means of meeting the GHG emissions reduction target at least overall cost to participants and ceremony as a whole. It allows a set environmental outcome to be achieved at the lowest cost. A tax does not guarantee the GHG emission reduction target will be achieved and in multi--national system, agreement would be required across all countries on the right price for carbon. It also very determines the right price to obtain in a cut in emissions required without under — or overcharging companies. Trading allows companies in the system

to determine, what the least cost option is for them to meet a fixed cap. The carbon price is then set by the market through trading and based on a wide range of factors.

The flexibility of cap-and-trade combined with other key benefits played an important role in the choice of a cap-and-trade structure in for points:

1. **Certainty about quantity**. GHG emission trading directly limits GHG emissions by setting a system cap that is designed to ensure compliance with the relevant commitments. There is certainty about the maximum quantity of GHG emissions for a time over which system cap is set. This is relevant for supporting the EU's international objectives and obligations and achieving environmental goals.
2. **Cost-effectiveness**. Trading reveals the carbon price to meet the desired target. The flexibility that trading brings means that all firms face the same carbon price and ensures that emissions are cut where it costs least to do so.
3. **Revenue**. If GHG emissions allowances are auctioned, this creates a source of revenue for governments. At least 50% of which should be used to fund measures to tackle climate change in the EU or the other Member States, as agreed by Head of States and government for the EUETS directives.
4. **Minimising risk to Member States budget**. The EU ETS provides certainty to emissions reduction from installation responsible to around 50% of EU emission. This reduces the risk that the Member States will need to purchase additional international units to meet their international commitments.

In the period 2013–2020 the majority of allowances are provided via auctioning. Full auctioning of allowances is required for the power sector, while for industry and heating sectors allowances are allocated for free based on ambitious greenhouse gas performance (see Figure 1).

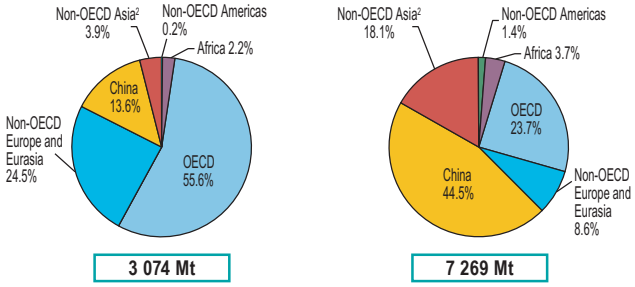


** Excluding inter and maritime (international traffic departing from the EU) including international aviation;
*** Emissions from Manufacturing and Construction, Industrial Process and Product use;
**** Emissions from fuel combustion and other emissions from Agriculture;
***** Emissions from other (not elsewhere specified) Fugitive emissions from fuels, Waste, Indirect CO_2 and other

Figure 1. EU greenhouse gas emission by sectors in 2015 (percent)

Source: *$C0_2$ Emissions from Transport EU28 by Mode (share %). Transport in Figures Statistical Pocketbook*, Eurostat, Luxemburg, 2017, part 3, tab. 3.2.10, p. 143.

The most polluting sector of the EU's economy was energy industries, while it was generated by coal. All over the world, coal production in regional shares in 43d years is presenting in Figure 2.



[1] Non-OECD Asia excludes China

Figure 2. Total coal production and the world regional shares of coal production at the year 1973 and 2016 (includes steam coal, coking coal, lignite and recovered coal)

Source: 1973 and 2016 regional share of coal production, In *Key world energy statistics*, International Energy Agency, 2017, p. 16.

The total world production of coal is grew two times. At the analysed period greatest share of coal production upgraded in China over 30 percent only, and in Europe downgraded till 16 percent, as well as in other regions.

The combustion coal and oil occurred in greenhouse gas emissions. From the point of view of coal combustion, it would be interested to compare the world's ten producers, net exporter and importer (see Table 1).

Table 1. World's producers, ten net exporters and ten net importers of coal in 2016

Producers	Mt	% of world total	Net exporters	Mt	Net importers	Mt
People's Rep. of China	3,242	44.6	Australia	389	People's Rep. of China	247
India	708	9.7	Indonesia	367	India	199
United States	672	9.2	Russian Federation	147	Japan	189
Australia	503	6.9	Colombia	83	Korea	134
Indonesia	460	6.3	South Africa	76	Chinese Taipei	66
Russian Federation	365	5.0	United States	46	Germany	53
South Africa	257	3.5	Mongolia	26	Turkey	36
Germany	176	2.4	Kazakhstan	26	Malaysia	29
Poland	131	1.8	Canada	24	Thailand	23
Kazakhstan	98	1.3	DPR of Korea	21	Brazil	20
Rest of the world	657	9.3	Others	8	Others	215
World	7,269	100.0	Total	1,213	Total	1,211

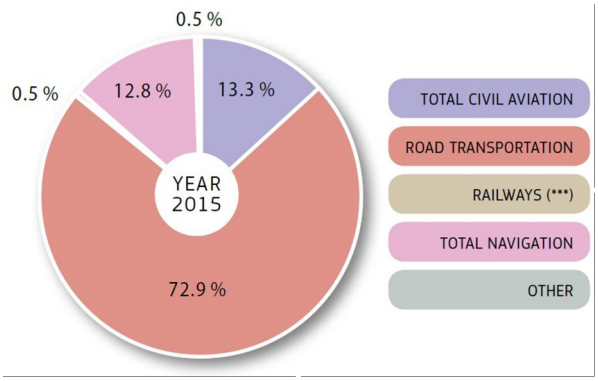
Source: Producers, net exporters and net importers of coal, In *Key world energy statistics*, International Energy Agency, 2017, p. 17.

In the ten top worlds, coal producer's from EU members were Germany 8th place (world share 1.8%) and Poland 9th place (world share 1.3%). There aren't any EU members net exporter and only one net importer Germany (15th place) The German economy has used great share of coal combustion for production electricity energy. As a result of this in 2017, the emission of CO_2 in EU grew about 1.8 percent to 2016 comparison. In Poland, the emission growth was 3.8 percent, while in Germany the biggest the EU economy, slowed down about 0.2 percent. Germany has more efficient emission of coal power electricity than Poland. At 2016, the biggest eminent emission of coal power electricity in the EU, the polish Bełchatów electricity power plant emitted 35 tonnes of greenhouse gases $C0_2$ (based on press information in Bloomberg News, 18 June 2018).

The fee price for emission is added to the final price of electric energy and at the beginning of 2018 was €5 per tonne and at the end of the year would be €25.7 per tonne fifth times growth (Werpechowska, 2018, p. 18).

In-country top ten producers all over the world of nuclear electricity, France was in first place 2016 in domestic electricity generation share 77.6% from the nuclear power plant (International Energy Agency, 2017, p. 19). But nuclear waste material, that is created when nuclear energy is produced is not utilised over one hundred years. It's not a renewable source of energy like natural gas, oil and coal.

In the second place of the greenhouse gas emission at the EU market's by transport sectors and main division in transport sectors belong to road transport (see Figure 3).



*** Excluding indirect emissions from electricity consumption

Figure 3. CO_2 Emissions from transport EU 28 by Mode (share %) in 2015

Source: *$C0_2$ Emissions from Transport EU28 by Mode (share %). Transport in Figures Statistical Pocketbook*, Eurostat, Luxemburg, 2017, part 3, tab. 3.2.12, p. 151.

Compliance with the pledges made by European countries will require the transport sector to make large contribution towards mitigation efforts, given its share in total GHG emission. To achieve the 2°C target, the EC estimates that GHG emission from EU transport will need to be reduced by 70% below 2008 levels by 2050 (European Commission, 2011).

Road transport was responsible for around 20% gas emission (GHG) of total greenhouse gas in EU-28 in 2013 (EEA, 2015). It's reasoned introducing to electro--mobility in the urban passenger transport EU member states.

Moreover, the World Health Organisation (WHO) estimates that approximately 600,000 premature deaths in the European Union region in 2010 were due to health--damaging air pollution (WHO Regional Office for Europe and OECD 2015). In 2013 around 61 percent of the urban population in the EU-28 was exposed to fine particular matter ($PM_{2.5}$), concentration levels exceeding the WHO Air Quality Guidelines (EEA, 2015)[1].

Road transport pollution has made a necessity to subsidies oil car mobility vehicles at electro-mobility vehicles.

4. Benefits used for renewable energy technology

Given adequate support, renewable energy technologies can meet much of the growing demand lower than those usually forecast for conventional energy. By the middle of the 21st century, renewable sources of energy could account for three-fifth of the world's electricity market for fuel used directly (Johansson, Kelly, Reddy, & Williams, 1992, p. 201).

Moreover making the transition to a renewable energy-intensive energy economy not measured in a standard economic account can be achieved. The benefit not measured in a standard account are as follows:

1. **Social and economic development**. Production of renewable energy, particular biomass, can provide economic development and employment opportunities, especially in rural areas, that otherwise have limited chances for economic growth. Renewable energy can thus help reduce poverty in rural areas and reduce pressures for urban migration.
2. **Land restoration**. Growing biomass[2] for energy on degraded lands can provide activities and financed needed to restore land useless by previous agricultural or forest practices. Although land farmed for energy, would not be restored to their original condition. The recovery of these lands for biomass plantation would support rural development, prevent erosion and provide a better habitat for wildlife than at present.
3. **Abatement of global warming**. Renewable energy didn't produce carbon dioxide and other greenhouse emissions that contribute to global warming.
4. **Fuel supply diversity**.

There would be substantial interregional energy trade in renewables, intensive energy futures, involving energy carriers and suppliers. Energy importers would be

[1] Abbreviations used in Guidelines: AB Arellano Bond, API autoregressive distribute lag, ECM error correction model, ESD effort sharing decision, GMM instrument variable, LRM long-run multiplier, LSDM least square dummy variable. $LSDM_c$ bias-corrected least square dummy variable, NO_2 nitrogen oxides, OLS ordinary least square, PAM particular adjustment model, $PM_{2,5}$ particular matter with aerodynamic diameter up to 2.5 μm, SCC — the social cost of a car.

[2] The term "biomass" refers to any plant matter used directly as fuel or converted into fluid fuels or electricity. Sources of biogas are diverse and include the wastes of agricultural and forest products, as well as wood, sugar cane and other plant growth especially as energy crops.

able to choose from among more producers and fuel types than they do today. Thus would be less vulnerable to monopoly, price manipulation or unexpected disruption of suppliers. The competition would make wider swings in energy prices, less likely leading to stabilization of the world oil prices.

The growth in world energy trade would also provide new opportunities in energy suppliers. Especially promising are the prospects for trade in alcohol fuels such as methanol derived from biomass. Natural gas, not a renewable fuels, but an important complement for renewables and later hydrogen.

Renewable energy system has benefited from development in electronic, biotechnology, material science and other energy areas. For example, advances in jet engines for military and civilian aircrafts applications, and in coal gasification for reducing air pollution from coal combustion, have made it possible to produce electricity competitively using gas turbines derived from jet engines and fired with gasifier biomass.

And fuel-cell originally developed for space programs have opened the door to the use of hydrogen as a non-polluting fuel for transportation. Indeed, many of the most promising options are a result of advances made in areas not directly related to renewable energy and were scarcely considered a decade ago.

Moreover, because most renewable energy equipment is small, smart renewable energy technology can advance at a faster pace than convention technologies. While large energy facilities require extensive construction in the field where labour cost and productivity gains difficult to achieve, most renewables energy equipment can be constructed in factories, where it's easier to apply modern manufacturing techniques that facility cost reduction.

The small scale of equipment also makes the time required from initial design to operation short, so that needed improvements can be identified by field testing and quickly incorporated into modified designs. In this way, many generations of technology like batteries and inventors can be introduced in a short period.

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