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Chapter two

European Union policy on climate change

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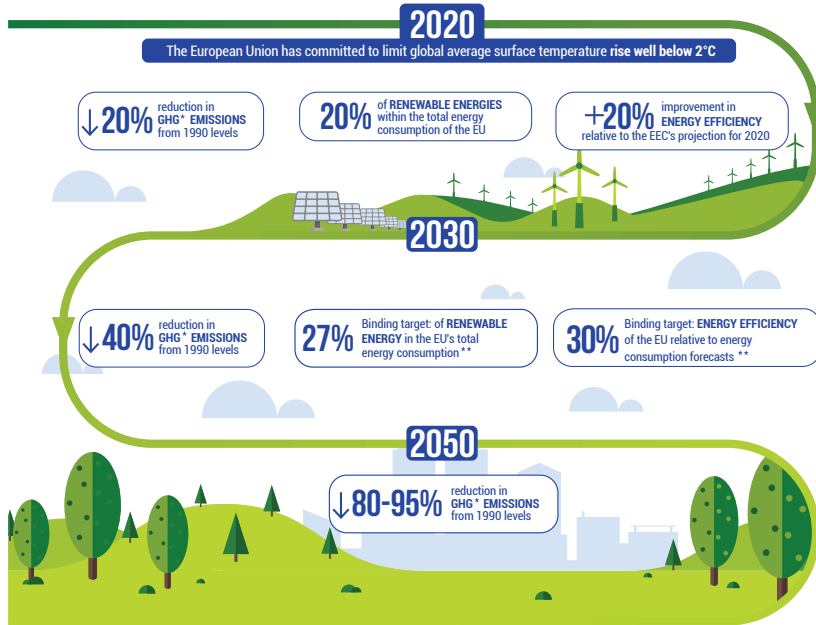
Abstract

Since the beginning of 1990s the European Union promoted and participated actively in international negotiations on climate change. The commitment of the EU to the fight against global climate change materializes in the policies and internal rules which, as we shall see below, are among the most ambitious in the world.

Keywords









Climate change, EU, Kyoto Protocol, Paris Agreement.

EUROPEAN UNION POLICY ON CLIMATE CHANGE



*Greenhouse gases. | ** Target subject to upward negotiation with the European Parliament.

MAIN LEGISLATIVE INSTRUMENTS ON CLIMATE CHANGE

-  THE EUROPEAN EMISSIONS TRADING SCHEME (ETS)
-  EMISSIONS' REDUCTION NOT COVERED BY THE ETS (EFFORT SHARING REGULATION)
-  EMISSIONS AND ABSORPTION FROM FORESTRY AND AGRICULTURE (LULUCF)
-  SYSTEM OF MONITORING AND NOTIFICATION OF GHG EMISSIONS
-  NEW GOVERNANCE SYSTEM PROPOSED FOR CLIMATE AND ENERGY
-  MONTREAL PROTOCOL, FLUORINATED GASES AND CLIMATE ACTION
-  RENEWABLE ENERGY DIRECTIVE
-  DIRECTIVE ON ENERGY EFFICIENCY



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The European Union and the fight against climate change on the world stage

Since the beginning of 1990s the European Union promoted and participated actively in international negotiations on climate change. The first major step was the adoption of the United Nations Framework Convention on Climate Change (UNFCCC) at the 1992 Rio Summit, which encompasses 195 countries. This was followed by the adoption in 1997 of the Kyoto Protocol, which, despite the blow received by the refusal to ratify it by the then largest emitter, the USA, in 2001, it was ratified by the European Union in 2002. This was followed, along with a small handful of countries, by the negotiation and signing of the second commitment period of this Protocol, which extends it until 2020. The ratification of the Paris Agreement in October 2016 completes the participation and active drive of the European Union in all the major global milestones dedicated to the fight against climate change that have occurred to date.

The European Union's commitment to the fight against climate change on a global scale is embodied in the internal policies and rules that, as we will see below are among the most ambitious in the world, and also in its continuous promotion in its relations with third countries. Thus, the fight against climate change has been present for years at all international, regional or bilateral summits that the European Union holds with its partners, as well as in trade negotiations and relevant association agreements. In addition, within the scope of foreign policy, the European Union has a specific Climate Diplomacy Action Plan aimed at including and promoting the fight against climate change in its relations with all relevant countries and institutions. Without willing to be exhaustive, we must also remember that in its international dimension it also pays the necessary attention to the security dimension through the appropriate debates and conclusions of the Council.

And all this, despite the fact that in terms of emissions, the Union is having an ever smaller contribution in quantitative terms to global greenhouse gas emissions. The explanation is twofold, since on the one hand its own emissions are decreasing in absolute terms, and on the other, those of other countries, particularly the large emerging economies, continue to grow and gain greater relative weight.

Figure 1 shows the relative weight of the European Union's emissions in the world as a whole, as well as the global reduction trajectory included in the Paris Agreement of December 2015.

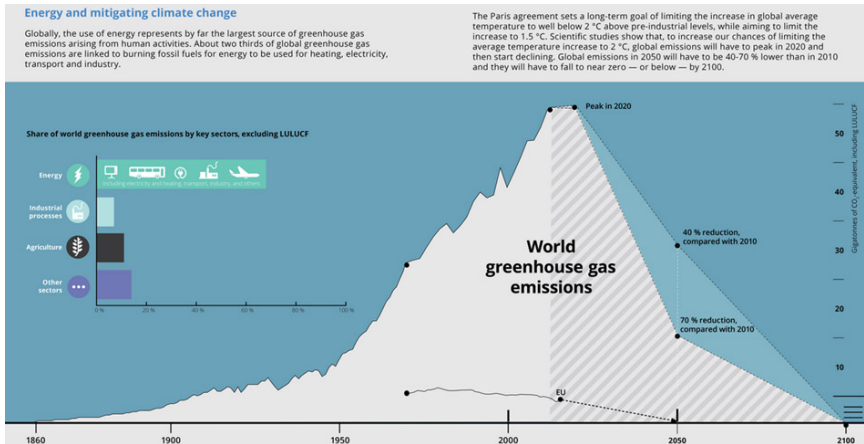


Figure 1. Global and European Union emissions and the emissions mitigation trajectory included in the Paris Agreement. Source: EEA ¹.

This relative significance and evolution of European emissions is well reflected in Figure 2, which shows the evolution of emissions since 1990 in the five largest emitters.

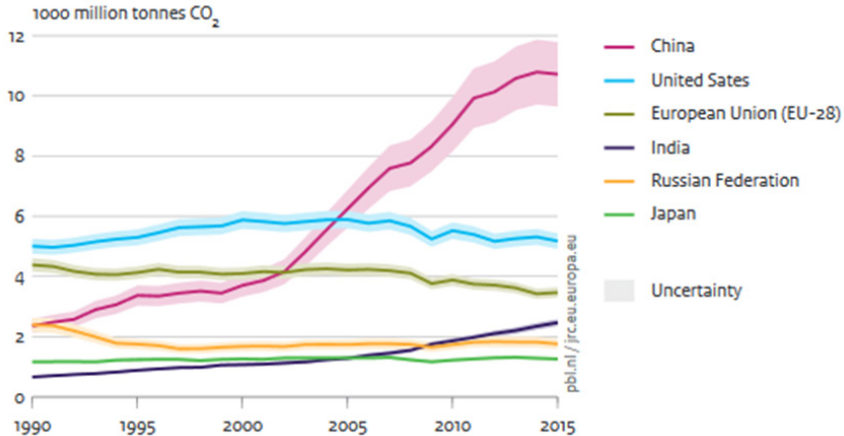


Figure 2. Emissions of CO₂ from fossil fuels and cement from the five largest emitters and from the European Union. Source: PBL, JRC².

We see that the European Union went from being the second global emitter of this type of gases, and very close to the USA in 1990, when China and

¹ https://www.eea.europa.eu/signals/signals-2017/infographics/energy-and-mitigating-climate-change/image/image_view_fullscreen.

² PBL, JRC. 2016. «Trends in Global CO₂ emissions: 2016 report». http://edgar.jrc.ec.europa.eu/news_docs/jrc-2016-trends-in-global-co2-emissions-2016-report-103425.pdf.

Russia emitted less than half, to third place in a line that continues to fall and with emissions increasingly distant from those of China and the USA, while approaching those of India.

The Union's effort to reduce emissions, especially since the end of the last century and strongly driven by the two international instruments in force at the time, the UNFCCC and the Kyoto Protocol, bore fruit in the fact that their greenhouse gas emissions in 2015 were already 22% lower than in 1990. According to the EDGAR database, the total emissions of greenhouse gases of the European Union in 2012 were 8.8% of global emissions. Figure 3 shows the same proportion approximately in 2014 for CO₂ emissions and certain industrial processes.

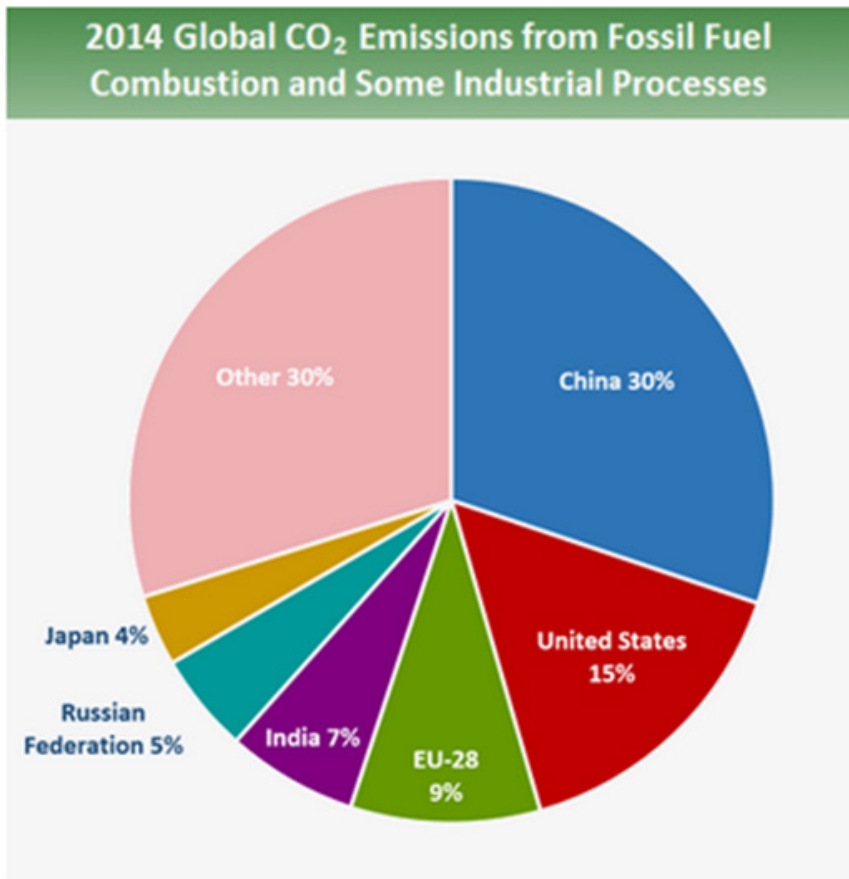


Figure 3. Source: EPA, USA³.

³ <https://www.epa.gov/ghgemissions/global-greenhouse-gas-emissions-data#Country>.

One aspect that particularly stands out in this journey is that, contrary to what certain voices predict, this reduction of emissions could be made, and continues to be made, while maintaining economic growth. The European Union was successful in delinking economic growth and environmental degradation in terms of climate change. Figure 4 shows this evolution throughout the considered period.

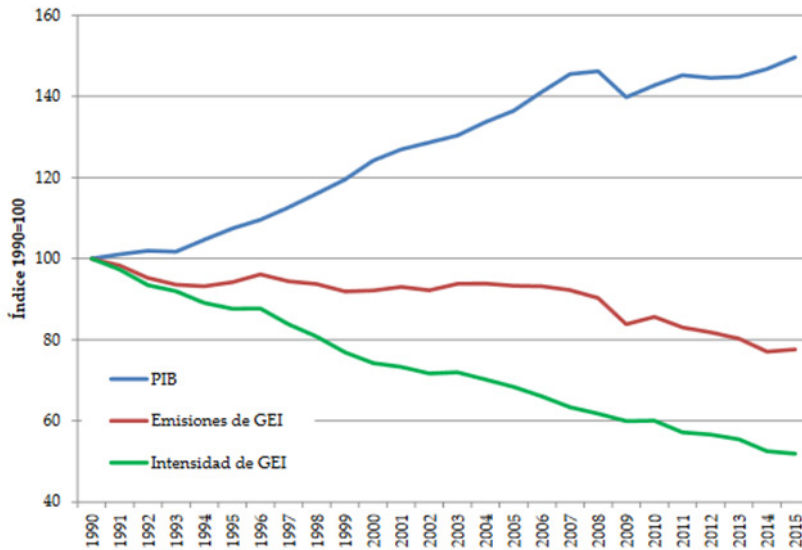


Figure 4. Evolution of GDP, greenhouse gas emissions and the intensity of emissions in the economy. Source: European Commission⁴.

It is also to be noted how at the same time, the intensity of emissions of the economy, measured as the ratio between emissions and GDP, was also considerably reduced.

Regarding the emission sources and achievements made, the graphical representation of the situation of the European Union in 1990 and in 2015 according to Eurostat data (figure 5), speaks for itself on the sectors in which the action of the Union placed an emphasis and in those where it must be placed in the future to achieve the objectives set by the European Council and agreed internationally.

⁴ European Commission. 2016. Report of the Commission to the European Parliament and the Council. «Application of the Paris Agreement: Advances of the European Union towards the objective of a minimum reduction of 40%». COM, 2016, pp. 707-end. <https://ec.europa.eu/transparency/regdoc/rep/1/2016/ES/COM-2016-707-F1-ES-MAIN.PDF>.

European Union policy on climate change

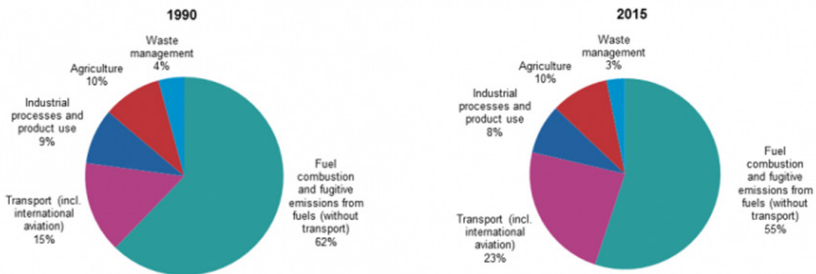


Figure 5. Emissions of greenhouse gases in the European Union - 28 by source, in 1990 and 2015. Source: Eurostat⁵.

The following pages will focus on the analysis of climate change policy in the European Union with regard to mitigation.

The formulation of European Union climate change policy: the institutional game

The speed and consistency with which the climate policy of the Union was developed during its barely 20 years of active existence is explained because only a policy with support at the highest level can go so far and in such a short time. And this is because this policy was directly taken in hand by the European Council a decade ago. As a result of the seriousness of the environmental problem generated by climate change, the international attention paid to it and its economic dimension, the European Council intervenes periodically and actively in the formulation and promotion of this policy. This means that practically all the institutions of the Union participate in one way or another in the matter, which makes it very special compared to other sector policies. Thus, the robust framework of political and legal acts that define it at the European Union level is established. Both types of acts play a complementary and mutually reinforcing role, as we shall see below.

Acts of a political nature These are acts adopted individually by an institution of the European Union. They mark the view of the institution that adopts them on the matter in question and their application is not enforceable before the courts of justice.

Particularly noteworthy among them are those adopted by the European Council, which is the official body that brings together the Heads of State and Government of the 28 Member States of the European Union. It is therefore the institution with the highest political level and its decisions have a particular relevance for all the others. It usually acts as a guide for the action

⁵ [http://ec.europa.eu/eurostat/statistics-explained/index.php/File:Greenhouse_gas_emissions_analysis_by_source_sector_EU-28_1990_and_2015_\(percentage_of_total\)_new.png](http://ec.europa.eu/eurostat/statistics-explained/index.php/File:Greenhouse_gas_emissions_analysis_by_source_sector_EU-28_1990_and_2015_(percentage_of_total)_new.png).

of the other institutions. 2007 can be cited as the year in which the high-level management of the climate and energy policy of the European Union began to take on a more concrete form. Firstly with the conclusions of March of the same year, in which the objectives for 2020 were set. Then with several others adopted either in outstanding international meetings or following the progress towards the previously decided objectives. The conclusions of October 2014 are also highlighted, which establish the objectives in terms of climate and energy for the decade following 2020, that is to say, from 2030.

The conclusions of the Council are also of particular importance. Although it may be better known for its essential legislative role, the Council also plays a political role which, in the particular case of climate change, is generally manifested through the adoption of «Council conclusions». They are also of great importance and are often adopted in preparation for the debates of the European Council, to establish the position of the European Union in international negotiations on climate change or, on other occasions, as a reaction to other political acts, such as the «communications» from the European Commission. They are typically adopted by the Environment Council. The conclusions of the Ecofin Council on climate finance are also frequent and recently the Council of Foreign Affairs on climate diplomacy has also been included in this line of action.

For its part, the European Commission also makes key contributions to this group of political acts. Apart from its capacity for exclusive legislative initiative within the European Union, it often makes important contributions within the framework of political reflection at key moments with the publication of «communications from the Commission». In practice, they largely nurture the political debates of the European Council and the Council.

Finally, the European Parliament, in addition to its role as co-legislator with the Council, also frequently adopts resolutions related to climate change intended to publicise the position of the institution and influence the political debates of the European Council and the Council. These resolutions are sometimes adopted in reaction to the communications of the Commission.

Legal acts. These are directives, regulations and decisions adopted jointly by the Council and the European Parliament on the basis of a legislative proposal from the Commission. They are binding instruments, whose compliance can be demanded before the courts of justice, and put into practice the internal climate policy of the European Union. As we will see later, they cover a whole series of domains, ranging from the standards most directly directed to the climate sector to another series of standards in the field of energy, transport, building and finance, for example.

In short, the political acts of each institution start from their own initiative and the legal acts are proposed by the Commission and adopted by the Council and the European Parliament. However, all remain within a framework of obvious mutual influence and under the political direction and drive of the European Council.

The European Union objectives for 2020, 2030 and 2050. The drive of Copenhagen and Paris

The objectives for 2020

In view of the end of the first period of compliance with the Kyoto Protocol in the years 2008-2012, a new agreement to replace it after 2010 began to be intensely prepared. This new instrument should be approved at the Conference of the Parties (COP) of the UNFCCC to be held in Copenhagen in December 2009. One of the great objectives of the time was to bring the United States and China to the future agreement and although in the end the attempt failed and the agreement was not reached, expectations were high in the years before. The European Union, a great promoter of the fight against climate change on a global scale, wanted to attend the meeting with its homework done and therefore decided in advance to set ambitious and unilateral ambitions for climate and energy by 2020. It was its contribution to encourage other countries to make similar efforts in a «lead by example» exercise. With this fund, the European Council, under the Presidency of the German Chancellor Angela Merkel, adopted⁶ the «2020 climate-energy framework» in the conclusions of March 2007. This framework at the time was the most ambitious contribution made by the developed countries towards the COP in Copenhagen. It highlights the following goals and objectives on climate and energy to be achieved by the European Union by 2020:

- to limit the increase in the global average temperature to no more than 2°C, with which the European Council endorses the figure given by science through the IPCC;
- this gives a clear mandate to energy policy to incorporate the climate goals by establishing that the fight against climate change is one of the three objectives of energy policy together with security of supply and guaranteeing the competitiveness of European economies;
- to reduce the European Union's greenhouse gas emissions by 20% with respect to 1990 and to reduce them by up to 30% if other developed countries commit to comparable efforts;
- to achieve a 20% improvement in energy efficiency compared to the values projected by the Commission for 2020;
- to achieve 20% of renewable energies in the total energy consumption of the European Union;
- a minimum of 10% for all Member States as a proportion of biofuels in all fuel (gas oil and petrol) in transport.

⁶ Conclusions of the European Council of 8 and 9 March 2007. Conclusions of the Presidency. Doc. 7224/07. <http://data.consilium.europa.eu/doc/document/ST-7224-2007-INIT/es/pdf>.

In order to understand the ambition of the European Council at the time, it must be borne in mind that the adopted goals were not only a negotiating position but that they also contained a commitment from the Union itself, even if no international agreement was reached, as was the case. This domestic objective was the famous 20-20-20 in 2020 (20% reduction of greenhouse gases, 20% renewable energy and 20% energy efficiency).

These conclusions largely gave rise to the complex legislative framework on climate and energy that is currently in force, and which is driving the transformation that we face towards 2020.

The objectives for 2030

After the Copenhagen disappointment, it became clear that a Kyoto-type agreement in which binding commitments were addressed only at developed countries could not succeed and a comprehensive agreement was sought that would include commitments for all the Parties to the Convention. Later, the appointment for this agreement was scheduled in Paris for December 2015. Here too the European Union wanted to lead by example and a year earlier, in October 2014, the European Council adopted some conclusions⁷ with the climate and energy goals and objectives for 2030 in the so-called «climate-energy framework 2030». The following stand out:

- To reduce greenhouse gas emissions by 40% compared to 1990, with the detail of distributing the contribution between the sectors subject to the emissions trading regime and those that are not; the former must reduce their emissions by 43% by 2030 compared to 2005, and the latter by 30%;
- It sets a binding minimum target of 27% as the contribution of renewable energies within the total energy consumption of the European Union;
- It establishes an minimum indicative target of a 27% improvement in the energy efficiency of the European Union with respect to the energy consumption forecasts and determines that it must be reviewed before 2020 with a view to raising it to 30%.

This political commitment of the European Council resulted in turn in a complete package of legislative measures proposed by the Commission and which are now being debated in the Council and in the European Parliament and should come into force before 2020. These will largely replace the current legislative framework of 2020.

Below, figure 6 shows a graphic representation of the meaning of the objectives indicated in relation to the trajectory and reduction efforts carried out to date.

⁷ European Council of 23 and 24 October 2014. Conclusions. Doc. EUCO169/14 <http://data.consilium.europa.eu/doc/document/ST-169-2014-INIT/es/pdf>.

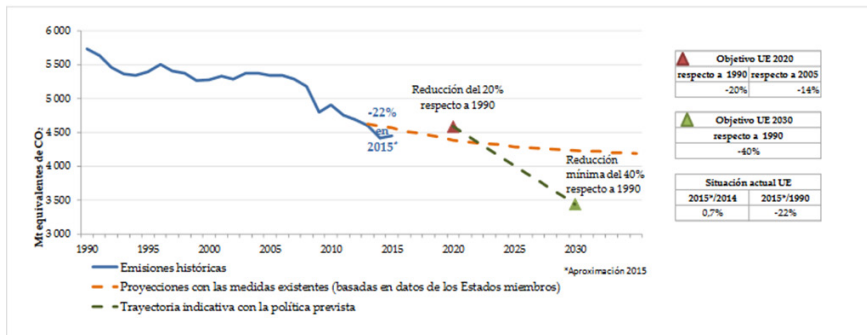


Figure 6. Mitigation objectives before 2030 and progress made up to 2015. Source European Commission ⁸.

The objectives for 2050

The global scientific consensus gathered by the IPCC⁹ has determined that to avoid the most negative effects of climate change, the average temperature of the Earth should not increase by more than 2°C, which is coupled with certain ranges of reduction of greenhouse gas emissions¹⁰ to achieve it.

In preparing COP15 on climate change in December 2009 in Copenhagen¹¹ and in order to lead by example, in October 2009 the European Council returned to the position of the European Union for this COP and adopted¹² quite detailed conclusions in which it established a European Union long-term climate goal for 2050.

The emission reduction established for the European Union was 80-95% in relation to 1990, in the context of the joint reductions of the developed countries. This figure in the form of a fork is that given as necessary by the IPCC so that the average temperature of the Earth does not rise above 2°C, as previously agreed. The language used by the European Council on this occasion is different from the usual and is rather more ambiguous, but for the first time it establishes a long-term objective that in practice is still frequently used as a point of reference by the different institutions of the European Union in political discussions on climate matters.

⁸ European Commission. 2016. Report of the Commission to the European Parliament and Council, «Implementation of the Paris Agreement: Advances of the European Union towards the objective of a minimum reduction of 40%». COM, 2016, pp. 707-end. <https://ec.europa.eu/transparency/regdoc/rep/1/2016/ES/COM-2016-707-F1-ES-MAIN.PDF>.

⁹ Intergovernmental Panel on Climate Change.

¹⁰ http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr_sp.pdf.

¹¹ 15 Conference of the Parties to the United Nations Framework Convention for the fight against climate change.

¹² Brussels European Council of 29 and 30 October 2009. Conclusions of the Presidency. Doc. 15265/09. <http://data.consilium.europa.eu/doc/document/ST-15265-2009-INIT/es/pdf>.

The road map of the Commission: Towards a low carbon economy in 2050

At the COP16 held in Cancun in December 2010, it was agreed to support this objective of not exceeding the 2°C increase and in this context the Commission announced the presentation of a roadmap¹³ of the European Union to reach a low carbon economy by 2050. Its objective is to analyse what would be the most appropriate path to achieve the emission reduction objectives established by the European Council and already included in the international agenda for the year 2050.

This Roadmap is based on a modelling made from three scenarios in terms of the evolution of various factors between now and the year 2050. These scenarios take into account factors such as action in the fight against climate change on a global scale, technological progress and the prices of fossil fuels. As a whole, the models are applied for a domestic reduction (excluding the use of credits from outside the European Union) of greenhouse gas emissions of 80% by 2050 with respect to 1990. It is noteworthy that this 80% reduction is in the lower limit of the range agreed by the European Council and recommended by the IPCC (80-95%). A key element of the exercise is to determine what would be the most profitable route for the EU as a whole to reach this point.

The roadmap gives guidance on where reduction efforts should be applied beyond 2020 to achieve the major reductions proposed and sheds light on two key aspects on the way to 2050, namely: 1) the reduction milestones in different years and 2) the reduction efforts that correspond to the different sectors of economic activity.

It must be borne in mind that this communication from the Commission is not binding on any institution. However, even today its consideration and analysis helps to justify the climate objectives that the Union is gradually adopting.

Milestones on the roadmap to 2050

The roadmap shows that to achieve 80% domestic reduction by 2050, the profitable road leads to a reduction of greenhouse gas (GHG) emissions of 40% by 2030 and 60% by 2040, preceded by 25% in the year 2020, always in relation to 1990 emissions, as shown in figure 7. All this indicates that the closer we get to the year 2050, the greater the effort, while recognising that the sooner actions are taken, the lower the cost of the whole effort. The profitability of recent years is based on the fact that more technologies

¹³ Communication from the Commission – Roadmap towards a competitive low-carbon economy by 2050. <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0112:FIN:ES:PDF>.

are expected to be available. Conversely, failure to follow these reduction milestones could limit the investments needed in the early phases and consequently lead to higher prices at the end. In short, the Commission considers that any other path than that marked on this roadmap will end up being more expensive for the EU.

The goal of a 40% reduction by 2030 was already formally agreed by the European Council in October 2014, as we saw above.

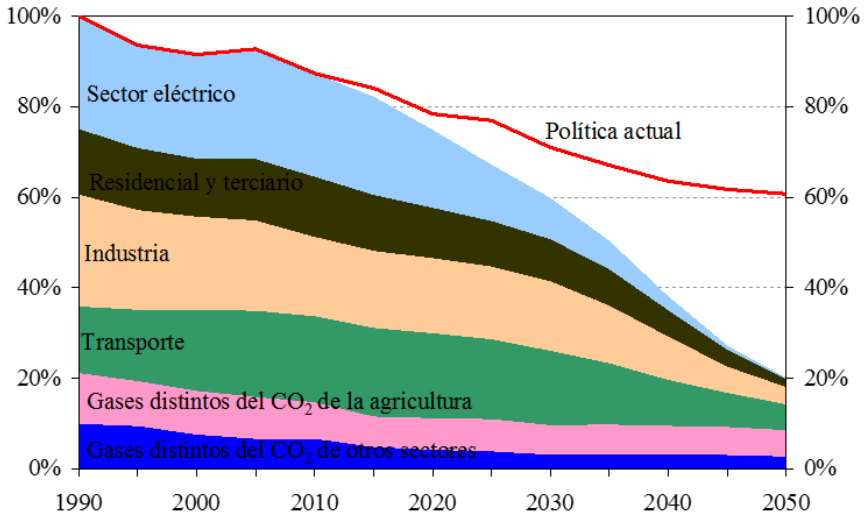


Figure 7. EU greenhouse gas emissions: towards an internal reduction of 80% (100% = 1990). Source: European Commission¹⁴.

The effort by economic sectors

The challenge posed by the reduction objectives is equivalent to a full-fledged economic revolution, and particularly for some sectors such as the energy sector and also for residential and services, which must reduce their emissions by more than 90% compared to 1990. On the other hand, those that contribute least to the reduction are the agricultural sectors (gases other than CO₂) and transport, which does not mean that they are not asked for a great effort. Table 1 shows the efforts by sector for the range of scenarios analysed.

¹⁴ Communication from the Commission - Roadmap towards a competitive low-carbon economy by 2050. <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0112:FIN:ES:PDF>.

GHG reductions compared to 1990	2005	2030	2050
Electricity (CO ₂)	- 7%	- 54 to - 68%	- 93 to - 99%
Industry (CO ₂)	- 20%	- 34 to - 40%	- 83 to - 87%
Transport (including aviation, excluding sea transport) (CO ₂)	+ 30%	+ 20 to - 9%	- 54 to - 67 %
Residential and services (CO ₂)	- 12%	- 37 to - 53%	- 88 to - 91%
Agriculture (other than CO ₂)	- 20%	- 36 to - 37%	- 42 to - 49%
Emissions other than CO ₂	- 30%	- 72 to - 73%	- 70 to - 78%
Total	- 7%	- 40 to - 44%	- 79 to - 82%

Chart 1. Contribution of the economic sectors to the reduction effort. Source: European Commission¹⁵.

A - Maximum decarbonisation in the energy sector

The model shows a reduction of emissions from 93% to 99% by 2050 for the energy sector in all scenarios, which, in practice, means its almost total decarbonisation. It does not take much imagination to realise the enormous challenge that it will mean for electricity production by 2050 not to emit CO₂, especially taking into account that at the same time part of the transport and consumption of heating is also expected to use electric power. The technological change that will have to be achieved is practically total and means the abandonment of some of today's and historically most used technologies.

The technologies on which the models foresee that electricity production will essentially lie will be those associated with renewable sources, fossil fuels with carbon capture and storage (CAS) and nuclear energy. These three technologies are expected to cover 60% of electricity production by 2020 and up to 80% by 2030.

B - Buildings and associated services

The reduction potential of this sector is also very high and achieves a decrease in GHG emissions from 88% to 91% of emissions by 2050 compared to 1990. Most of the consumption, about two thirds of the total, takes place in heating and cooling and cooking and water heating, which means about a fifth of the total. The reduction potential is essentially based on measures of efficiency and energy saving in both public and private buildings, and to this the Union devotes and expects to devote a large part of its efforts in this field in the future.

It is worth particularly highlighting the ambitious objective of the Directive on energy efficiency of buildings¹⁶, May 2010, which establishes that by 1

¹⁵ Communication from the Commission - Roadmap towards a competitive low-carbon economy by 2050. <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0112:FIN:ES:PDF>.

¹⁶ Buildings Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (recast) <http://www.idae.es/>

December 2020 all new buildings will be of almost zero energy consumption, a date that is brought forward to 1 January 2019 for new publicly owned buildings.

C - Industrial sectors

This is the third sector in terms of reduction potential for the year 2050, with forecast greenhouse gas reductions ranging from 83% to 87% depending on the scenario. The models show that the effort is essentially achieved with more efficient industrial processes and based on the application of innovative technologies, both for CO₂ emissions and for the others, with special mention to carbon capture and storage, which is understood to be a technology that will already be profitable in certain industrial sectors, such as steel and cement, from the year 2035. It is also worth noting the €10 billion annual investment that the Commission estimates will be necessary to implement it.

D - Reductions in transport

Transport, which according to the European Environment Agency (EEA) is responsible for more than 20% of greenhouse gas emissions in the European Union, has shown particular resistance to efforts to reduce emissions. It considers that the first sign of reduction could appear towards the year 2030, when the emissions would return to 1990 levels.

The scenarios modelled in the roadmap aim at a range of reductions for transport by 2050 (excluding sea transport) of 54% to 67%, whose achievement should be considered a success given the behaviour of the sector to date. To reach this point, the main measures would be in the field of efficiency in the use of fuel, use of non-fossil fuels, increased use of biofuels and in transport management, such as infrastructure fees and congestion charges, the improvement of public transport, the establishment of smart taxes and others. Its effectiveness will be shown from 2025 by providing the implementation of new transport technologies such as electric vehicles, hydrogen-powered vehicles and hybrids, which provide a determining potential, as shown in Figure 8. Here you can see how, in accordance with the modelling of the Commission and in this ambitious scenario, without electric vehicles, reductions in the transport sector could not be achieved.

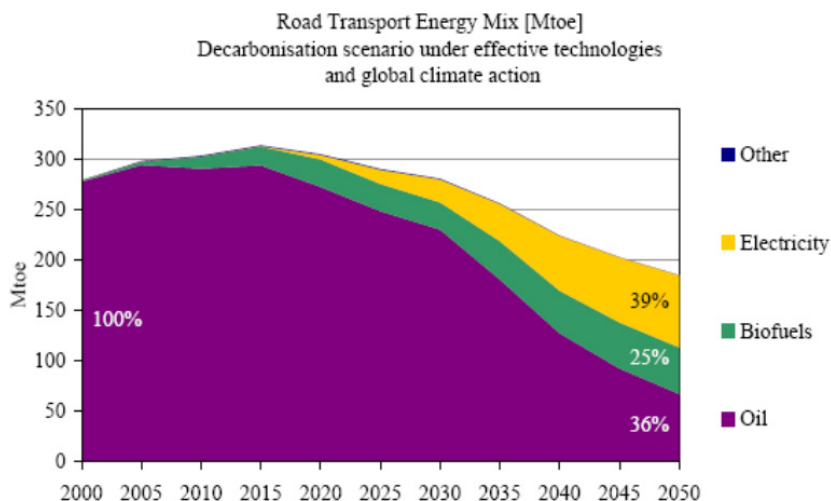


Figure 8. Contribution of fuel types to reductions in the transport sector. Source: European Commission¹⁷.

E - Agriculture

Agriculture is another example in which the reduction of emissions is of limited potential. In fact, the roadmap model shows a maximum reduction capacity of 42% to 49% by 2050 in the different scenarios, and always for emissions other than CO₂, with the peak to be achieved in 2030.

Regarding the measures to be applied, the key appears in two lines of action: on the one hand, the best available practices in waste and slurry management, use of fertilisers, biogasification and livestock production, for example, and on the other, the potential for carbon sequestration (forests, woody vegetation, grasslands, soil conservation, wetlands, peat bogs, etc.) offered by agriculture.

In this sector there is a very special paradox, because on the one hand it must reduce its emissions, but on the other it is practically advocated to increase them. With a population that, according to current estimates, may exceed 9 billion people by 2050 and a development that happily tends to feed it better, it will be necessary to produce more and more food, intensify crops and more intensely transform lands that today can be considered natural. This logically leads to an increase in greenhouse gas emissions and to the reduction of carbon stores. The dilemma of agriculture is while it is difficult to contain its emissions, it may also be very costly not to do so, because

¹⁷ Communication from the Commission - Roadmap towards a competitive low-carbon economy by 2050. <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0112:FIN:ES:PDF>.

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the effects of climate change on natural resources (climate, water, soil etc...) may cause a loss of output in many areas of agricultural production.

Main legislative instruments on climate change

The European Emission Trading Scheme

The reduction of emissions by 20% by 2020 compared to 1990 is equivalent to a reduction of 14% compared to 2005. To achieve this figure, the European Union divides the total emissions into two large blocks: those covered by the European emission trading scheme and those covered by the system of distribution of efforts. The former must be reduced by 21% and the latter by 10%, both with respect to 2005.

The European emission trading scheme (ETS)¹⁸ was an essential pillar in the European Union's response to the emission reduction obligations of the Kyoto Protocol and was created experimentally in 2005. It became mandatory in 2008. It is a market instrument that is currently applied to more than 11,000 fixed installations or air operators distributed among 31 countries, 28 of the European Union and 3 of the EEA¹⁹, which together exceed the figure of 500 million inhabitants. It covers about half of European carbon dioxide emissions.

Today it represents around 75% of the international carbon market and is the largest in the world. Other countries and regions seek experiences and sources of inspiration for the development of their own markets here²⁰. The European Union also actively seeks to link it to other markets in third countries in order to increase its size and effectiveness, and is in advanced negotiations with some of them.

In essence, it consists of establishing an annual European cap of greenhouse gas emissions that can not be exceeded and that is also being reduced to achieve the previously established reduction targets of the European Union (for example, that by 2030 its total emissions do not exceed 43% of 1990). In line with this cap, a series of emission rights are issued -one per ton of equivalent CO₂- that end up in the operators included in the system. The way to access these rights can be free (limited access) or by purchase, in organised auctions or by direct purchase on the secondary market. The emission right thus becomes the currency of this market, a currency that can be used only once. Operators have the obligation to make an annual inventory of their emissions and to deliver the national authorities a number of rights equal to the emissions they have had in that year. If they have more rights, they can

¹⁸ Commonly cited in English ETS, for *Emission Trading Scheme*.

¹⁹ EEA, European Economic Area.

²⁰ Today there are already national or regional carbon markets in China, South Korea, Canada, Japan, New Zealand, Switzerland and the United States.

keep or sell them. If they lack rights, additional rights should be procured, which they can buy on the market, until they equal the emissions.

The main advantage attributed to the scheme is that it allows facilities to choose the cheapest option to reduce the emissions they are forced to make, since they can choose between continuing to issue and purchase the rights they lack at the end of the year or otherwise reduce emissions (by changing production processes, for example) and, where appropriate, sell or save their surplus rights for later. These are therefore economic and strategic decisions for facilities and not environmental, because the environmental objective is ensured by the total ceiling of emissions established at European level, and can not be exceeded as a whole.

Since 2005, the system has undergone successive reforms, in which the number of participating countries has been increased, the number of greenhouse gases covered and the number of sectors affected. It is currently in phase 3, period 2013 - 2020. The reform of what will be phase 4 for the period 2021-2030 is also under discussion in the Council and in the European Parliament, and which will adjust the ETS to the decision of the European Council of October 2014 on the climate-energy 2030 framework. Below is a brief description of how the system works in 2016.

Sectors and greenhouse gases covered by the ETS system

The directive applies to emissions generated by high energy consumption facilities such as the combustion with thermal power of more than 20 MW (except for waste incineration) and, above certain thresholds, to oil refineries, coke producers, production of steel and other metals, production of aluminium, manufacturing of cement, lime, ceramic products, paper pulp, production of various chemical products (such as nitric acid, adipic acid, ammonia, hydrogen) and aviation emissions on internal flights of the EEA.

In terms of gases, they vary by sector, but cover the emissions of carbon dioxide (CO₂), nitrous oxide (N₂O) and per fluorocarbons (PFC).

How many emission rights are issued annually?

First of all, remember that an emission right is the right to emit an equivalent ton of carbon dioxide.

The cap of issued rights is calculated annually by the Commission. Part of the average figure issued by the Member States in the second phase (2008-2012) and the amount set in 2010 is thereafter reduced by 1.74% per year. This achieves the reduction target set for 2020 to emit 21% less than in 2005, which is the part that corresponds to ETS in the effort to reduce greenhouse gas emissions by 20% with respect to 1990. In absolute figures,

the maximum ceiling of ETS emissions in 2013 for fixed installations was 2,084,301,856 tons, and the annual reduction is 38,264,246 up to 2020. For aviation, the ceiling was established at 95% of the historical emissions of the sector corresponding to the years 2004-2006.

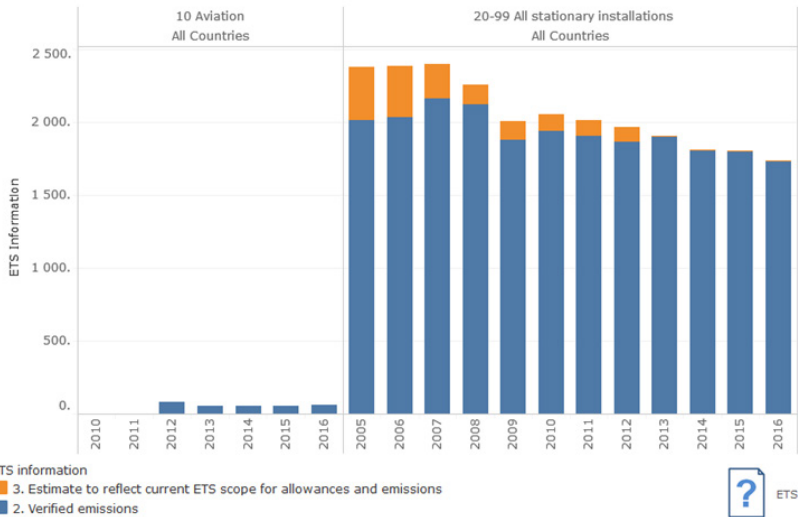


Figure 9. Historical emissions of the sectors covered by ETS. Source: European Environment Agency, 2017²¹.

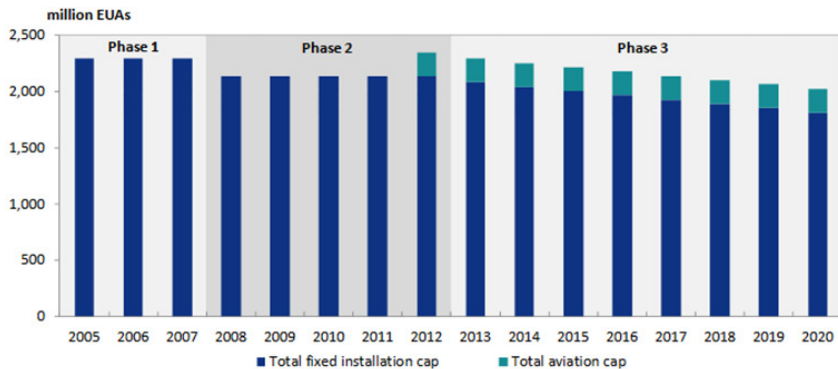


Figure 10. Evolution of the ceiling of emission rights (millions) of ETS. European Commission²².

²¹ <https://www.eea.europa.eu/data-and-maps/dashboards/emissions-trading-viewer-1>.

²² European Commission (2015). EU ETS Handbook. https://ec.europa.eu/clima/sites/clima/files/docs/ets_handbook_en.pdf.

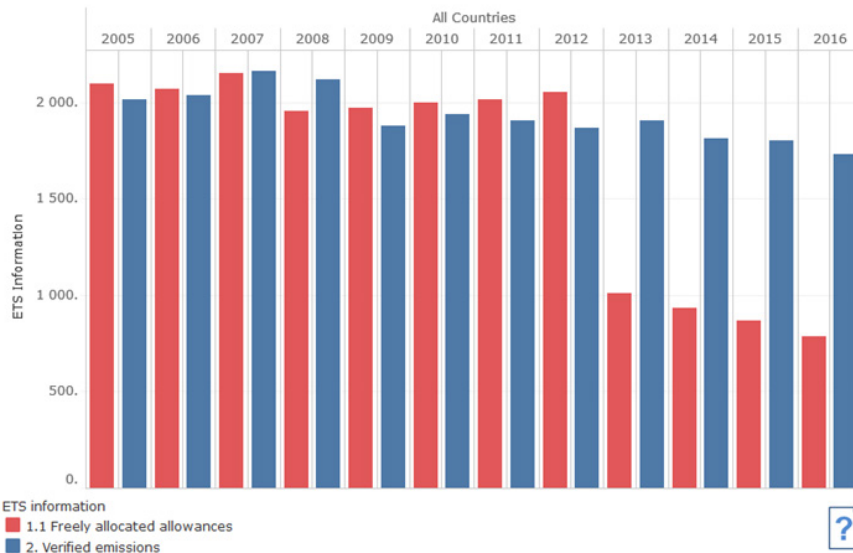


Figure 11. Evolution of verified emissions and rights assigned freely. Source EEA²³.

Figure 11 shows how since the beginning of phase 3 of the ETS in 2013 when the auction was imposed, the difference between the rights assigned free and the verified emissions has grown.

Distribution of rights between operators

As stated above, the rights are distributed among operators through two totally different methods: auction and free allocation. Obviously, operators can also gain and get rid of rights through their direct purchase on the market.

From stage 3, the default distribution method and that used is the auction. It is a question of the facilities reflecting the cost of carbon in the price of products. Free allocation is understood as something residual that is necessary to maintain due to various market circumstances, for example if competition against products from third countries does not allow the cost of carbon to be transferred to the prices of products.

The auction method is mandatory for all electricity generation, although there is an exception for eight Member States (Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Lithuania, Poland and Romania) which can also distribute free a part of the rights for their electricity generators in order to modernise the sector.

²³ <https://www.eea.europa.eu/data-and-maps/dashboards/emissions-trading-viewer-1>.

As for the industrial sectors, there is a progressive increase in the auctioned proportion that goes from 20% in 2013 to 70% by 2020.

The Commission estimates that in the whole of this phase 3, 57% of the total rights will have been auctioned and the remaining 43% will have been distributed free.

The free allocation also applies 100% to all facilities that are at risk of carbon leakage due to competition with facilities outside the European Union, as will be seen below.

For aviation, 15% of its rights are auctioned and the rest is distributed free. This distribution is made from a reference parameter in tons of CO₂ per ton - kilometre for the different operators.

The free allocation among the facilities that are entitled to it is done in a totally harmonised way for the whole of Europe. An industrial facility in Budapest or Madrid will thus receive its rights with exactly the same rules in both sites. The distribution is preferably through reference parameters that establish the number of rights to be delivered per unit of product (for example, ton CO₂/ton product). The reference is taken from 10% of the most efficient installations within the system for each sector. Figure 12 shows an example in the case of aluminium. This favours the incorporation of the most efficient technologies in emission savings in the different industrial processes.

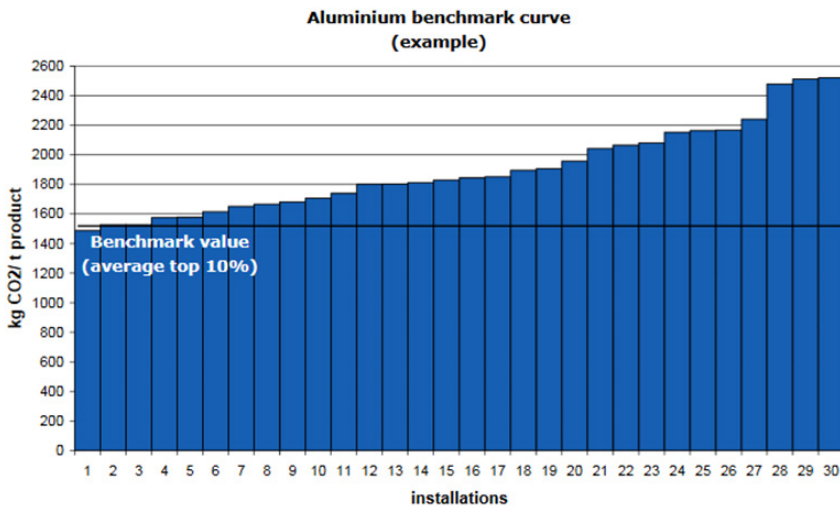


Figure 12. Aluminium reference parameter curve. Source: European Commission²⁴.

²⁴ European Commission (2015). EU ETS Handbook. https://ec.europa.eu/clima/sites/clima/files/docs/ets_handbook_en.pdf.

This graph shows that when setting the reference value from the 10% best emissions (the first 3 in this case), the end installations, for the same volume of production as the former, will receive far fewer rights than the emissions they generate, which will force them to buy those they lack. This provides a permanent incentive to reduce emissions through technological improvement.

On the other hand, there is a safeguard clause that also establishes a maximum ceiling for the free allocation to the corresponding facilities, and this can not exceed the proportion that these facilities had as a whole in the ETS in the years 2005-2007. Since what is fixed is the proportion, as the maximum ceiling of ETS is lowered each year and the same proportion is always applied to it, what finally decreases is the final volume assigned free. The rights that may be missing from the different facilities are reduced proportionally to all of them when making the annual allocation and they will have to look for them on the market.

Protection against the risk of carbon leakage

The emissions trading regime inevitably leads to a reflection on issues related to the risk of carbon leakage, which could lead to the relocation of industrial activity from the EU to third countries where there are not these carbon pricing mechanisms which, in the end, add production costs. This would be harmful both environmentally and economically. Environmentally because, with relocation, emissions would be transferred to other places with fewer restrictions, which could even increase them instead of the sought-after reduction. And economically because activity and employment would be lost in the European Union to the benefit of third countries.

It is obvious that in the case of the existence of an international binding regime on climate change applied globally that includes a price for carbon throughout the world, this risk would tend to disappear since similar conditions would apply everywhere, and it would not make sense for operators to make the pilgrimage in search of emission paradises.

European industry, and particularly that based on more intensive use of energy, has called for measures to avoid this risk of carbon leakage, and this has been established in the current climate-energy package. In practice, however, there are many factors that influence the location of a production centre (labour costs and qualifications, markets, access to raw materials, regulatory and investment stability, for example), and carbon costs are but one factor among others, and certainly not that of greater weight. This is an intense debate in which there is no shortage of analyses that considerably reduce the risk of these carbon leakages materialising in practice (see Tscherning, a study²⁵ carried out precisely in the industrial heart of the

²⁵ TSCHERNING, R. (2011). The EU ETS Rules on Carbon Leakage and Energy Intensive Industry in the Federal Republic of Germany, *European Energy and Environmental Law Review* Wolters Kluwer.

European Union, in Germany). There are many studies in this regard and, with the carbon prices known to date, it has not yet been proven that there have been relocations due to the price of carbon.

The ETS determines the risk of carbon leakage for a certain sector through a combination of the extra costs generated by access to emission rights and their exposure to international trade. In this way, a sector with very little extra cost or that is hardly exposed to international trade would hardly be at risk of carbon leakage, while another in the opposite situation would have a high risk. A list of sectors at risk of carbon leakage is prepared and reviewed periodically.

The sectors included in the list of carbon leakage are exempted from auction and they are guaranteed free access to 100% of their emission rights, within the limits established by the ETS, in order to avoid their having additional costs.

Monitoring, reporting and verification of the system. Penalties

Operators are required to monitor and report their emissions every year, with reports that have to be approved by accredited verifiers. On 30 April of each year, they must deliver a number of rights equivalent to the previous year's emissions. The rights are then cancelled and can not be reused. The integrity of the system is guaranteed through a single Union registry including all issued rights.

A market system like this would be unfair and could not work well without a monitoring and control mechanism for all actors and without sufficient sanctions to deter potential non-compliers. This is necessary to create the necessary trust between all the actors and to prevent those who do not comply from gaining an advantage over others.

It is the Member States participating in ETS that establish the sanctions for non-compliance, which must in any case be proportionate and dissuasive. The fines imposed to date move in a range varying between the minimum of €75,000 of Slovenia to the maximum of €16,000,000 of Estonia. The system also imposes a uniform cost at European level of €100 for each surplus ton issued at the end of each year, for which the corresponding right was not delivered.

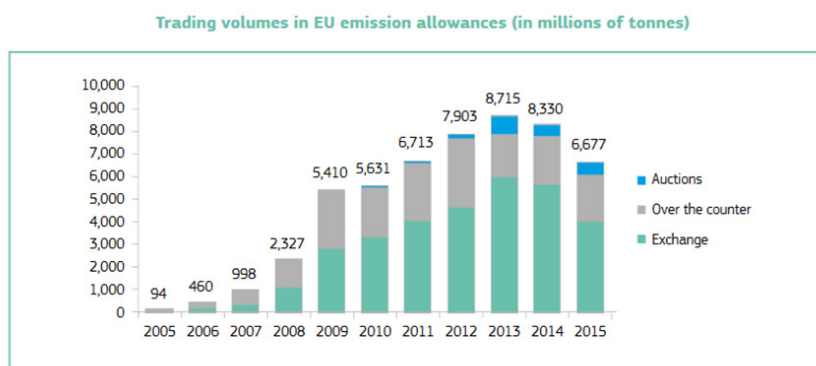
According to the ETS report of 2016²⁶ in 2015 there were six countries that imposed sanctions for excess emissions and eight that imposed fines on fixed installations. The country that issued most fines was the United Kingdom, with 22. The most frequent cause was for not delivering the emission

²⁶ European Environment Agency (2017). Application of the European Union Emissions Trading Directive. Analysis of national responses under Article 21 of the EU ETS Directive in 2016. EEA Report No. 4/2017.

inventories. The highest of €12,300,000 was imposed by Italy on a facility for operating without authorisation. Six others imposed fines on air operators.

Negotiated volumes and market value of ETS. Price stability

It is difficult to make an accurate estimate of volumes negotiated each year and even more of the market value. Firstly, because although the volumes auctioned each year are known, as can be seen in figure 13, what can not be predicted is the volume of transactions between the operators, which will depend on many factors including the strategic decisions of every business.



Source: Bloomberg LP, ICE, EEX, NYMEX, Bluenext, CCX, Greenmarket, Nordpool, UNFCC. Also using Bloomberg New Energy Finance estimations.

Figure 13. Volume of rights negotiated each year in ETS. Source: European Commission²⁷.

Regarding the value of the ETS market, the prediction is even more difficult, because to the previous unknown we must add the evolution of the price of the right. What the data show is the rapid development of this market, which, non-existent before 2005, showed a continuous increase in volumes negotiated until 2013 and which, in combination with the prices of the emission right, also showed a continued increase in value, reaching 81 billion euros in 2011. The results of the financial crisis were felt strongly from that year, when the combination of the lower volume traded and the lower price of the right made its value fall to less than half in 2013.

The price variability is an element that caused particular concern to the European legislator due to the market instability and the weakening of the price sign, just the opposite of what were the objectives of the ETS to encourage investments in low carbon technologies.

Since one of the causes of the low prices of the emission right is the excess of rights on the market (the causes of this surplus are many and are partly in

²⁷ European Commission 2017. The EU Emissions Trading System (EU ETS). Fact sheet. https://ec.europa.eu/clima/sites/clima/files/factsheet_ets_en.pdf.

the original design of ETS), it was decided to reduce it and stabilise the market to make prices more predictable and higher. A «market stability reserve»²⁸ was created for it in 2015, which in essence consists of removing the rights that are above a certain volume from the market and reintroducing them on the market when their volume falls below a certain threshold. This reserve should be operational as of 2019 and it is likely that in phase 4 its design will be further strengthened to make it more efficient.

The reduction of emissions not covered by the European emissions trading system

As we saw in the previous section, for the non-ETS group, the European Union has the operational objective of reducing emissions by 10% by 2020 compared to 2005. In 2013, the total volume represented 55% of the greenhouse gas emissions of the European Union. This group includes the facilities of small industry (those not covered by the first section) and most of the diffuse sources of emissions such as transport (except for aviation and international navigation), buildings, waste or agriculture (with the exclusion of emissions from land use and forests, which is expected to be included, however, after 2021).

The nature of the emissions from this non-ETS group, many distributed diffusely within each Member State, makes it impossible to focus on the distribution of the cap between individual issuers, so the chosen solution consists of dividing the effort of reducing by 10% at Union level in differentiated efforts for each of the 28 Member States. Unlike ETS, emission targets for the sectors covered are not established here, but the choice of how and in which sectors to carry out the reductions is left to each Member State. To this end, it must adopt the national measures it deems appropriate, in addition to the reduction measures that can be established at Union level, among which we can mention those relating to CO₂ emissions from vehicles and vans, fluorinated gases and equipment, mobile air conditioning, those relating to energy (energy efficiency or output of buildings, for example) or landfills, among others.

The instrument providing for distribution between Member States and the applicable conditions is a decision of the Council and of the European Parliament adopted in 2009, the Effort Sharing Decision²⁹ (ESD³⁰). The instrument tries to make the distribution of costs and efforts as fair and equitable as possible and

²⁸ <http://eur-lex.europa.eu/legal-content/ES/TXT/HTML/?uri=CELEX:32015D1814&from=EN>.

²⁹ Decision no. 406/2009/EC of the European Parliament and of the Council of 23 April 2009 on the efforts of the Member States to reduce their greenhouse gas emissions in order to meet the commitments made by the Community up to 2020. <http://eur-lex.europa.eu/legal-content/ES/TXT/HTML/?uri=CELEX:32009D0406&from=ES>.

³⁰ Better known as Effort Sharing Decision.

uses the economic capacity of each Member State based on its relative wealth (per capita income in 2005), combined to a certain degree with the profitability of the measures to be adopted. This means that there is a greater contribution from the richest countries, but also taking into account the places where it is cheaper to reduce in the whole of the Union. With this, the richer Member States have to reduce their emissions while the poorer, to grow faster, reduce less and can even increase them. The scheme incorporates an upper and a lower limit, so that no Member State will be obliged to reduce more than 20% of its emissions nor be able, on the other hand, to increase them more than 20%. Finally, all the Member States gave their approval to the system used, as shown in figure 14.

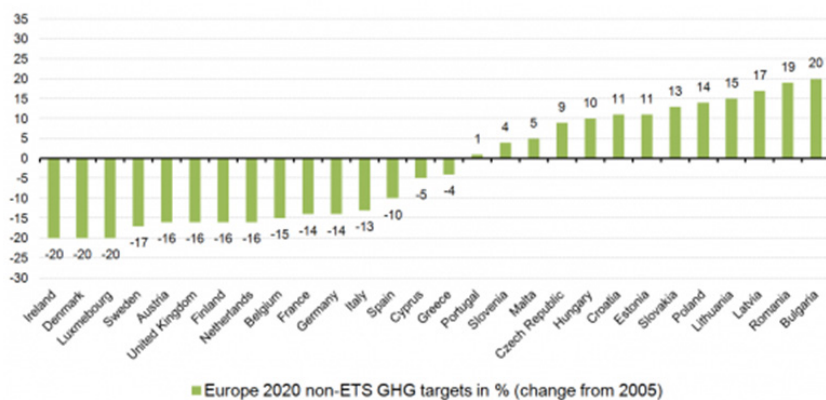


Figure 14. Greenhouse gas reduction goals in non-ETS sectors by Member State under the Effort Sharing Decision. Source: European Commission³¹.

The ESD also establishes annual maximum emission limits per Member State, which are given by an annual downward trajectory from 2013 to 2020. The Commission calculates the annual allocation of emissions (AAE) that corresponds to each one of them for each year. They are binding and the Member States have to answer for them. To facilitate compliance with these annual objectives and set them apart from circumstances of force majeure such as weather phenomena (extreme winters or summers) or economic crises, which could temporarily hinder the expected reductions, the ESD also foresees a series of flexibilities within the Member States and between them, throughout the compliance period (2013-2020). Thus, if one year a Member State makes reductions greater than those required by the annual objective, it can drag that excess compliance to successive years and count them later³². Conversely, if in a given year their

³¹ https://ec.europa.eu/clima/policies/effort_en.

³² It is the so-called «banking» or «drag».

emissions are above the established target, the Member State may borrow up to 5% of the AAEs the following year, when they will have to be discounted³³.

Member States may also transfer (generally through sale) their AAEs to each other when they have over-compliance. Finally, and within certain qualitative and quantitative limits, they can also buy international credits from the Clean Development Mechanism and the Joint Implementation Mechanism³⁴.

To date, according to the official data of inventory of the last year published, the Member States are meeting the established objectives with a certain ease. Thus, for example, between 2005 and 2013 all sectors reduced their emissions, some up to 25%, such as the waste sector (see figure 15). The total emissions of 2014 were already 12.9% below those of 2005, so the 2020 target had already been reached six years in advance.

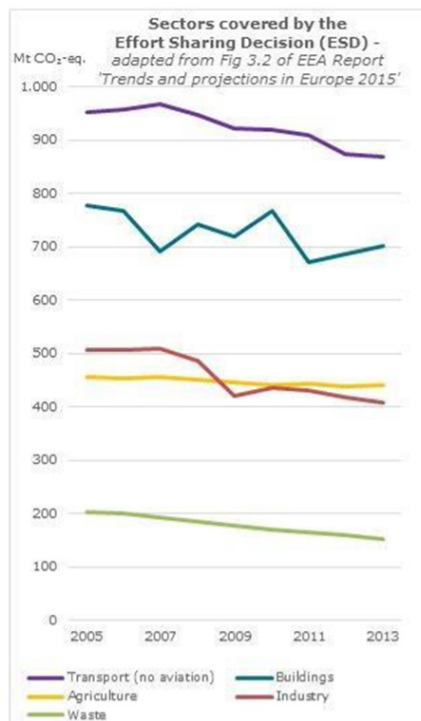


Figure 15. Reductions of emissions of non-ETS sectors achieved in the European Union in 2013-2015. Source: European Commission³⁵.

³³ It is the so-called «borrowing» or «loan».

³⁴ They are the two flexibility mechanisms developed in the implementation of the Kyoto Protocol.

³⁵ European Commission. 2016. Report from the Commission to the European Parliament and the Council on evaluating the implementation of decision no. 406/2009/EC pursuant to its article 14. COM, 2016, pp. 483-end. <https://ec.europa.eu/transparency/regdoc/rep/1/2016/EN/1-2016-483-EN-F1-1.PDF>.

In addition, in order to verify compliance with the annual objectives marked by their linear trajectory, the Member States are obliged to measure and control their emissions through a monitoring system. They must also inform the Commission each year of the progress made and future projections, both of the emissions and of the policies and measures that they plan to apply. In case of non-compliance with the annual objectives, once the available flexibilities are exhausted, they are subject to certain sanctions and the obligation to implement corrective actions.

Projections for 2020 also show comfortable compliance with the European Union's 2020 target (see figure 16). Projections by Member State show that by 2020 all will have internally reached their target for that year except four, Luxembourg, Ireland, Belgium and Austria. The latter will have to adopt additional measures or use the margins given by the flexibility mechanisms to achieve their objectives.

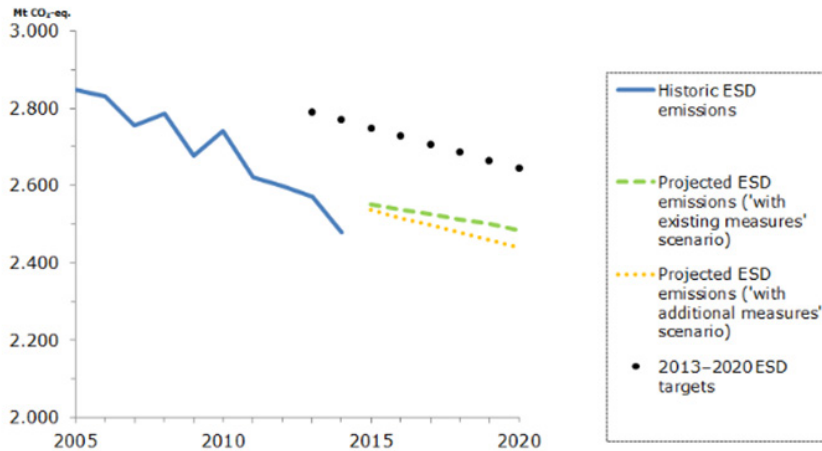


Figure 16. Emissions covered by the real and projected ESD 2005 - 2020. Source: European Commission³⁶.

As for the future, as with ETS, the Council and the European Parliament are now discussing the new provision on the share-out of efforts that should regulate this sector between 2021 and 2030. The new objective established by the European Council and already agreed by the European Union within the framework of the Paris Agreement of 2015 is to reduce this group of emissions by 30% in 2030 compared to 2005. One of the important features of the new proposal is that it already incorporates emissions and removals of greenhouse gases from the use of the land and its changes, as well as forestry. In any case, until the agreement between the Council and the European Parliament is reached, it will not be possible to know what the new scheme will finally be.

³⁶ European Commission. 2016. Report from the Commission to the European Parliament and the Council on evaluating the implementation of decision no. 406/2009/EC pursuant to its article 14. COM, 2016, pp. 483-end. <https://ec.europa.eu/transparency/regdoc/rep/1/2016/EN/1-2016-483-EN-F1-1.PDF>.

Emissions and absorptions from forestry and agriculture (LULUCF)

The use of land is also of particular relevance in terms of climate change. On the one hand, soils and vegetation cover store carbon and can remove it from the atmosphere through plant growth and good soil management, where considerable quantities are stored. Conversely, they can also emit CO₂, for example, when deforested, wet areas are drained or when permanent grasslands are transformed into cultivation areas. In the field of climate change policy, all of these modifications are called «land use, land use change and forestry» and are commonly referred to by their acronym LULUCF. As a whole, these surfaces cover more than 75% of the European Union and are its largest CO₂ storage.

Until now, the European Union has been a carbon sink since its LULUCF absorptions are larger than its emissions. According to EEA data³⁷, in 2014 the net total absorbed in the whole of the European Union was 308 Mton-CO₂-eq³⁸, and only four countries counted net emissions (Denmark, Ireland, Latvia and the Netherlands). The main cause of this balance lies in reforestation and in the rate of annual forest harvesting, which was considerably less than the growth of forests (a variable directly linked to the absorption of CO₂). The figure is in line with the average of 320 Mton-CO₂-eq a year absorbed since 2000, and with a decreasing trend in the last 7 years. These figures reached up to about 10% of the total greenhouse gas emissions of the European Union in certain years.

On the other hand, climate and energy policy can also be very directly related to LULUCF emissions. Thus, for example, if the reduction of greenhouse gases in the production of electricity is achieved by changing the energy source from a fossil fuel to biomass, the increase in biomass consumption could result in the reduction of CO₂ stored in a forest. Hence, in view of a policy that facilitates the use of biomass as a source of renewable energy, it makes perfect sense to also analyse its effect on the global carbon balance, since it can reduce the sink effect in forests.

Currently and until 2020, LULUCF emissions and removals are not included in either the ETS or the non-ETS group and therefore do not count towards the reduction target for 2020. However, they are subject to certain obligations both internal to the European Union and internationally in the framework of the second commitment period of the Kyoto Protocol. At an internal level, since 2013, Member States have been obliged to account for emissions and absorptions derived from forest plantations, reforestation and deforestation, and under certain conditions those derived from crops and the management of grasslands³⁹.

³⁷ EEA. 2016. *Trends and projections in Europe 2016 – Tracking progress towards Europe's climate and energy targets*.

³⁸ Millions of tons of equivalent CO₂.

³⁹ Decision 529/2013 / EU of the European Parliament and of the Council of 21 May 2013 on accounting standards applicable to emissions and absorptions of greenhouse gases

Regarding the Kyoto Protocol, the obligation is that there should be no net emissions in the LULUCF sector. In other words, if a Member State increases its emissions through deforestation or its agricultural activity, it will have to offset them with new reforestations or by improving the management of forests, crops or pastures. And if this is not enough to offset the emissions, the corresponding rights will have to be found by other methods, such as buying them from other Member States or discounting them from their emissions in other sectors. This is what is called the «no debit» rule in LULUCF, which in practice prohibits this sector from counting as a net issuer.

For all of the above, accounting for LULUCF emissions and absorptions in the overall greenhouse gas emissions of the European Union only increases the coherence of the system by providing a more global vision of the whole. This was decided by the European Council in October 2014 by including the LULUCF sector within the goal of reducing emissions by 2030. As we pointed out above, the Commission already included it in the new ESD proposal, in which the main developments with regard to Decision 529/2013/EU are the following:

- The LULUCF emissions and removals of the next period 2021-2030 are counted within the objective of reducing the emissions of greenhouse gases in the sectors not covered by the ETS system by 30% by 2030 with respect to 2005;
- The non-debit rule for LULUCF emissions in the territory of each Member State is established as a domestic norm of the European Union, accounted for up to 2030 in two five-year periods (2021-2025 and 2026-2030);
- Various accounting flexibilities are incorporated to reflect the conditions in the different Member States; among them the net absorptions can be accumulated in the whole period of ten years and can be transferred between Member States;
- To compensate for the limited capacity of agriculture to reduce emissions explicitly recognised by the European Council, and to encourage actions aimed at absorbing CO₂, up to 280 Mton of CO₂ at European Union level can be offset with LULUCF absorptions instead of forcing net reductions of emissions in other sectors;
- This limit of 280 Mton is distributed among the Member States according to the weight of the emissions of their agricultural sector. Spain can therefore offset up to 29.1 MT of CO₂ from its non-ETS sectors with LULUCF net absorptions from 2021 to 2030, equivalent to 1.3% of its total emissions not covered by ETS.

resulting from activities related to land use, land use change and forestry and on information related to the actions related to said activities. <http://eur-lex.europa.eu/legal-content/ES/TXT/PDF/?uri=CELEX:32013D0529&from=EN>.

The system of monitoring and reporting of greenhouse gas emissions. Emissions from sea transport and heavy vehicles

Knowing the reality of greenhouse gas emissions in each country is an essential issue from many points of view, although it may seem that it is something of a technical nature. In fact, its negotiation at the international level within the UNFCCC is and has always been polemical and politically controversial.

On the one hand, at the domestic level, it is essential to analyse the mitigation needs, to define and reliably plan the necessary actions and to assess their effectiveness, as well as the progress towards the reduction objectives. On the other hand, the functioning of certain mechanisms such as the trading of emission rights or international credits without a reliable emission measurement system is inconceivable. And, at the international level, it is a key pillar of transparency, an element that is essential to generate trust among the different parties involved in agreements to combat climate change. For example, the continued provision of financial assistance from one country to another is difficult if it is not reliably known that the resources contributed are used and what effects they have. Figure 17 can serve as an example of the importance of having reliable data to produce all the relevant climate information.

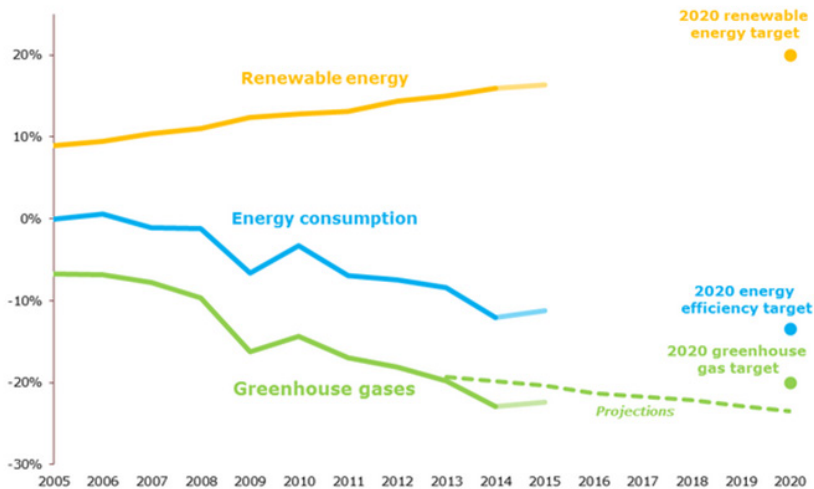


Figure 17. Progress towards climate and energy objectives in Europe. Source: EEA ⁴⁰

At the international level there are already various obligations derived from the UNFCCC and the Kyoto Protocol. The new rules deriving from the Paris Agreement are currently being negotiated. At European Union level, the provisions in force in this area, supplemented by additional regulations, are

⁴⁰ European Environment Agency, 2016. Trends and projections in Europe 2016 – Tracking progress towards Europe’s climate and energy targets. Copenhagen.

set out in a specific regulation on monitoring and notification⁴¹. It establishes a framework for careful monitoring and notification of anthropogenic emissions of greenhouse gases by sources and their absorption by sinks and for their periodic evaluation. It is a complex system that has the necessary provisions to ensure the completeness, transparency, accuracy and comparability of national inventories with each other and with respect to the inventory of the European Union.

The monitoring regulation of the European Union includes the obligation for the Member States to prepare an annual inventory of emissions of seven greenhouse gases from all sectors such as industry, energy, waste, agriculture, LULUCF and others. Also annually, they must report on the technical and financial support provided to developing countries and the destination of the proceeds from the auctioning of emission rights under the ETS (on which there is a certain commitment to allocate at least 50% to the domestic and international fight against climate change). With this information, the European Commission each year prepares the inventory of greenhouse gases of the European Union that refers to the UNFCCC and covers the period from the base year of 1990 to two years before the present.

Furthermore, both the Member States and the Commission have a system for the biennial notification of policies and measures and of the projections of anthropogenic emissions by sources and of absorption by sinks of greenhouse gases, as well as of the national low-carbon strategies and their modifications. Every four years there is also a similar notification on adaptation to change by the Member States to the Commission.

On a global scale, the shipping greenhouse gas emissions⁴² are becoming increasingly important in overall emissions. This importance is accentuated as the other sectors reduce their own. According to data from the International Maritime Organisation (IMO)⁴², marine transport emissions are around 1 billion tons of CO₂ per year, which represents about 3% of total emissions, and they are expected to grow between 50% and 250% up to 2050. According to the same Organisation in its Second Study of Greenhouse Gases, with existing technologies and applying operational measures, these emissions could be reduced by 75%.

Emissions from international shipping are not included in the commitments to reduce greenhouse gases in the European Union despite the fact that

⁴¹ Regulation (EU) no. 525/2013 of the European Parliament and of the Council of 21 May 2013 concerning a mechanism for the monitoring and reporting of greenhouse gas emissions and for notification, at national or Union level, of other information relevant to climate change.

⁴² IMO 2014. 3rd IMO GHG study. <http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Pages/Greenhouse-Gas-Studies-2014.aspx>.

according to the Commission's data⁴³ in 2013, they accounted for 4% of total emissions and they had grown 48% between 1990 and 2008, and were expected to do so by 86% by 2050 with respect to the same year, 1990.

For this reason they have been subject to individualised treatment and the European Commission devoted a specific communication to them⁴⁴. One of the singularities of the sea transport sector is that it has an institution dedicated to it, the IMO, which deals with its regulation on a global scale and with which it is necessary to cooperate to implement the appropriate measures. The Commission therefore proposes a gradual approach focusing on three successive stages:

- a) Implement a monitoring, notification and verification system at European Union level;
- b) Establish reduction goals for the sector, and
- c) Apply a market mechanism to achieve the reduction of emissions.

Along with the communication, the Commission presented a proposal for a regulation for phase a) based on fuel consumption and so that afterwards a global monitoring and notification scheme could also be established through the IMO. The regulation was subsequently approved by the Council and the European Parliament⁴⁵ in 2015 and is the current framework with which the monitoring of these emissions in the European Union is regulated.

As a result, starting in 2018, large ships (more than 5,000 tons) that use European ports will have to control their verified emissions as well as other environmental information. The scheme essentially consists of the companies responsible for such ships having to draw up a plan to monitor the emissions for each of the ships with respect to any trip to or from a port under the jurisdiction of a Member State. This monitoring plan, which must be followed by a fixed and common form approved for the entire European Union, will be monitored by an accredited verifier and, starting in 2019, will result in the annual notification of the verified emissions.

As for the heavy road transport sector and unlike for light vehicles and trucks, there is currently no measurement and emission limitation policy.

⁴³ European Commission. 2013. Commission Staff Working Document accompanying document to the Proposal from the Commission to the European Parliament and Council for the inclusion of greenhouse gas emissions from maritime transport in the EU's reduction commitments. Impact assessment.

⁴⁴ European Commission. 2013. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Integration of emissions from maritime transport in the European Union's greenhouse gas reduction policies.

⁴⁵ Regulation (EU) 2015/757 of the European Parliament and of the Council of 29 April 2015 on the monitoring, notification and verification of carbon dioxide emissions generated by maritime transport and amending Directive 2009/16/EC.

An *ad hoc* policy is now being developed. Buses and trucks are responsible for about 25% of transport emissions, which represents approximately 5% of the total greenhouse gas emissions of the European Union, according to data of the Commission⁴⁶, which also calculates that in the absence of an adequate policy, these emissions may still grow by 10% by 2030 compared to 2010. For this reason, the Commission has established a calculation tool for these emissions (*Vehicle Energy Consumption Calculation Tool*, VECTO) and has adopted a proposal for a regulation for monitoring and reporting them for new vehicles⁴⁷. The regulation is now under discussion in the Council and the European Parliament and, once adopted, will from 2019 require producers of vehicles of over 7.5 tons to calculate CO₂ emissions and fuel consumption of the new vehicles they produce, so the respective emissions will be able to be known as of the year 2020. In the near future, the obligation is expected to be extended to trucks of smaller tonnage and that from 2018 the Commission will take a step forward and also submit a legislative proposal to limit emissions from heavy transport.

With this real and reliable information generated through these new instruments, the establishment of realistic and achievable reduction commitments in both sectors, sea maritime and heavy road transport, will be facilitated, and action on climate will be completed in all sectors of the economy.

The new governance system proposed for climate and energy

In the new «climate-energy framework⁴⁸ 2030» adopted in October 2014, the European Council called for the development of a reliable and transparent governance system to help ensure that the European Union achieves its energy policy objectives. It also said that it should build on existing pillars, such as national programmes to combat climate change, national plans on renewable energies and energy efficiency, and rationalise the elements related to planning and reporting, which are currently separated.

The Commission therefore presented a proposal for a regulation on «governance of the Energy Union»⁴⁹, which is now under negotiation in the Council and the European Parliament. This new regulation foresees important changes and new obligations with respect to the current situation. It forms part of the «Clean energy for all Europeans» package approved in November

⁴⁶ https://ec.europa.eu/clima/policies/transport/vehicles/heavy_en.

⁴⁷ European Commission. 2017. Proposal for a Regulation of the European Parliament and of the Council on the monitoring and reporting of CO₂ emissions and fuel consumption of new heavy goods vehicles.

⁴⁸ <http://www.consilium.europa.eu/es/meetings/european-council/2014/10/23-24/>.

⁴⁹ European Commission. 2016. Proposal for a Regulation of the European Parliament and of the Council on the governance of the energy union. <http://ec.europa.eu/transparency/regdoc/rep/1/2016/ES/COM-2016-759-F1-ES-MAIN-PART-1.PDF>.

2016 and simplifies, integrates and reinforces the planning, monitoring and reporting obligations of the Member States and the Commission in the field of climate and energy. When in force it is expected to facilitate the monitoring of progress towards the objectives of the Energy Union, in particular those related to climate change, renewable energies and energy efficiency of the European Council package and the Paris Agreement. It also provides for the Commission to be empowered to take certain measures if there is a risk of failing to achieve the common objectives of the European Union in the area of renewable energy and energy efficiency so as to force the Member States to act more.

The regulation, once approved, should also overcome the current situation in which the obligations of monitoring and notification in these fields come from dispersed standards, approved at different points in time and that respond to different objectives. They also mean that similar obligations sometimes fall on the same public bodies at different times, with overlaps in the information to be drawn up. It also ensures that the obligations are extended in a useful way beyond 2020, the deadline for the application of some of the current obligations. Together, it integrates 31 planning, monitoring and notification obligations and repeals 23.

Regardless of how the final text is approved, the Commission's proposal establishes a robust planning, information and notification regime where the main novelties appear in the field of energy, since in the field climate change what it does in essence is to assume the current obligations in terms of monitoring and notification, for which it repeals the existing standard (see above) and integrates it in the new. In essence, the proposal incorporates the following obligations:

- National energy and climate plan. From a first draft on which the Commission can make recommendations, the Member States should draw up a first 10-year plan on energy and climate in January 2019 for the years 2021-2030. Following the same procedure, the plans will be renewed every ten years. The plan has a content already defined in the text itself, common to the 28 Member States and will address the essential issues of energy and climate planning in order to achieve the objectives of the Union. In this way, it is expected to facilitate the Commission's task in terms of monitoring and controlling the obligations of the Member States and achieving the common objectives. Member States also have an obligation to consult the public on energy planning and to report their results to the Commission.
- Implementation follow-up. Member States have to make a progress report every two years on the implementation of the plans and on progress towards the planned objectives. Also in this case they must follow some detailed forms previously established and common for all. These reports cover all dimensions of the energy and climate regulations, and require explaining how they are moving towards the objectives of

the Paris Agreement. The report becomes annual in terms of emissions of greenhouse gases, the destination of revenue from emission rights auctions and financial assistance to developing countries for mitigating climate change.

- Long-term low emission strategies. They must contain a 50-year perspective, they must incorporate the aspects that derive from international obligations and their implementation, and they must be reported every ten years.
- Breach of the objectives to 2030. In case of risk of non-compliance, the Commission is empowered to require Member States to adopt measures in addition to those foreseen in the plans and they may be asked to contribute to the establishment of a European platform for financing renewable energy projects. It is also planned to enable the Commission to adopt additional common measures on the energy efficiency of products and buildings.
- It also foresees that, in the area of climate change, the monitoring, notification and planning obligations will be aligned dynamically with those that are derived from the Paris Agreement at international level.
- It also establishes the obligation for the Commission to prepare each autumn a report on the State of the Energy Union, in which it will give an account of the situation, work and progress of the Member States and the European Union on this matter.

It is, as we see, an ambitious set of measures that are expected to have a facilitating, driving and important control effect in achieving the objectives of the European Union.

A singular instrument: the Montreal Protocol, fluorinated gases and climate action

The Montreal Protocol on the protection of the ozone layer is an example of a particularly effective instrument of environmental policy. Since its establishment in 1987, it has managed to reduce the consumption of substances that deplete the ozone layer by more than 98%, which is now beginning to show signs of recovery. As these substances used to be also generally potent greenhouse gases, their reduction also provides important benefits in the fight against climate change. The dark side of this brilliant action is that the fluorinated gases that were developed in substitution of the prohibited substances, though not harmful to the ozone layer, have been shown also to be powerful greenhouse gases that can have a warming potential of up to 23,000 higher than CO₂. For this reason it is also necessary to reduce or suppress the use of these fluorinated gases as far as possible .

Of the large family of fluorinated gases, the most relevant from the point of view of climate change are by far the hydro fluorocarbons (HFCs). The European Union is a pioneer in the proposal and application of policies to control these

substances both internationally and internally. At international level, it has very actively supported the modification⁵⁰ of the Montreal Protocol to also include HFCs among controlled substances, which was achieved at the COP in Kigali in October 2016 after many years of negotiations with the adoption of the Kigali Amendment⁵¹. With this new agreement over the progressive elimination of HFCs, it is expected to avoid the emission of 80 Gton of equivalent CO₂ by 2050.

Internally and after the 2006 regulation⁵² on certain fluorinated greenhouse gases, the European Union adopted a new regulation in 2014⁵³ on fluorinated greenhouse gases that introduces more stringent measures to reduce and control HFCs that is expected to prevent, only in Europe, the accumulated emission into the atmosphere of 1.5 Gton of equivalent CO₂ by 2030 and 5 Gton by 2050.

The contribution to climate action from other sectors

In addition to the climate policy itself, the European Union is developing various measures in the fight against climate change in other specific economic sectors that are high emitters of greenhouse gases, such as energy, construction and transport. The following are the most relevant legislative measures from the point of view of climate change in these sectors.

Renewable Energies

The European Union is a pioneer and world leader in the development and deployment of renewable energy. Since the 1997 *White Paper* on renewable energy sources⁵⁴ the Union has maintained an active policy in this field that has been sustained over time at the highest level, as can also be seen in the mission letter of the President of the Commission to the Commissioner for Energy and Climate⁵⁵ at the beginning of the mandate in 2014, in which he expressly instructs him to make the European Union a world leader in renewable energy.

The directive on energy from renewable sources⁵⁶ (RED, for renewable energy directive) is currently the framework that regulates the action in this field until

⁵⁰ https://ec.europa.eu/clima/sites/clima/files/f-gas/docs/eu_hcf_amendment_en.pdf.
https://ec.europa.eu/clima/sites/clima/files/f-gas/docs/eu_hcf_amendment_en.pdf.

⁵¹ http://ozone.unep.org/sites/ozone/files/pdfs/FAQs_Kigali_Amendment_v3.pdf.

⁵² <http://eur-lex.europa.eu/legal-content/ES/TXT/PDF/?uri=CELEX:32006R0842&from=EN>.

⁵³ <http://eur-lex.europa.eu/legal-content/ES/TXT/PDF/?uri=CELEX:32014R0517&from=EN>.

⁵⁴ European Commission. 1997. Commission memo Energy for the future: renewable energy sources. *White paper for a Community Strategy and Action Plan*. http://europa.eu/documents/comm/white_papers/pdf/com97_599_es.pdf.

⁵⁵ https://ec.europa.eu/commission/sites/cwt/files/commissioner_mission_letters/arias-canete_en.pdf.pdf.

⁵⁶ 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 repealing

2020. It is part of the aforementioned 2020 climate - energy package approved by the European Council in March 2007. The directive establishes a general framework to guarantee that the objective is achieved that at least 20% of the final gross energy consumption of the European Union in 2020 comes from renewable sources, which must be achieved through a mandatory objective for each Member State established in the directive itself, as shown in table 2. The objectives per Member State range from 11% for Luxembourg to 49% for Sweden. Spain has an objective of 20%, a value that matches the average of the European Union.

	Cuota de energía procedente de fuentes renovables en el consumo de energía final bruta, 2005 (S_{2005})	Objetivo para la cuota de energía procedente de fuentes renovables en el consumo de energía final bruta, 2020 (S_{2020})
Bélgica	2,2 %	13 %
Bulgaria	9,4 %	16 %
República Checa	6,1 %	13 %
Dinamarca	17,0 %	30 %
Alemania	5,8 %	18 %
Estonia	18,0 %	25 %
Irlanda	3,1 %	16 %
Grecia	6,9 %	18 %
España	8,7 %	20 %
Francia	10,3 %	23 %
Italia	5,2 %	17 %
Chipre	2,9 %	13 %
Letonia	32,6 %	40 %
Lituania	15,0 %	23 %
Luxemburgo	0,9 %	11 %
Hungría	4,3 %	13 %
Malta	0,0 %	10 %
Países Bajos	2,4 %	14 %
Austria	23,3 %	34 %
Polonia	7,2 %	15 %
Portugal	20,5 %	31 %
Rumanía	17,8 %	24 %
Eslovenia	16,0 %	25 %
Eslovaquia	6,7 %	14 %
Finlandia	28,5 %	38 %
Suecia	39,8 %	49 %
Reino Unido	1,3 %	15 %

Table 2. Overall national objectives of the Member States in relation to the share of energy from renewable sources in the final energy consumption in 2020 set by the renewable energy directive of 2009. Source: DER.

Directives 2001/77/EC and 2003/30/EC. <http://eur-lex.europa.eu/legal-content/ES/TXT/PDF/?uri=CELEX:32009L0028&from=en>.

The RED obliges each Member State to make and implement a National Plan of Action on Renewable Energy and to publish a progress report every two years on the application of the plan and the progress towards the established objectives. The directive leaves Member States free to choose the type of renewable energy they prefer (wind, solar, biomass or others), to design measures of support and promotion for renewables and to set specific objectives for the electricity, heating and refrigeration, transportation sectors, as well as the guarantee that biofuels will meet the sustainability criteria of the directive itself.

According to the latest data update from the European Environment Agency (EEA)⁵⁷ in 2016, the European Union is on track to meet the 2020 target, as can be seen in Figure 18.

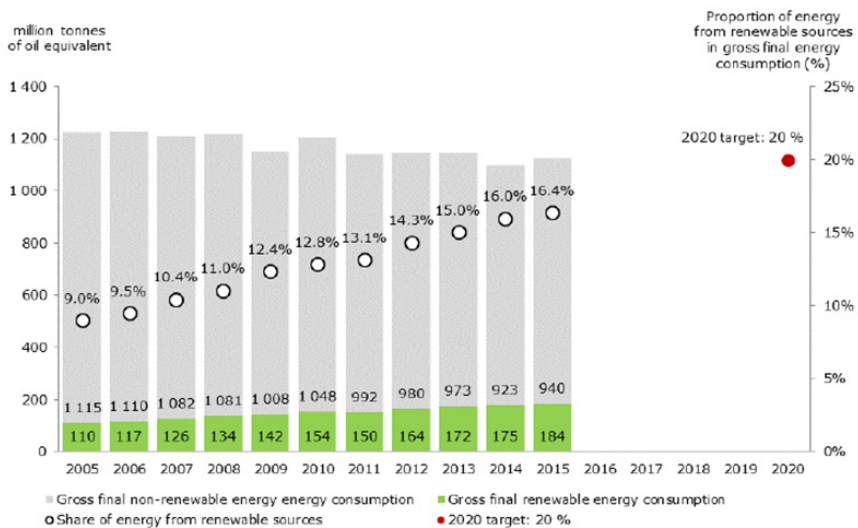


Figure 18. Gross final consumption of energy from renewable and non-renewable sources in the European Union between 2005 and 2015. Source: EEA, 2016.

The proportion of energy from renewable sources reached 16% in 2014, with a value already above the target from the RED, and for 2015 the estimate is a proportion of 16.4%. However, progress varies considerably depending on the sector in question, as does the degree of penetration of renewables in each sector. The Progress Report on Renewables⁵⁸ of the Commission in 2017 shows that the heaviest sector in the consumption of renewables is heating and cooling, with 48% of consumption, compared to 42% for electricity and 8% for transport.

⁵⁷ EEA. 2016. *Trends and projections in Europe 2016 – Tracking progress towards Europe's climate and energy targets*.

⁵⁸ European Commission. 2017. Report from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. «Renewable energy progress report». COM (2017) 57 final. <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52017DC0057&qid=1488449105433&from=EN>.

Final Energy Consumption in the EU28 in 2015

based on Öko-Institute proxies, statistical transfers and mult. counting excluded in Mtoe

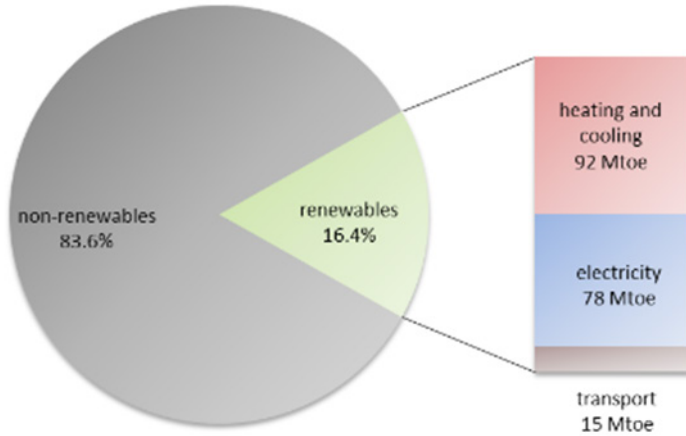


Figure 19. Source: European Commission, 2017.

The sector in which the penetration of renewables has advanced the most is electricity, with close to 30% in 2015 for the whole of the European Union, compared to just over 18% for heating and cooling, which, as we have seen, has a much greater weight in the consumption of energy, as seen in figure 20. However, both are ahead of the aggregate trajectories of the national plans of the Member States for that year at Union level.

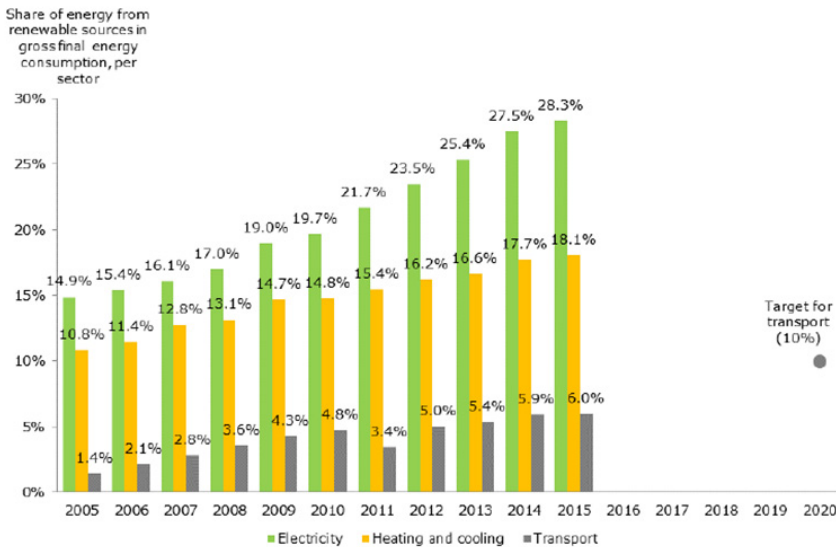


Figure 20. Proportion of energy consumption from renewable sources by sector in the European Union between 2005 and 2015. Source: EEA, 2017.

When considering the relative weight of different renewable energy sources, the figures also vary by sector. Thus figure 21 shows that in the heating and cooling sector, biomass is dominant with 82% of renewable production, while in electricity it is still hydroelectric, with 38%, followed by wind with about 30%. What is worth noting, however, is the change in trend, because while the hydroelectric proportion fell from 74% to 38% between 2004 and 2015, wind power quadrupled in the same period. In this regard it should be remembered that renewable energy accounts for 85% of the investment in electricity generation at this time⁵⁹ and that according to Irena,⁶⁰ generation costs were reduced by 80% for solar and 30% to 40% for wind between 2009 and 2015.

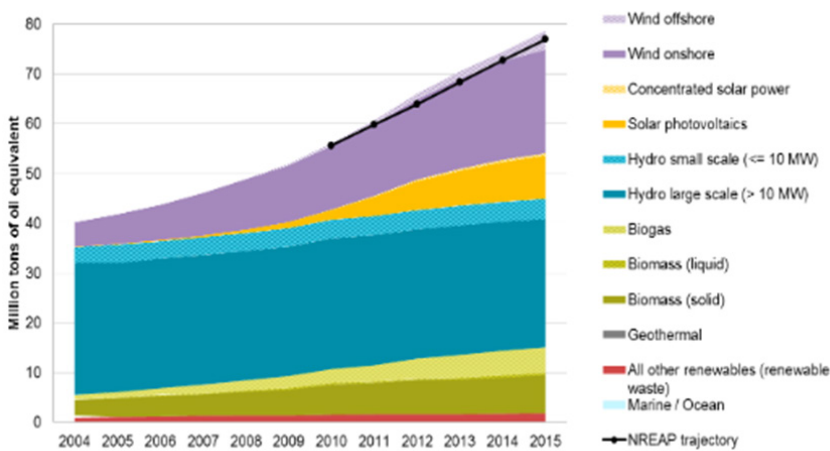


Figure 21. Production of renewable electricity in the European Union-28 by energy source. Source: European Commission, Renewables Report, 2017.

However, the sector in which the penetration is slowest is transport, with a proportion of only 6% of renewables in 2015. Within this, the absolutely dominant source is biofuels, which account for 88% of the contribution, and in particular biodiesel, which covers 79% of the total.

With regard to transport, it is important to also take into account that in the DER, together with the Directive on the quality of fuels⁶¹ (DCC), two objectives are established in relation to the use of renewables in the sector. The RED reflects

⁵⁹ https://ec.europa.eu/energy/sites/ener/files/documents/technical_memo_renewables.pdf.

⁶⁰ IRENA (2016). The Power to Change: Solar and Wind Cost Reduction Potential to 2025.

⁶¹ Directive 2009/30/EC of the European Parliament and of the Council of 23 April 2009 amending Directive 98/70/EC in relation to the specifications of petrol, diesel and gas oil, introduces a mechanism to control and reduce greenhouse gas emissions; the 1999/32/EC Directive of the Council is modified in relation to the specifications of the fuel used by inland waterway vessels and Directive 93/12/ECC is repealed. <http://eur-lex.europa.eu/legal-content/ES/TXT/PDF/?uri=CELEX:32009L0030&from=EN>.

the objective of the European Council of 2007 that by 2020 10% of the fuels for transport should come from renewable sources and the DCC forces fuel operators to reduce the intensity of greenhouse gases of the fuels supplied by 6%.

The establishment of both objectives is still relatively controversial due to the difficulty of their implementation and the possible negative environmental effects derived from it. Perhaps the most prominent is that related to indirect land use change (ILUC). The problem is that a large part of biofuels can be produced on agricultural land, which causes the production of food to move to other lands that have to be transformed into agricultural land. It is this second transformation of land that can cause additional emissions of greenhouse gases, as well as loss of biodiversity and other environmental damage. Occasionally, these induced greenhouse gas emissions far exceed the savings produced by the use of biofuels. Perhaps the most frequently used example to present this negative effect is the transformation of natural lands to produce palm oil in developing countries. To correct this effect, the European Union adopted a new directive that limits the maximum proportion of biofuels that can be produced on agricultural land to 7% to remain within the objective of 10% and establishes an indicative target of 0.5% of second generation fuels (from waste, biomass and others), whose contribution counts double for the 10% objective, and which can obviously not be produced on agricultural land.

In November 2016, with the aforementioned «Clean energy for all Europeans» package, the Commission presented a new proposal for a renewables directive⁶² with which to regulate the post-2020 regime and achieve the 2030 objectives. In essence, with the new proposal:

- It establishes the binding objective for the European Union of 27% of renewables mentioned above, without this time having objectives per Member State (although the 2020 objectives are maintained as a minimum baseline);
- It is demanded to increase the proportion of renewables in heating and cooling by 1% per year;
- Common principles of support for the deployment of renewables are established and retroactive changes in the Union are prohibited;
- The administrative procedure for authorising renewable projects with a single window is sped up and maximum periods are established for authorisations ranging from 6 months to three years;
- The objectives of renewable consumption in transport are modified; the proportion of second generation biofuels is increased to 3.6% in 2030 and

⁶² Proposed directive of the European Parliament and Council on the promotion of the use of energy from renewable sources (recast). COM, 2016, pp. 767-end. http://eur-lex.europa.eu/resource.html?uri=cellar:3eb9ae57-faa6-11e6-8a35-01aa75ed71a1.0006.02/DOC_1&format=PDF.

the proportion of first generation biofuels that can be counted towards the mandatory target is reduced to a maximum of 3.8% by 2030;

- New criteria of sustainability and reduction of emissions of greenhouse gases are established that will be applied to biofuels, bioliquids and biomass.

The proposal is now being debated in the Council and the European Parliament with the aim of approving it as soon as possible.

Energy efficiency

Energy efficiency is widely recognised as a very effective way to reduce greenhouse gas emissions. It also saves money and improves energy security. It is not surprising, therefore, that it plays an important role in the climate and energy policy of the European Union. Therefore, when talking about the fight against climate change, it is often said that the best energy is the energy that is not consumed: this is often the phrase used to justify energy efficiency action in a few words.

The objective set by the European Council for 2020 in terms of energy efficiency is to reduce primary and final consumption (which includes all the energy distributed to end users except that used by the industry) by 20% of energy with respect to the projections for said year, which means that in 2020 the primary energy consumption of the European Union can not exceed 1,483 Mtoe⁶³ or 1,086 Mtoe in final energy. To achieve this, the European Union adopted a series of specific measures, most notably the energy efficiency directive⁶⁴ (2012), the ecological design directive for energy-related products⁶⁵ (2009), the product energy labelling directive⁶⁶ (2010) and the buildings energy efficiency directive⁶⁷ (2010).

These are particularly important measures in the energy efficiency directive:

- The obligation of certain energy distributors to reduce the volume of sales to end consumers by 1.5% per year, although there may be exceptions and Member States are also allowed to achieve the same results with alternative measures (taxes, tax incentives and others);
- The imposition of certain smart metering and billing systems for electricity, natural gas, heating and cooling of district and domestic hot water, in order to provide better information on consumption (hourly consumption, individualised consumption and others) and to facilitate savings;
- The requirement to governments in public contracting to only buy products, services and buildings of high energy efficiency and to promote the same measure with regional and local public authorities;

⁶³ Mtoe, millions of tons of oil equivalent.

⁶⁴ <http://eur-lex.europa.eu/legal-content/ES/TXT/PDF/?uri=CELEX:32012L0027&from=ES>.

⁶⁵ <http://eur-lex.europa.eu/legal-content/ES/TXT/PDF/?uri=CELEX:32009L0125&from=EN>.

⁶⁶ <http://eur-lex.europa.eu/legal-content/ES/TXT/PDF/?uri=CELEX:32010L0030&from=EN>.

⁶⁷ <http://eur-lex.europa.eu/legal-content/ES/TXT/PDF/?uri=CELEX:32010L0031&from=en>.

- The establishment of an annual target from 2014 onwards for renovation of 3% of the total surface of public buildings of central governments;
- The requirement for the Member States to implement long-term energy renovation strategies for public and private buildings.

According to the data up to 2015, the European Union is on track to meeting

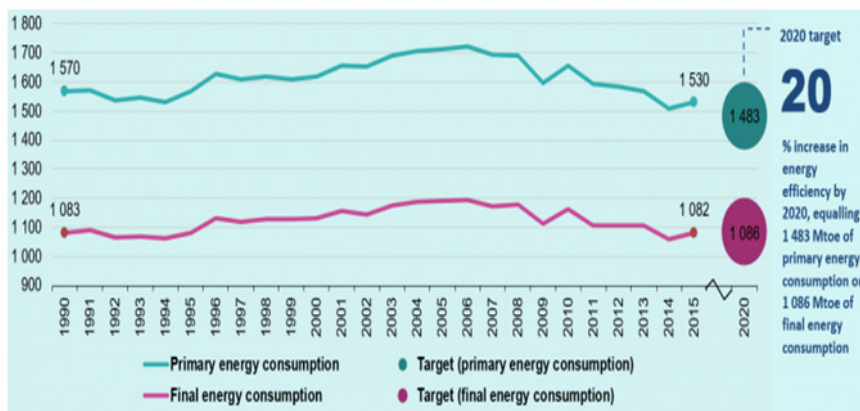


Figure 22. Consumption of primary energy and final energy in the European Union-28, from 1990 to 2015. Source: Eurostat ⁶⁸

the 20% target in 2020 (see figure 22), which, we must not forget, is measured in reductions with respect to the initial projections for 2020. In 2014, its primary energy consumption was 12% lower than in 2005, only 1.6% above the 2020 target according to the Commission⁶⁹. In fact it fell from 1,712 Mtoe in 2005 to 1,507 Mtoe in 2014. If the trend continued, it would ultimately lead to consumption 13.4% below that of 2005.

In terms of final energy, in 2014 the European Union had already achieved the 2020 target with a reduction of 11% compared to 2005, going from 1,191 Mtoe in that year to 1,062 Mtoe in 2014, already below the target of 1,086 Mtoe.

Despite these good results, the estimates⁷⁰ foresee a possible increase in consumption due to economic recovery and population growth, which is why they warn of the need to make additional efforts.

⁶⁸ http://ec.europa.eu/eurostat/statistics-explained/index.php/Europe_2020_indicators_-_climate_change_and_energy#The_EU_needs_to_further_pursue_energy_efficiency_improvements.

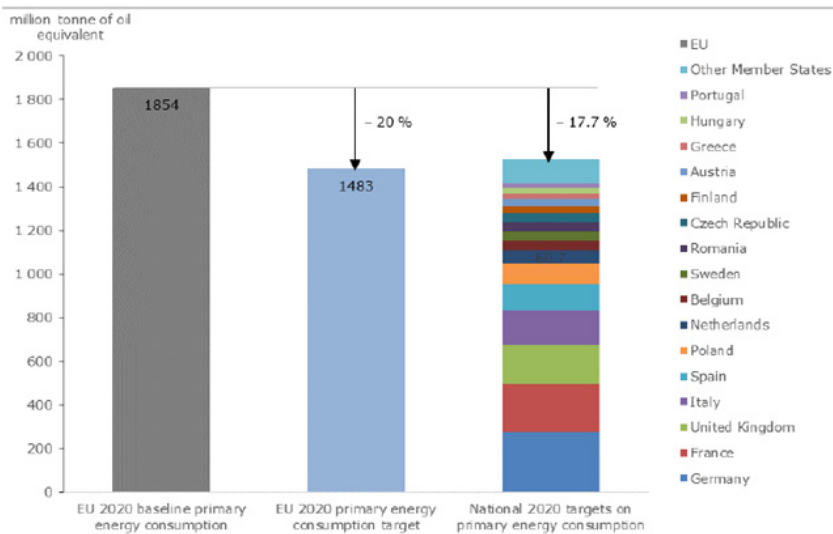
⁶⁹ Report from the Commission to the European Parliament and the Council: 2016 assessment of the progress made by Member States in 2014 towards the national energy efficiency targets for 2020 and towards the implementation of the energy efficiency directive 2012/27/EU as required by article 24 (3) of the energy efficiency directive 2012/27/EU. COM, 2017, pp. 56-end. <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52017DC0056&from=EN>.

⁷⁰ EEA. 2016. *Trends and projections in Europe 2016 – Tracking progress towards Europe's climate and energy targets*.

European Union policy on climate change

The new proposal for a directive on energy efficiency presented by the Commission in November 2016 with the Clean energy package for all Europeans, now being discussed in the European Council and Parliament, foresees some important changes, among which:

- The establishment of a new and binding objective, higher than that of the European Council of 2014 of 30% by 2030, to be distributed among the Member States through indicative objectives that they should include in their integrated climate and energy plans. Figure 23 shows the objectives of each Member State for 2020;
- Periodic and continuous revision of the objective, the first time in 2027 and then every 10 years, with a view to achieving the 2050 objectives;
- The revision of the systems of measurement and billing of energy consumption, with a view to making them smarter and facilitating the remote management of consumption;
- Diverse changes in the implementation of the directive, including the panoply of measures to be adopted by the Member States.



Note: The Member States grouped as 'Other Member States' are those that have a 2020 target for primary energy consumption lower than 20 Mtoe and a 2020 target for final energy consumption lower than 15 Mtoe. In order of decreasing magnitude of 2020 targets, these countries are Denmark, Bulgaria, Slovakia, Ireland, Croatia, Slovenia, Estonia, Lithuania, Latvia, Luxembourg, Cyprus and Malta.

Figure 23. Objectives of reduction in primary energy consumption by Member States for 2020. Source: EEA, 2017.

Buildings are a particularly powerful deposit of energy efficiency and therefore have a specific directive that adds obligations to that envisaged

in the energy efficiency directive to renew the annual 3% of the public building already seen. Among its most important obligations is that all new buildings should be «almost zero energy consumption» from 2021 (2019 for public buildings). It also incorporates many operational measures such as the development of energy certificates that must accompany all sales or rentals of buildings or the establishment of minimum energy performance requirements for new buildings and major renovations, among others. With the well-known Clean Energy package for all Europeans of November 2016, a proposal to revise and update this directive is also incorporated.

The reductions in transport. The Commission's roadmap

The transport sector is responsible for about a quarter of the greenhouse gas emissions of the European Union and, unlike the other sectors, its emissions are still higher than in 1990 due to the increase in the activity of the sector and the vehicle fleet. Despite all the mitigation measures applied. Between 1990 and 2013 its emissions still grew⁷¹ by 22% (figure 24).

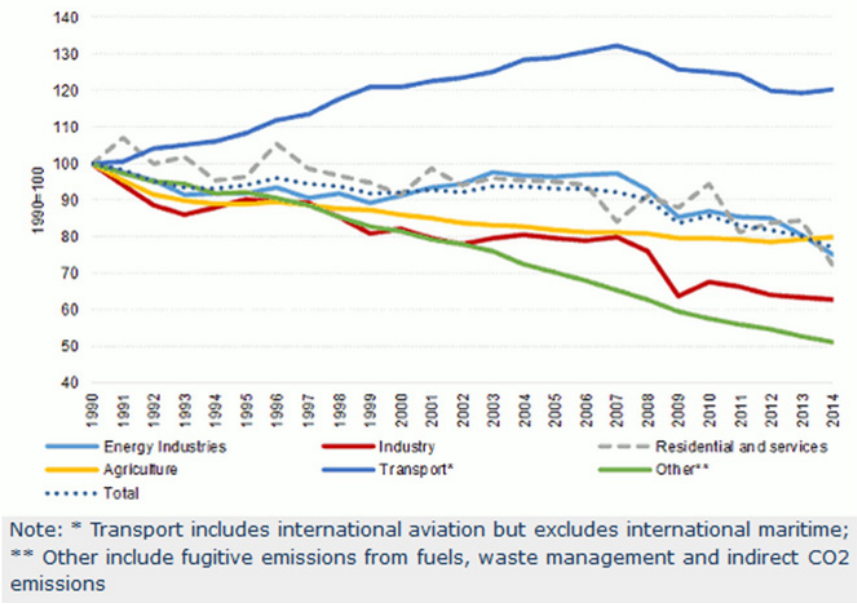


Figure 24. Evolution of greenhouse gas emissions by sector in the European Union 1990 - 2014. Source: European Commission⁷².

⁷¹ European Parliament 2015. Research for TRAN Committee: Greenhouse gas and air pollutant emissions from EU transport – In depth analysis. Directorate General for internal Policies - Policy department B: Structural and Cohesion Policies. [http://www.europarl.europa.eu/RegData/etudes/IDAN/2015/563409/IPOL_IDA\(2015\)563409_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/IDAN/2015/563409/IPOL_IDA(2015)563409_EN.pdf).

⁷² https://ec.europa.eu/clima/policies/transport_en.

Within transport, road transport is the cause of the vast majority of emissions, as can be seen in Figure 25, with more than 70%.

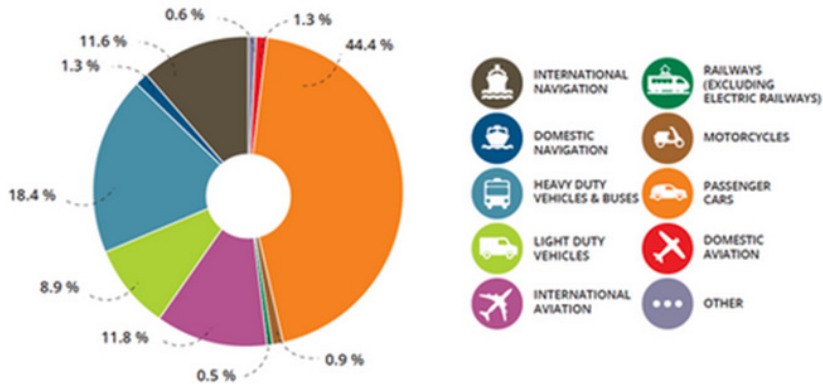


Figure 25. Emissions of greenhouse gases by transport in the European Union-28 in 2014. Source: EEA⁷³.

The action of mitigation of climate change in transport covers measures of different kinds, most notably trade in emissions (for aviation), fuel quality and promotion of biofuels, emission limits in vehicles and development of infrastructure for clean transport (charging points for low consumption vehicles) d out. In view of the data, it is not surprising that the greatest emphasis is placed on reducing emissions from road transport.

The Commission published a *White Paper on transport* in 2011⁷⁴ in which it set the long-term goal of reducing transport emissions by at least 60% by 2050. With this, it proposes a coherent effort with the objective of global emission reduction. The measures adopted later have shorter-term objectives that are also consistent with this long-term objective. An important complement is the European Strategy in favour of low-emission mobility⁷⁵ adopted by the Commission in July 2017 and with which it intends to direct a package of future measures in improving the efficiency of transport systems, in the deployment of low-emission means of transport and in the progress towards vehicles with zero emissions. It should be remembered in this regard that this type of transport measures also have numerous other advantages for improving our quality of life, such as reducing air pollution or congestion, among others.

⁷³ <https://www.eea.europa.eu/signals/signals-2016/articles/transport-in-europe-key-facts-trends>.

⁷⁴ https://ec.europa.eu/transport/sites/transport/files/themes/strategies/doc/2011_white_paper/white-paper-illustrated-brochure_es.pdf.

⁷⁵ http://eur-lex.europa.eu/resource.html?uri=cellar:e44d3c21-531e-11e6-89bd-01aa75ed71a1.0004.02/DOC_1&format=PDF.

With regard to the emissions reduction targets for 2030, as today only EU aviation emissions are within ETS, the vast majority of transport reductions fall within the effort that Member States should make in non-ETS sectors, for which the reduction is 30% compared to 2005. Together with national measures that may be taken (traffic regulation, means of transport in cities, among others), the measures taken at Union level are capital. As can be seen, on the other hand, in Figure 26, the weight of transport varies considerably from one Member State to another.

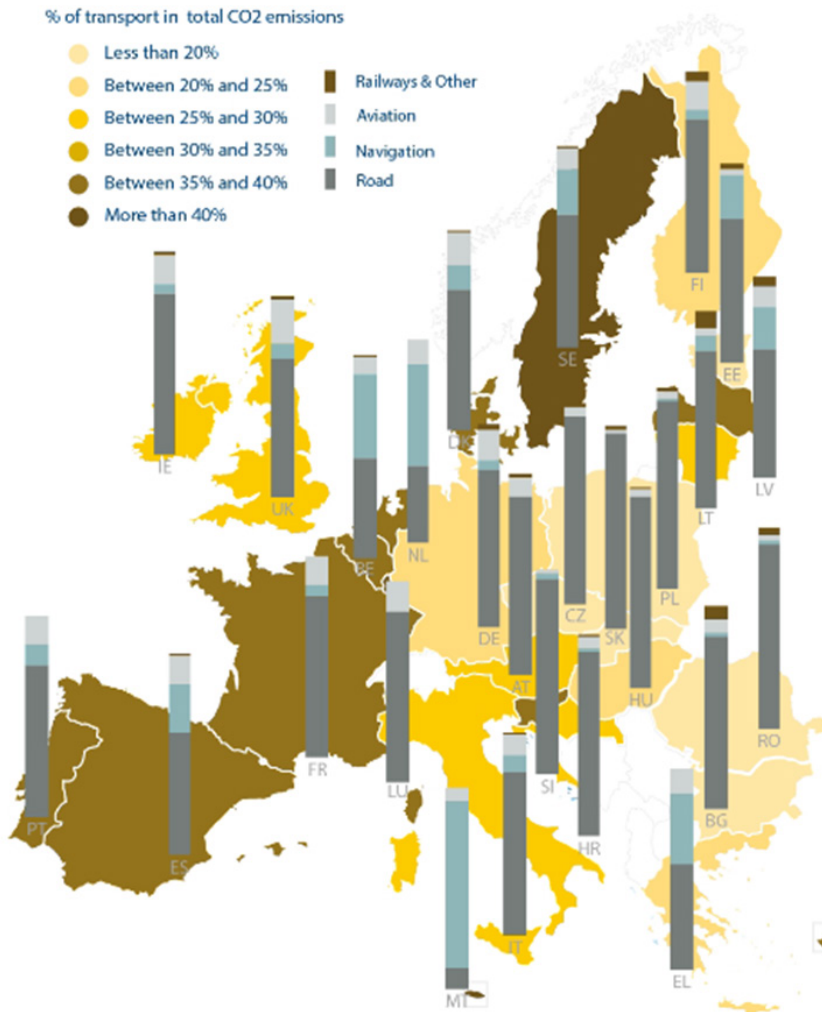


Figure 26. CO2 emissions from transport by form of transport in the European Union in 2012. Source: European Parliament .

⁷⁶ [http://www.europarl.europa.eu/RegData/etudes/BRIE/2015/569031/EPRS_BRI\(2015\)569031_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/BRIE/2015/569031/EPRS_BRI(2015)569031_EN.pdf).

Along with the measures already discussed on fuels and others, among the most important measures are those related to vehicle emission limits. The target for passenger vehicles of 130 grams of CO₂/km for 2015 was already reached in 2013 and that of the trucks of 175 grams of CO₂/km for 2017 was also reached in 2014. The new targets are 95 grams of CO₂/km for passenger vehicles by 2021 and 147 grams of CO₂/km for trucks by 2020.

In addition, the Commission must submit new legislative proposals in 2018 with new limits for these vehicles after 2021 and also to boost the penetration of low emission vehicles (hybrids, electric or hydrogen cells), as part of the reduction effort. It also plans to soon submit a proposal for emission limits for heavy vehicles, as indicated above.

Financing the fight against climate change in the European Union

The priority given by the European Union to the fight against climate change is also reflected in the financial effort devoted to it. In the financial framework for the period 2014-2020, it has been established that at least 20% of the European Union budget, that is, close to 200 billion euros, will be devoted to actions related to the fight against climate change. This obligation covers all major areas of Union policy⁷⁷: the structural and investment funds (€115 billion for climate, 25% of the total for this), the common agricultural policy (13.6 billion on climate in 2015), Horizon 2020, which is the key instrument of research policy (€27 billion on climate), and the development policy⁷⁸, which in 2015 along with the Member States and the EIB contributed a further €17.6 billion for the fight against climate change in developing countries. On the other hand there are other programmes of variable financial significance that also contribute a part of their resources to the fight against climate change, such as the Life programme, which finances demonstration projects.

In terms of low-emission technologies, particular mention should be made of a programme that is financed with the proceeds of auctions of emission rights under ETS. This is the NER 300 programme, which enables the European Investment Bank to auction up to 300 million rights to finance demonstration projects in mature, low-emission energy technologies that are not yet viable on a commercial scale, and that also include the capture and storage of carbon.

In addition, also in relation to ETS, member states paid the amount of €4.9 billion in 2015, 77% devoted to climate-related actions, according to the distribution shown in figure 27.

⁷⁷ European Commission. 2016. Report of the Commission to the European Parliament and the Council. Adoption of the Paris Agreement: Advances of the European Union towards the goal of a minimum reduction of 40%. COM, 2016, pp. 707-end. <https://ec.europa.eu/transparency/regdoc/rep/1/2016/ES/COM-2016-707-F1-ES-MAIN.PDF>.

⁷⁸ https://ec.europa.eu/clima/sites/clima/files/budget/docs/pr_2013_11_19_en.pdf.

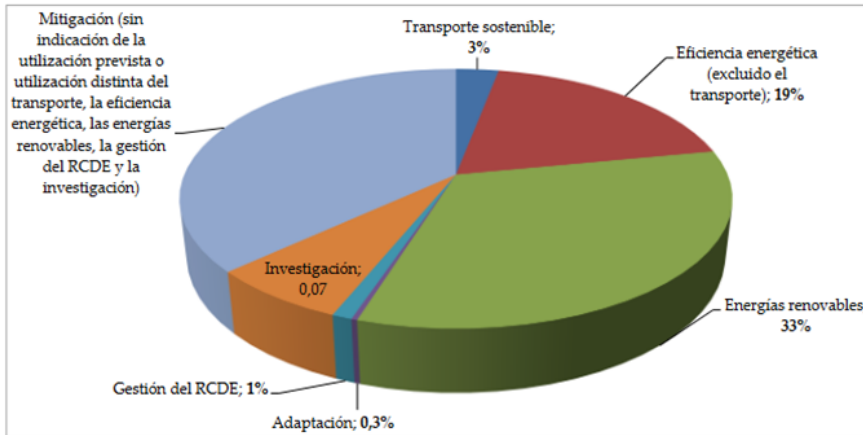


Figure 27. Use of revenue from the auctioning of emission allowances spent on climate and energy in the Member States, by sector (weighted EU average) in 2015. Source: European Commission⁷⁹.

Among the financial measures of the European Union we should also mention the activity of the public European Investment Bank, which has become one of the major multilateral providers of financing regarding climate change, and which has also provided funds for emerging and developing countries outside the European Union. And we must also mention the European Fund for Strategic Investments, which plans to mobilise large sums (more than half a billion € in the latest extension of 2016) in large projects that pay particular attention to the low-carbon economy.

⁷⁹ European Commission. 2016. Report of the Commission to the European Parliament and the Council. Adoption of the Paris Agreement: Advances of the European Union towards the goal of a minimum reduction of 40%. COM, 2016, pp. 707-end. <https://ec.europa.eu/transparency/regdoc/rep/1/2016/ES/COM-2016-707-F1-ES-MAIN.PDF>