



**7th National Communication &
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UN Framework Convention on Climate Change (UNFCCC)
(required under the UNFCCC and the Kyoto Protocol)**

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EXECUTIVE SUMMARY

i. INTRODUCTION

The European Union (EU) and its Member States, both jointly and individually, have engaged in domestic and international action on climate change for a number of years and this has resulted in significant emission reductions.

The staff working documents accompanying this report constitute the EU's seventh national communication as required under Article 12 of the United Nations Framework Convention on Climate Change (UNFCCC) and Article 7 of the Kyoto Protocol, and its third biennial report as required under Decision 2/CP.17 of the Conference of the Parties under the UNFCCC. This report is an executive summary of those documents.

ii. NATIONAL CIRCUMSTANCES

The EU comprises 28 Member States, with a total population of 510 million. Over the last 26 years, the population in the 28 Member States has grown on average by 0.3 % a year.

Total energy consumption grew between 1990 and 2006 (by around 0.5 % a year), but since then it has generally declined; in 2015, it was back to 1990 levels. The trend observed since 1990, of a shift in the primary fuel mix from coal to gas, has slowed in recent years. There has been an increasing shift to renewables, with their share rising from 4 % in 1990 to 13 % in 2015, largely driven by an increase in biomass consumption. Production of energy from solar photovoltaics and wind also increased very substantially over the period.

iii. GREENHOUSE GAS INVENTORY

Emissions included in this executive summary are those relevant to the EU target under the Convention and the data are taken from the latest submission of the EU inventory to the UNFCCC. Total greenhouse gas (GHG) emissions in the EU, excluding emissions and removals from land use, land-use change and forestry (LULUCF) but including emissions from international aviation, decreased by around 22 % between 1990 and 2015, and by 23% between 1990 and 2016.

The most prevalent GHG by far is CO₂, which accounted for 81.8 % of total EU emissions in 2015, excluding LULUCF. The energy sector accounted for most of the EU's GHG emissions in 2015 (77.9 %), followed by agriculture (10.1 %) and industrial processes and product use (8.7 %).

Per capita emissions dropped by 28.7 % between 1990 and 2015, from 11.9 t to 8.5 t. The ratio of GHG emissions to GDP also fell considerably, thanks to steady progress since 1990 on decoupling economic activity from GHG emissions.

iv. POLICIES AND MEASURES

Under the UNFCCC, the EU and its Member States have taken a joint emission reduction target to reduce its GHG emissions by at least 20% compared to 1990 by 2020, with a conditional offer to move to a 30% reduction, provided that other developed countries

commit themselves to comparable emission reductions and developing countries contribute adequately according to their responsibilities and respective capabilities.

The EU target is enshrined in legislation, and is being implemented by the EU and its Member States. At the heart of this legislation, the EU Climate and Energy package sets for the Union a 20% GHG emission reduction target by 2020 compared to 1990, which is equivalent to -14% compared to 2005. This effort has been divided between the sectors covered by the EU Emission Trading System (EU ETS) and non-ETS sectors under the Effort Sharing Decision (ESD).

The EU has agreed that at least 20 % of its budget for 2014-2020 – as much as €180 billion – should be spent on climate change-related action. To achieve this increase, mitigation and adaptation actions are integrated into all major EU spending programmes. By current estimates, this target has been exceeded in 2016 and spending will remain close to it over 2017-2020.

Since the last national communication and biennial report, the EU and its Member States have continued to strengthen legislation to enable GHG reductions and the transition to a low-carbon economy. Key policy developments include developments to the EU ETS, new legislative instruments for emissions in the ‘non-traded’ sectors, and proposed amendments to renewable energy and energy efficiency policies.

Cross-cutting policies

EU ETS

The EU ETS, which has been operational since 2005, is based on the ‘cap and trade’ principle. It limits emissions from nearly 11 000 heavy energy-using installations (power stations and industrial plants) and slightly over 500 aircraft operators operating between countries in the European Economic Area, and covers around 45 % of the EU’s GHG emissions.

A political agreement was reached in the beginning of November 2017 on phase 4 of the EU ETS, to help achieve a 43 % reduction (from 2005 levels) of emissions from energy production and industry by 2030, providing for:

- increasing the annual reduction in the overall number of allowances ("cap") from 1.74 % to 2.2 % from 2021 onwards, in order to deliver the emission reductions and achieve the underlying environmental objective;
- continued free allocation after 2021, including updates to the relevant benchmarks to reflect technological progress, criteria for the future inclusion of sectors in the carbon leakage list and procedures to account for changes in production levels and a continued possibility to compensate sectors for indirect carbon costs;
- several low-carbon funding mechanisms, in particular an Innovation Fund of at least 450 million allowances (to support the demonstration of innovative renewable-energy and low-carbon innovation in industry, and carbon capture, use and storage) and a Modernisation Fund of at least 310 million allowances (to help modernise the energy systems of 10 Member States with lower GDP).

Non-ETS

The EU Effort Sharing Decision covers emissions from the non-ETS sectors, such as buildings, transport and agriculture. Evaluation of the legislation that has been in place since 2013 shows that it has stimulated new national policies and measures.

Two legislative proposals tabled in July 2016 set out how Member States should implement their commitment to reduce its non-ETS emissions by 30 % by 2030 compared to 2005.

- First, for the 'effort sharing sectors', which are sectors outside the ETS and Land Use, Land Use Change and Forestry (LULUCF), each Member State would be subject to a binding annual greenhouse gas emission limits for the period 2021–2030. Member States agreed to share the relevant efforts on the basis of fairness, solidarity, cost-effectiveness and environmental integrity. The proposal thus recognises Member States' varying capacities to take action by differentiating 2030 targets primarily based on 2013 GDP *per capita*. The proposed 2030 targets range from 0 % to -40 % compared to 2005 levels.
- Second, Member States would be required to balance GHG emissions and removals from LULUCF under the 'no debit rule'. It is proposed that any debit from LULUCF would have to be entirely compensated by an equivalent removal of CO₂ from the atmosphere through action in the sector or, alternatively, in the effort-sharing sectors. For example, if a Member State increases its forest harvest, even within the limits imposed by sustainable forest management, it must compensate for the resulting emissions by establishing more forest area, and/or by improving the carbon management of existing forests, croplands and grasslands, or by further reductions in the effort-sharing sectors. In addition, Member States will also have the possibility to trade LULUCF credits. If implemented, this accounting system will help Member States to incentivise farmers and foresters to move towards climate-smart agriculture and forest management.

Energy

The EU has made progress towards achieving its targets of renewable generation equalling 20 % of energy, with a 16 % share of renewable energy in 2014 and an estimated 16.4 % in 2015. Moreover, the vast majority of EU countries are well on track to achieving their 2020 binding targets for renewable energy.

Likewise, the EU is broadly on track to meet its 20% 2020 energy efficiency target, despite an increase in primary and final energy consumption in 2015 driven by a colder winter and lower fuel prices. In 2015, primary energy consumption was 3.2 % above the 2020 primary energy consumption target and slightly below the 2020 final energy consumption target.

Continued efforts are needed to ensure that the 2020 targets are met and to lay the foundations for achieving the 2030 targets of a share of at least 27 % of EU energy consumption for renewable energy and 30 % energy efficiency. To support the delivery of these targets, the Commission adopted the Clean Energy for All Europeans Package in 2016, which aims to keep the EU competitive as the clean-energy transition changes global energy markets.

In this way, the EU can lead the clean energy transition, not only adapt to it. The eight legislative proposals in the package aim to put energy efficiency first, achieve global leadership in renewable energies and provide a fair deal for consumers. They include amendments to the directives on energy efficiency, the energy performance of buildings and renewable energy. On the same day, the Commission adopted measures in relation to eco-design and energy labelling as well as an overarching strategy, "Accelerating Clean Energy Innovation".

The proposed amendments to the Renewable Energy Directive include reforms across electricity, heating and cooling, and transport, including the introduction of coordinated regional approaches, targeted financial instruments, renewable heat and cooling obligations for fuel suppliers, and facilitation of uptake of district heating and cooling system. The reforms have been supported by the introduction of an EU heating and cooling strategy.

The proposal for an amended Energy Efficiency Directive includes provisions to align energy efficiency targets with the EU's 2030 climate and energy framework, extending beyond 2020 the obligation on energy suppliers and distributors to save 1.5 % of energy each year from 2021 to 2030.

The proposal for an amended Energy Performance of Buildings Directive includes provisions to help achieve a decarbonised building stock by 2050, clarify feasibility study and inspection requirements and promote electric vehicle uptake through infrastructure provision. It includes the provision of a smartness indicator for buildings, enhances the flexibility of funding mechanisms and increases building-data availability and quality.

Progress is also being made on the energy efficiency of products, through a new eco-design working plan for 2016-2019 which sets out existing and new product measures that have the potential to deliver more than 600 TWh of annual primary energy savings by 2030.

The Accelerating Clean Energy Innovation strategy, part of the Clean Energy for All European package, recognises the central role played by innovation and the importance of a regulatory framework that is conducive to innovation. This strategy sets 20 different actions to boost research and innovation in clean energy solutions and to bring results to the market quickly and successfully.

Transport

The 2011 White Paper on Transport put forward a goal of reducing by 2050 the EU GHG emissions from transport, by at least 60% (relative to 1990 levels). This target was reiterated by the EU low-emission mobility strategy, adopted in 2016, which also set an ambition goal of reducing – drastically and without delay – the emissions of air pollutants from transport. The analytical work underpinning the strategy highlighted how a reduction by 18-19% (relative to 2005 levels) of CO₂ emissions from transport would provide a cost-effective contribution to the 2030 Climate and Energy policy framework.

Although GHG emissions from transport have not shown the same decline as those in other sectors, provisional data published by the European Environment Agency show good progress on fuel efficiency of new cars, with average emission level of a new cars sold in 2016 at 118.1 grams of CO₂ per kilometre, significantly below the 2015 target of 130 g (the 2020 target is 95 g CO₂/km).

In order to optimise the transport system and improving its efficiency, the Commission has adopted a European Strategy for Low-emission mobility and an agenda for a socially fair transition towards clean, competitive and connected mobility for all. The Commission also adopted a European strategy on Cooperative Intelligent Transport Systems, a milestone towards cooperative, connected and automated mobility.

The EU Strategy on Low-emission mobility looks at how the transport sector can contribute to the 2030 climate and energy targets, and the transition to a low carbon circular economy. It presents an integrated, holistic approach through a wide range of actions, to address three key levers: optimising the transport system and improving its efficiency, scaling up the use of low-emission alternative energy for transport, improving vehicles efficiency and the deployment of low and zero emission vehicles.

Different measures are being proposed to implement the Strategy:

- The revision of the regulatory framework for road charging. This proposal aims to broaden the scope of the legislation to include coaches and other light vehicles (such as passenger cars), support the shift to the "user and polluter pays" principles for all vehicles, and modernise road charging methods. The revision of the EU rules on buses and coaches aims to achieve a level playing field for all operators and better travel options for consumers. The proposed revision on combined transport will promote cleaner road freight.
- The revision of the Renewable Energy Directive. This proposal aims to support the development of advanced alternative fuels for transport. The Commission's favoured approach to achieve this is the incorporation of an obligation for advanced renewable transport fuels (including advanced biofuels and renewable electricity), alongside a reduction of food-based biofuels.
- The revision of the Clean Vehicle Directive, that aims to promote the use of public procurement to incentivise the creation of markets for innovative and low-emitting vehicles.
- An Alternative Fuels Infrastructure Action Plan, adopted by the Commission, to support the deployment of an EU backbone charging infrastructure.
- A proposal on new CO₂ emissions standards for cars and vans for the period post 2020. This proposal aims to further curb emissions from road transport, setting new EU-fleet wide targets for 2025 and 2030 and providing incentives for the uptake of low and zero emissions vehicles. Monitoring and governance is improved, in order to reduce deviations between real-world and test-cycle emissions.
- A proposal on monitoring and reporting of CO₂ emissions and fuel consumption from heavy duty vehicles. For this purpose, the Commission has developed a new measurement tool, the Vehicle Energy Consumption Calculation Tool (VECTO). This new monitoring and reporting scheme will enable the Commission to collect data on emissions and fuel consumption, and make them publicly available through the European Environment Agency.

Research and innovation are also identified as instrumental to the decarbonisation of the transport system. The EU foresees actions in the short term (2018-2020) and in the medium

to long term (towards 2030 and up to 2050). Efforts will be coordinated at EU, national and local levels for implementation and deployment of innovative mobility solutions. To date, this has included the development of hydrogen fuel for transport, led by a Public-Private Partnership – the 'Fuel Cells and Hydrogen Joint Undertaking' (JU) – between the European Commission, industry and the research community, that will enable the commercial deployment of hydrogen by 2020. In addition, a Strategic Transport Research and Innovation Agenda was adopted this year as part of the European Commission's Strategy for low emission mobility.

Industry

The regulation of fluorinated GHGs (F-gases), including hydrofluorocarbons (HFCs), through the adoption of the EU directive on mobile air conditioning systems and the 'F-gas Regulation' is projected to lead to cumulative emission savings of 1.5 Gt CO₂-eq by 2030 and 5 Gt CO₂-eq by 2050. These acts have enabled the EU to rapidly ratify the Kigali amendment to the Montreal Protocol and show leadership in this area.

Agriculture

An initial analysis of Member States' implementation choices under the new common agricultural policy regulations suggests that most are relevant to identified GHG emission reduction/climate needs and priorities. Important contributions to climate action will come from the combined effects of a number of measures, including cross-compliance, direct payments and rural development policy under the European agricultural fund for rural development, accompanied by support from the Farm Advisory Service and the activities of the European Innovation Partnership for Agriculture.

'Greening' rules mean that 30 % of the payments going directly to farmers are linked to adopting and mainstreaming farming practices that help meeting environment and climate goals. More than 30% of EU's rural development funds are dedicated to measures relevant for the environment and climate. In 2015, EUR 13.6 billion of the allocations committed under the CAP budget were climate-relevant; this value rose to EUR 18.7 billion in 2016.

Forestry

As outlined above, the Commission has adopted a legislative proposal to integrate GHG emissions and removals from LULUCF into the 2030 climate and energy framework. This does not include normative rules for the sector, but essential for capturing the GHG impact of activities not accounted under the ETS and Effort Sharing Regulation, such as biomass burning and agricultural CO₂ emissions.

Waste

Implementation of the EU's circular economy action package has been key in progressing efforts to reduce emissions from waste. It provides a clear, systematic and holistic approach that focuses on a number of priority issues, including plastics, food waste, critical raw materials, and construction and demolition, and sets out clear actions, commitments and timetables.

The Commission has adopted a raft of legislative proposals on areas such as waste, packaging, landfill, end-of-life vehicles, batteries and accumulators, and waste electrical and electronic equipment. They include stricter targets, such as recycling 65 % of municipal waste and 75 % of packaging waste by 2030, and reducing landfill to 10 % of municipal waste by 2030.

v. PROJECTIONS

The latest available GHG projections, as reported by Member States show that the EU is on track to achieving its 2020 target. Under the ‘with existing measures’ (WEM) scenario, total GHG emissions (including international aviation) are projected to be 26 % lower in 2020 than in 1990 and 30 % lower in 2030. Under the ‘with additional measures’ (WAM) scenario, projected GHG emissions are 27 % lower in 2020 and 32 % lower in 2030 than 1990.

It is projected that the most significant sectoral contribution in absolute GHG emission reductions from 1990 to 2020 will come from the energy sector (without transport), with emissions down by 36.5 % in 2020 and 41.8 % in 2030 under the WEM scenario, and by 37.1 % in 2020 and 44.0 % in 2030 under the WAM scenario. The energy sector is followed by agriculture, industry and the waste sector.

The transport sector is the only sector where emissions would still be higher in 2030 relative to 1990, due to high emissions growth during the 90s. GHG emissions from the sector are projected to be 13.8 % higher than 1990 levels in 2020 and 13.4 % higher in 2030 under the WEM scenario, and 12.7 % and 9.9 % higher in 2020 and 2030 respectively under the WAM scenario.

Reductions in CO₂ emissions are expected to contribute most to overall emission reductions in the EU. In the two scenarios, CO₂ reductions account for slightly over 80 % of the total between 2015 and 2020, followed by CH₄ (around 10 %) and N₂O (around 6 %).

Total estimated GHG reductions amount to 560 Mt CO₂-eq in 2020 under the WEM and 600 Mt CO₂-eq under the WAM scenario.

vi. IMPACTS, VULNERABILITY AND ADAPTATION

The EU recognises that some climate change impacts are unavoidable due to past emissions. It is investing in work to understand climate change impacts and is taking action to reduce vulnerability and adapt to a changing climate.

Since the last national communication, the EU has continued to strengthen the evidence base that supports decision-making on climate change adaptation and has stepped up its efforts to improve climate resilience in Europe. It is also strengthening cooperation with developing countries on adaptation.

Notable actions include: Mainstreaming adaptation into EU instruments such as regional development and the CAP. Dedicated instruments, such as: financial support for climate change adaptation projects in EU Member States through the LIFE programme; inclusion of the reports from Member States of their adaptation activities into the country pages of Climate-ADAPT; the fourth ‘Climate change, impacts and vulnerability in Europe report’,

which considers past and projected climate change's impacts on ecosystems and society; and the fourth macro-regional strategy (MRS) in the EU being published for the Alpine region.

Member States have made good progress as a result of this action. In all, 23 had adopted adaptation strategies by 2017 (compared to 15 in 2013), in part driven by the implementation of the EU strategy on adaptation to climate change. Evaluation of the adaptation strategy is under way and will be completed in 2018.

vii. FINANCIAL RESOURCES AND TRANSFER OF TECHNOLOGY

The EU and its Member States are the world's biggest providers of official development assistance to developing countries, delivering EUR 75.4 billion in 2016. In particular, the EU, EIB and Member States provided EUR 20.2 billion to help developing countries tackle climate change in 2016.

For the EU alone, provision of bilateral financial support has increased during the reporting period, from USD 1 281 million (€ 964 million) in 2013 to USD 3 020 million (€ 2 730 million) in 2016. Total financial support provided by the EU in the years 2015 and 2016 amounted to USD 4 702 million (€ 4 247 million).

The EU has increased targeted support to the poorest and most vulnerable countries, through a variety of policies and measures, but specifically through the European Development Fund (EDF), Development Cooperation Instrument (DCI), and a new phase of the EU Global Climate Change Alliance Plus (GCCA+) Initiative, with respective commitments of USD 33 739 million (€ 30 500 million), USD 21 681 million (€ 19 600 million) and USD 479 million (€ 432 million) during 2014-2020.

The EU has mainstreamed technology transfer and capacity building activities into all development support.

viii. RESEARCH AND SYSTEMATIC OBSERVATION

The EU contributes to research and systematic observation (RSO) through the involvement of multiple actors, and various instruments, tools and programmes, and across multiple sectoral policies. Research is a shared competence of the EU and its Member States. Only actions coordinated at EU level are reported in the EU National Communication.

Key vehicles include Horizon 2020, the EU's 2014-2020 framework programme for research and innovation, where approximately 35 % of its budget is expected to be used for climate-relevant research and innovation.

Other action includes: LIFE+ (the EU's 2014-2020 funding instrument for the environment and climate); the 2014-2020 programme for the competitiveness of enterprises and SMEs; international cooperation enhanced through various platforms and instruments; contributions to and/or financial support for major international institutions, research initiatives and programmes, such as the UNFCCC, the Intergovernmental Panel on Climate Change (IPCC) and the global climate observing system (GCOS); and Mission Innovation – launched in the margins of COP 21 to accelerate global clean energy innovation through the doubling of clean energy R&I public investments in the next 5 years.

To facilitate the implementation of the strategy on accelerating clean energy research and innovation, over EUR 2 billion in Horizon 2020's work programme (2018-2020) have been allocated to programmable actions addressing four interconnected research and innovation priorities (decarbonising the EU's building stock by 2050, strengthening EU leadership in renewables, developing affordable and integrated energy storage solutions, and electromobility and a more integrated urban transport system). In addition, further research investments from Member States towards low-carbon energy are planned through the Strategic Energy Technologies (SET) Plan. It promotes research and innovation efforts across Europe by supporting the most impactful technologies in the EU's transformation to a low-carbon energy system. It promotes cooperation amongst EU countries, companies, research institutions, and the EU itself.

ix. EDUCATION, TRAINING AND PUBLIC AWARENESS

The EU has been investing significant effort and resources into raising its citizens' awareness of the challenges posed by climate change, but also the opportunities, in particular as regards reducing GHG emissions. Action in the field of education (e.g. Erasmus+, Horizon 2020 science education, the Knowledge and Innovation Communities of the European Institute of Innovation and Technology – in particular ClimaKIC and InnoEnergy), public information campaigns (e.g. climate-policy and open-door days), communication activities, training and awareness-raising campaigns have all played an important role in this context.

x. CONCLUSION

The domestic and international action taken by the EU and its Member States through the climate and energy package has resulted in significant emission reductions and the GHG reduction trends continue, with a clear decoupling of economic growth from GHG emissions. Action has also been stepped up, *inter alia* through new policy proposals to deliver additional emission reductions in key sectors post-2020.

The EU has continued to strengthen the evidence base for decision-making on climate change adaptation and has strengthened efforts to improve climate resilience in Europe. Furthermore, by stepping up the support and assistance it provides to developing countries, the EU has helped to enhance action globally.

SEVENTH NATIONAL COMMUNICATION OF THE EU

1. INTRODUCTION

This document represents the European Union's (EU) seventh National Communication (7NC) required under the United Nations Framework Convention on Climate Change (UNFCCC), as reaffirmed by UNFCCC decision 9/CP.16 and UNFCCC decision 2/CP.17. It provides a comprehensive overview of climate change-related activity at the EU level.

As defined in the UNFCCC reporting guidelines for National Communications¹, the information is structured into:

- National circumstances relevant to greenhouse gas emissions and removals (Section 2);
- Greenhouse gas inventory information (Section 3);
- Policies and measures (Section 4);
- Projections and the total effects of policies and measures (Section 5);
- Vulnerability assessment, climate change impacts and adaptation measures (Section 6);
- Financial resources and transfer of technology (Section 7);
- Research and systemic observation (Section 8) and
- Education, training and public awareness (Section 9).

UNFCCC decision 2/CP.17 also requires the EU to submit its third Biennial Report (BR) by 1st January 2018. The UNFCCC reporting guidelines for National Communications content-wise overlap with the UNFCCC biennial reporting guidelines for developed country Parties (Annex I of decision 2/CP.17).

As endorsed in UNFCCC decision 2/CP.17, the EU has opted to submit its third Biennial Report as Annex 1 to this 7th National Communication. The tables as defined in the common tabular format (CTF) for the UNFCCC biennial reporting guidelines for developed country Parties (UNFCCC decision 19/CP.18) are enclosed as Appendix to Annex I. For the CTF submission to the UNFCCC, the electronic reporting facility provided by the UNFCCC secretariat has been used as required by UNFCCC decision 19/CP.18.

To avoid unnecessary duplication of information, overlapping contents were concentrated in the third Biennial Report: Those sections of the seventh National Communication's main body which content-wise would be identical to sections of the third Biennial report, do thus solely contain a reference to the corresponding section of Annex 1 and/or the CTF Appendix to Annex 1. To facilitate user-friendliness, whenever a reference is made to chapters in the Biennial Report text, these are clearly marked with [3BR] before the relevant chapter number in the Biennial Report.

The 28 Member States of the European Union submit separate NCs to the UNFCCC.

A summary table outlining the location of supplementary information required under Article 7, paragraph 2, of the Kyoto Protocol within this National Communication is provided in Appendix I of this document.

¹ FCCC/CP/1999/7 part II, in combination with UNFCCC decision 15/CMP.1

2. NATIONAL CIRCUMSTANCES RELEVANT TO GREENHOUSE GAS EMISSIONS AND REMOVALS

Key Developments

Population

- Population has continued to grow, at around 0.3 % per annum, a similar trend to the 6NC.

Economy

- EU-28 real GDP was 53 % higher in 2016 compared to 1990. This economic growth was mainly driven by growth in the service sector and in international trade.
- Growth rates declined significantly in 2008-2010 as the EU-28 faced a severe economic crisis in the aftermath of the financial crisis in 2008.
- Since 2010, the growth rate has slowly increased and GDP has recovered. Nevertheless, in 2012 the Euro currency crisis in the Southern European countries contracted growth of the European economy again. Growth has subsequently recovered again and in 2016 was 1.9 % per annum.

Energy

- Total gross inland and final energy consumption grew over the period from 1990-2006 (at around 0.5 % per annum), but has generally declined thereafter and in 2015 was very slightly less (by 0.03 %) than in 1990.
- The economic crisis in 2008 was mirrored by a strong decline in energy consumption in 2009 with a subsequent increase in 2010; energy consumption has subsequently declined.
- The trend observed since 1990 of a shift in the primary fuel mix from coal to gas has slowed down in recent years, but there has been an increasing shift to renewables. The share of renewables in gross inland energy consumption increased from 4 % in 1990 to 13 % in 2015, largely driven by growth in biomass. Production of energy from solar photovoltaics and wind has also increased very substantially over the period.

Transport

- Both freight and passenger transport grew strongly from 1995 until the economic crisis in 2008. Freight transport then showed a strong decline in 2008 and 2009; while it subsequently recovered, it is still below its 2007 level. Passenger transport was relatively stable from 2007, until 2014 when it began to rise again.

Agriculture and forestry

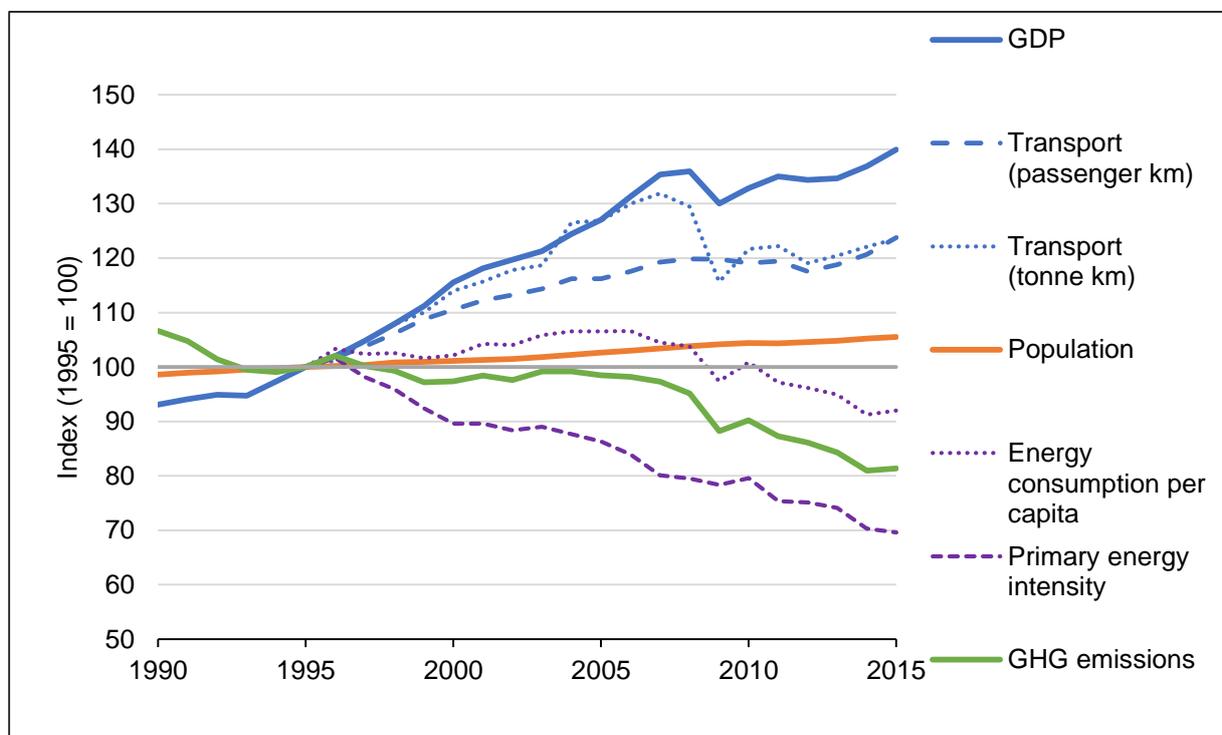
- In 2015, agricultural and forestry accounted for 41 % and 33 % respectively of land use.

Key trends

- Despite increases in population and GDP, GHG emissions for the EU-28 have fallen (Figure 2-1). Decomposition analysis of data from 1990 to 2012 shows that is due to

a decoupling of economic growth from GHG emissions². This was mainly driven by technological improvements which reduced energy intensity (energy use per unit of GDP), and the deployment of low carbon technologies.

Figure 2-1 Trends in greenhouse gas emissions and key parameters for the EU-28



Source: Chapter 2 and 3 of this report

Note: GHG emissions are without emissions and removals from Land Use, Land-Use Change and Forestry (LULUCF).

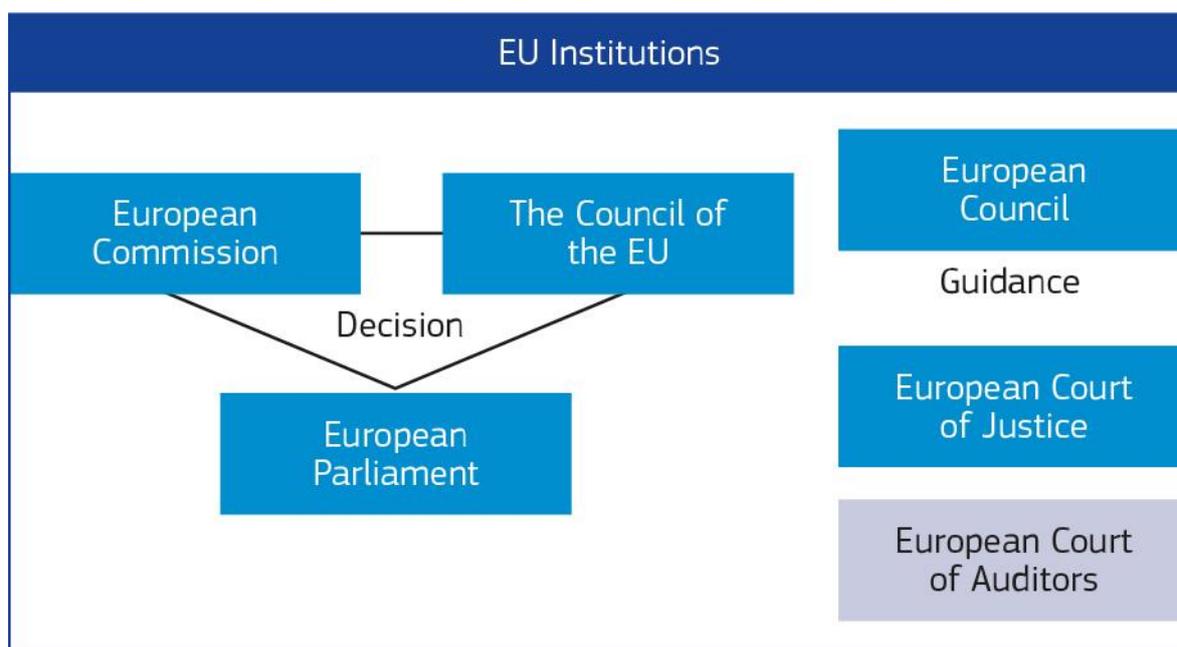
2.1. Government structure

The European Union's (EU) institutional system is unique in the world. The 28 Member States confer competences upon the Union to attain objectives they have in common. These competences are set out in a number of Treaties³, which are international agreements serving as the founding core legal acts establishing the Union. The Treaties regulate the Union's relations with the Member States, and create the Union's institutions (see Figure 2-2).

² ICF International, 2016. Decomposition analysis of the changes in GHG emissions in the EU and Member States. A report in association with ZEW Umweltbundesamt GmbH and Eclareon for DG CLIMA - https://ec.europa.eu/clima/sites/clima/files/strategies/progress/docs/dca_report_en.pdf.

³ The last revision of the Treaties was signed in Lisbon and entered into force on 1 December 2009. The consolidated versions of the current Treaties can be found at: <http://eur-lex.europa.eu/JOHtml.do?uri=OJ:C:2012:326:SOM:EN:HTML>

Figure 2-2 Key EU institutions for governance



The major policy-making bodies in the EU are the European Parliament, the Council of the EU and the Commission, who together drive the majority of policy initiatives, including on climate action. The Members of the European Parliament are directly elected by citizens every five years. The Council of the European Union consists of representatives of each national government at ministerial level. It is the main decision-making body and as well as being the legislative body in co-decision with the European Parliament, co-ordinates the broad economic policies of the Member States. The European Commission represents the interests of the Union as a whole. It proposes and enforces legislation, and implements policies and the EU budget. The President of the Commission and its other Members are appointed by the European Council after they have been approved by the European Parliament.

The European Council is made up of the Heads of State or Government of the Member States, and the European Commission President, together with its President and the President of the Commission. It defines the general political directions and priorities of the European Union, but has no legislative powers. Other key institutions are the judiciary (Court of Justice), the central monetary authority (European Central Bank) and the external audit authority, responsible for carrying out the audit of EU finances (European Court of Auditors).

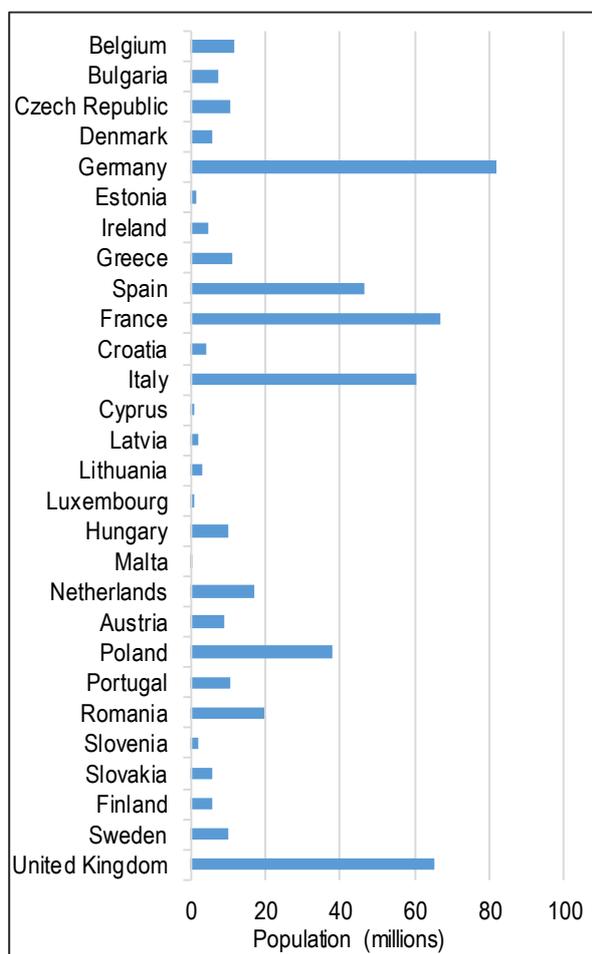
2.2. Population profile

Over the last 26 years the EU-28's population has grown on average by 0.3 % per annum, reaching 510 million people in 2016, an overall increase of 7.4 % since 1990. While population growth is generally considered a driver for greenhouse gas emissions and for increasing energy consumption, this trend of increasing population has not played a major

role in emission trends since 1990⁴. Trends in per capita primary energy consumption are shown in Section 2.5.1.

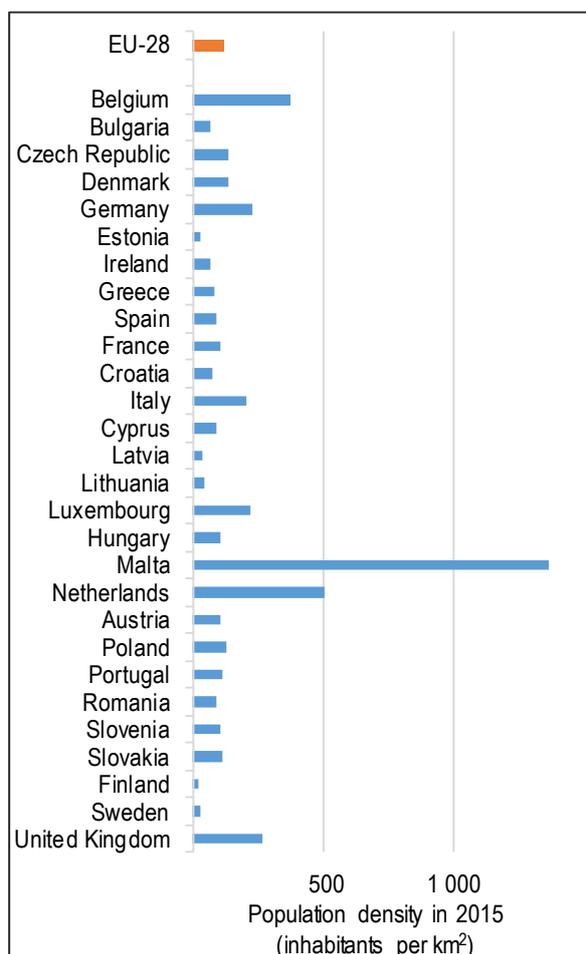
The populations of Member States vary considerably, from 0.43 million for Malta to 82.2 million for Germany (see Figure 2-3), as does population density (see Figure 2-4). The most densely populated Member State, Malta, has 1 370 inhabitants/km², which is more than 70 times that of the most sparsely populated, Finland with 18 inhabitants/km². Most EU Member States have relatively high population densities compared to other Parties to the UN Convention. Higher population densities can have both a positive and negative impact on greenhouse gas emissions. For example they can mean shorter transport distances, which might be expected to lower greenhouse gas emissions, but shorter transport distances may facilitate economic integration among communities and regions, resulting in a tendency for higher transport intensity.

Figure 2-3 EU Member States populations on 1 January 2016



Source: Eurostat

Figure 2-4 Population density of the EU Member States in 2015



Source: Eurostat

⁴ ICF International, 2016. Decomposition analysis of the changes in GHG emissions in the EU and Member States. A report in association with ZEW Umweltbundesamt GmbH and Eclareon for DG CLIMA https://ec.europa.eu/clima/sites/clima/files/strategies/progress/docs/dca_report_en.pdf ..

2.3. Geographic profile

The European Union is situated primarily in Europe, with the exception of some French, Danish and British Overseas Territories. It spans a total area of 4 464 thousand square kilometres⁵, with a large coastline of 141 941 km⁶ and a diverse topography including mountains, lakes, rivers, forests and plains. The EU is also highly urbanised, with 40 % of the population living in urban regions, and a further 32 % in intermediate regions⁷.

The most common type of land cover in the EU is woodland, which covers 38 % of the EU's surface (see Figure 2-5). Northern and alpine regions tend to have larger proportions of woodland, and in the most forested country, Finland, forests cover 68 % of the country. However the distribution of land cover types varies widely across the EU, and in the least forested country, Malta, forests cover only 5 % of the total area. The next most common land cover is crop land. 22 % of the total EU area is covered by arable land or permanent crops, but again this varies significantly between Member States. In Denmark and Hungary, more than 44 % of land is cropland, while in Finland, Ireland and Sweden it is less than 6 %. Grasslands (including natural and agricultural grasslands) are the dominant land cover in Ireland (56 %), and the Netherlands and the United Kingdom (36 %), although on average in the EU they account for only 21 %. Other land use types are shrubland, artificial land, water, bare land and wetland which together account for 19 % of the total EU land cover.⁸

Figure 2-6 shows that agriculture is the main use for land in the EU, accounting for 41 % of land use. Agriculture is the predominant land use in 19 of the Member States and in Denmark, Ireland, Hungary and Romania, agricultural is the primary land use and accounts for more than 58 % of land use. For other countries, forestry is the predominant land use, accounting for over 50 % of land area in Finland, Sweden, Estonia, Slovenia, and Latvia. For the EU as a whole, use for forestry accounts for 33 % of land area. Agriculture generates significant greenhouse gas emissions, and this is discussed in more detail in Section 2.11. Forest and other wooded areas however can be important carbon sinks (see Section 2.12 for further details). Changes in land use will be driven to some extent via policy actions in the agricultural sector (see Section 4.4.1.5), particularly the Common Agricultural Policy as well as those in the forestry sector (see Section 4.4.1.6).

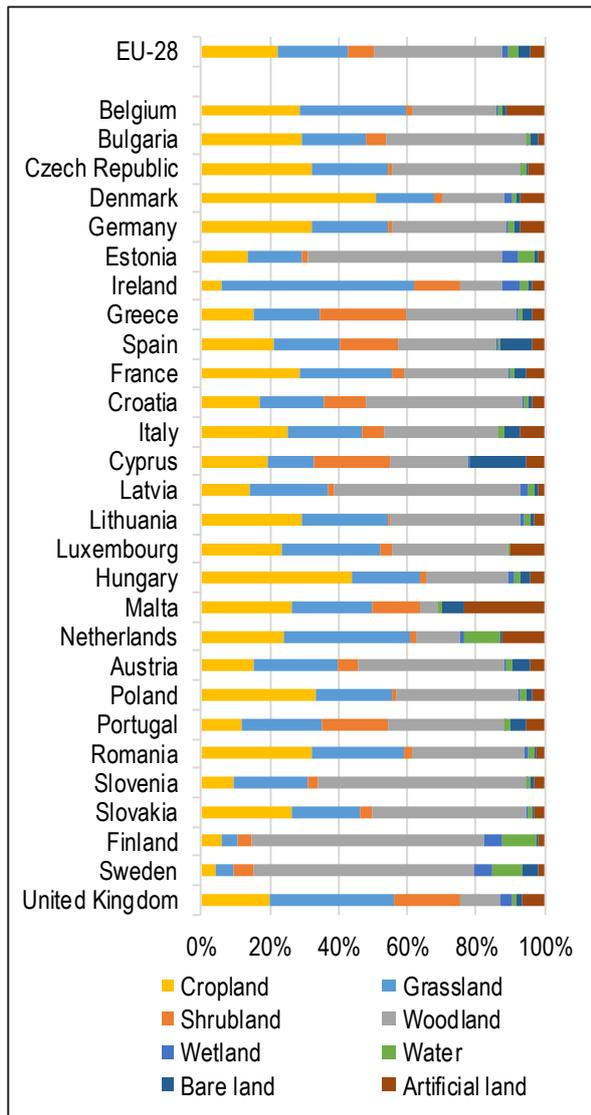
5 Eurostat, "Size and population", Living in the EU, 2017, https://europa.eu/european-union/about-eu/figures/living_en. Accessed on: 1.08.2017

6 Coastline length for EU27 of 136 106 km from: Eurostat, "Key figures for coastal regions and sea areas", Statistics in focus, 2009. http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-SF-09-047/EN/KS-SF-09-047-EN.PDF. Accessed on: 1.08.2017. Coastline length of 5 835 km for Croatia from the World Factbook <https://www.cia.gov/library/publications/the-world-factbook/geos/hr.html>, accessed on 19.06.2017

7 Eurostat, "Distribution of population by degree of urbanisation, dwelling type and income group - EU-SILC survey [ile_lvho01]", Eurostat dataset, Extracted on: 05.05.17

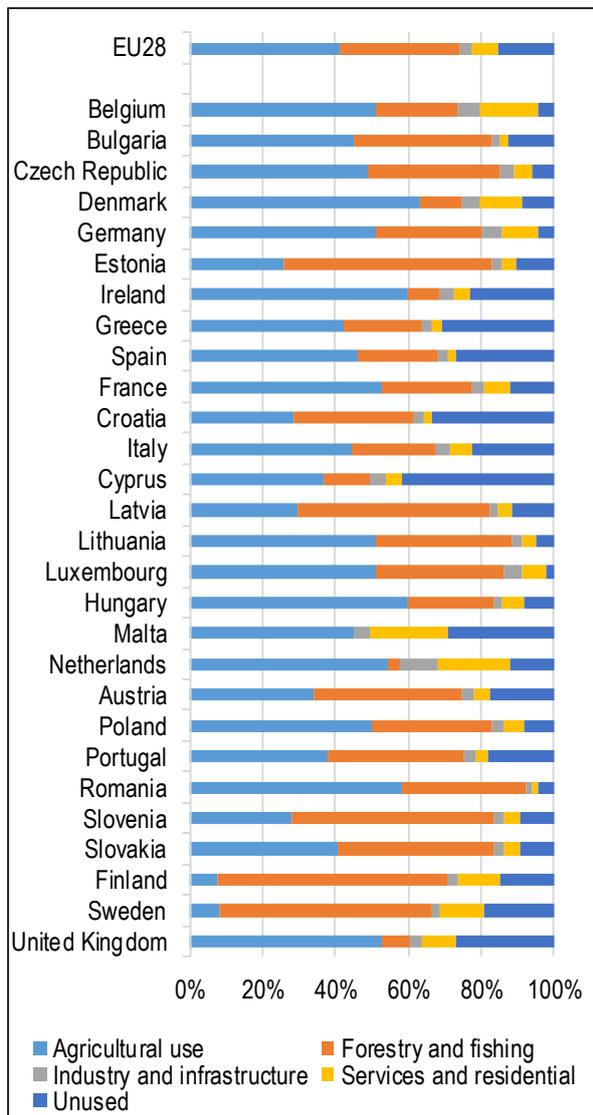
8 Eurostat, "Land cover overview [lan_lcv_ovw]", Eurostat dataset, Extracted on: 02.05.17

Figure 2-5 Main land cover in 2015
(% of total area)



Source: Eurostat LUCAS

Figure 2-6 Primary land use in 2015
(% of total area)



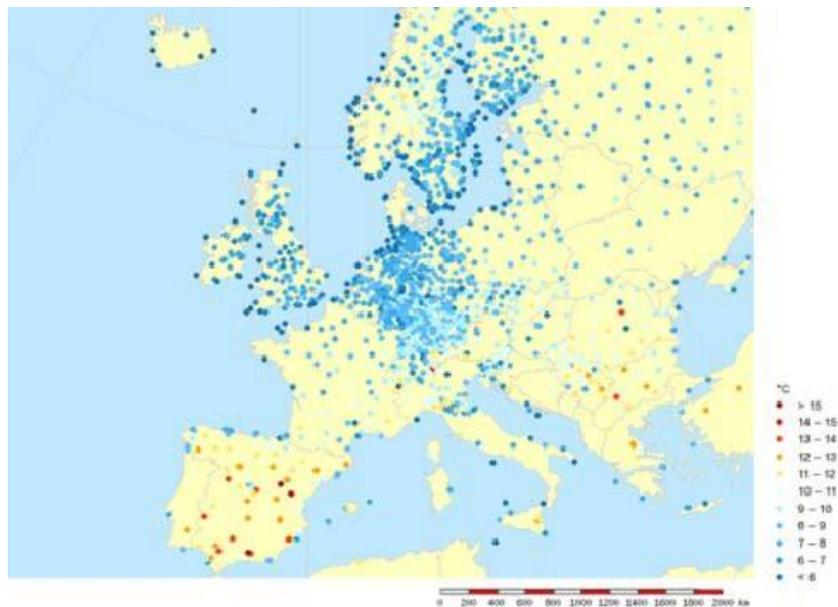
Source: Eurostat LUCAS

2.4. Climate profile

The European Union covers climate zones ranging from dry summer sub-tropical in the Mediterranean to hemiboreal and boreal in the northeast to temperate maritime conditions along the Atlantic coast and the British Isles. High elevation patches of tundra climate can be found as well. The climate profile of a country can strongly influence on its needs for heating during cold seasons or cooling during hot seasons, which triggers higher energy consumption and greenhouse gas emissions. EU Member States close to the Atlantic Ocean or the North Sea generally experience relatively low temperature variations, both between summer and winter and between day and night. Figure 2-7 gives an overview of daily temperature

variations. The northern Atlantic coast also experiences high rainfall (see Figure 2-8). Scandinavian countries (Denmark, Finland and Sweden) tend to have mild summers and cold winters.

Figure 2-7 Mean of daily temperature range in the EU (1961-2010)



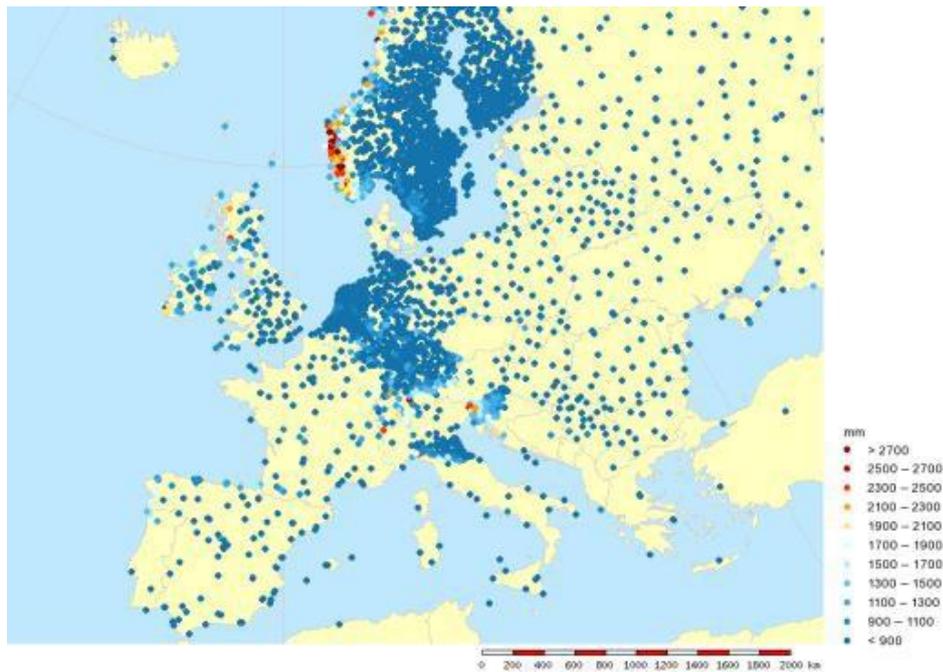
Source: E-OBS dataset from the EU-FP6 project ENSEMBLES⁹ and the data providers in the European Climate Assessment and Dataset project¹⁰.

Note: Each dot represents a measuring station.

⁹<http://ensembles-eu.metoffice.com>

¹⁰ <http://www.ecad.eu>

Figure 2-8 Annual precipitation sum in the EU (1961-2010)



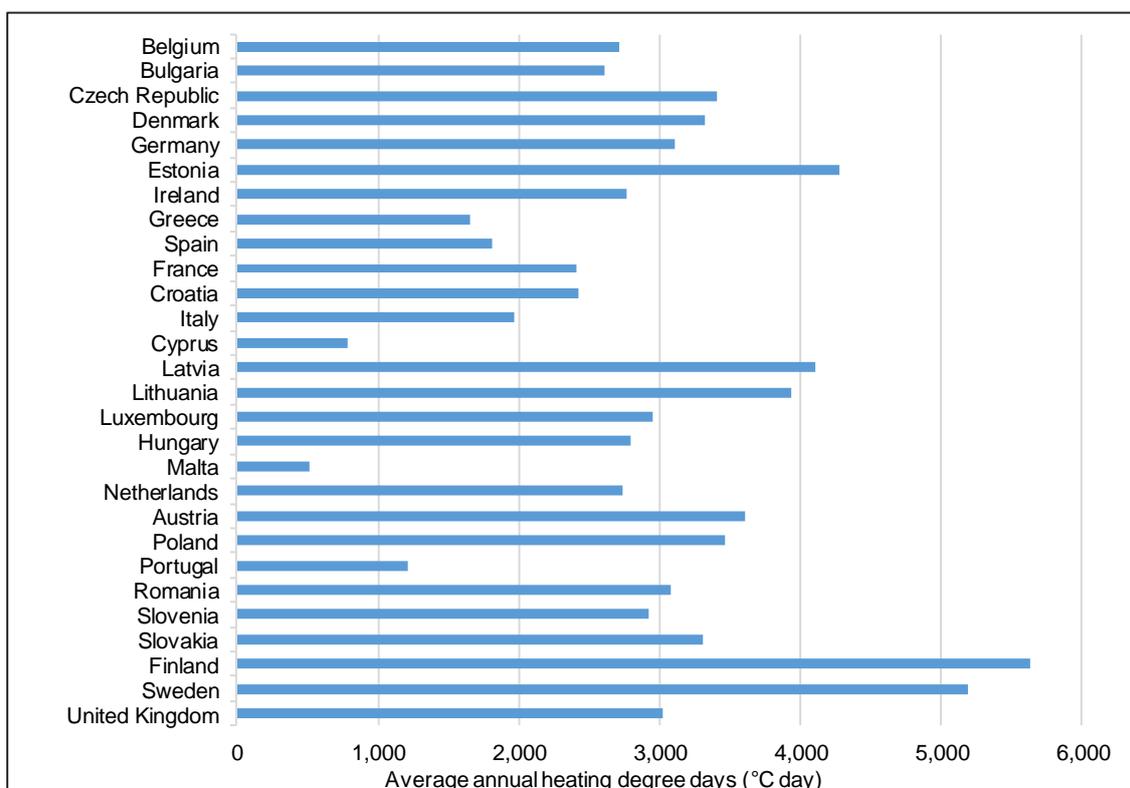
Source: E-OBS dataset from the EU-FP6 project ENSEMBLES⁹ and the data providers in the European Climate Assessment and Dataset project¹⁰.

Note: Each dot represents a measuring station.

The energy requirements and emissions in both winter months (for space heating) and summer months (for air conditioning) vary according to the temperature.

Figure 2-9 below shows the average annual number of heating degree days in each Member State. Space heating requirements are particularly high in the northern and eastern Member States, whilst in summer months, southern and eastern countries will often experience average temperatures of more than 25 °C, leading to electricity demand for space cooling. This means that in some countries, such as Greece, peak electricity demand tends to occur in summer months whereas for the majority of Member States it still occurs during the winter period.

Figure 2-9. Average annual heating degree days by Member State (1990-2016)

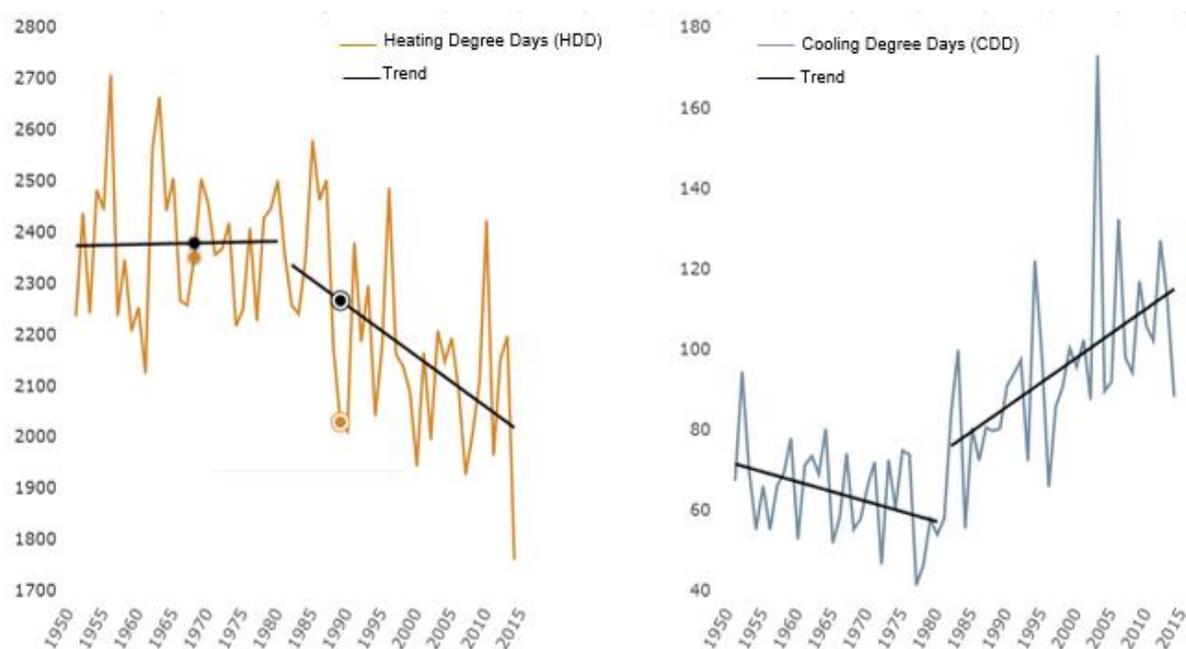


Source: JRC Agri4Cast

Note: Heating degree-days are a measure of the demand for energy needed to heat a building in a certain climate. JRC calculates heating degree days as: $(18\text{ °C} - T_m)$ if T_m is lower than or equal to 15 °C (heating threshold) and as nil if T_m is greater than 15 °C where T_m is the daily mean air temperature.

Figure 2-10 shows population-weighted heating degree days and cooling degree days for Europe since 1951. These vary substantially year by year depending on weather during the year, however some long-term trends can also be seen. The number of population-weighted heating degree days decreased by 8.2 % between the 1951–1980 and 1981–2014 periods, with the largest absolute decrease occurring in northern and north-western Europe. The number of population-weighted cooling degree days increased by 49.1 % between the 1951–1980 and 1981–2014 periods; the largest absolute increase occurred in southern Europe.

Figure 2-10 Population-weighted heating and cooling degree days averaged over Europe (1951 to 2014)



Source: EEA

Note: This figure shows time series of heating degree days (left) and cooling degree days (right) averaged over Europe (EU-28 without Cyprus but including Liechtenstein, Norway and Switzerland) over the period 1951-2014, including linear trends for 1951-1980 and 1981-2014. Population weighting based on the GEOSTAT2011 dataset by Eurostat was applied during spatial aggregation.

2.5. Economic profile

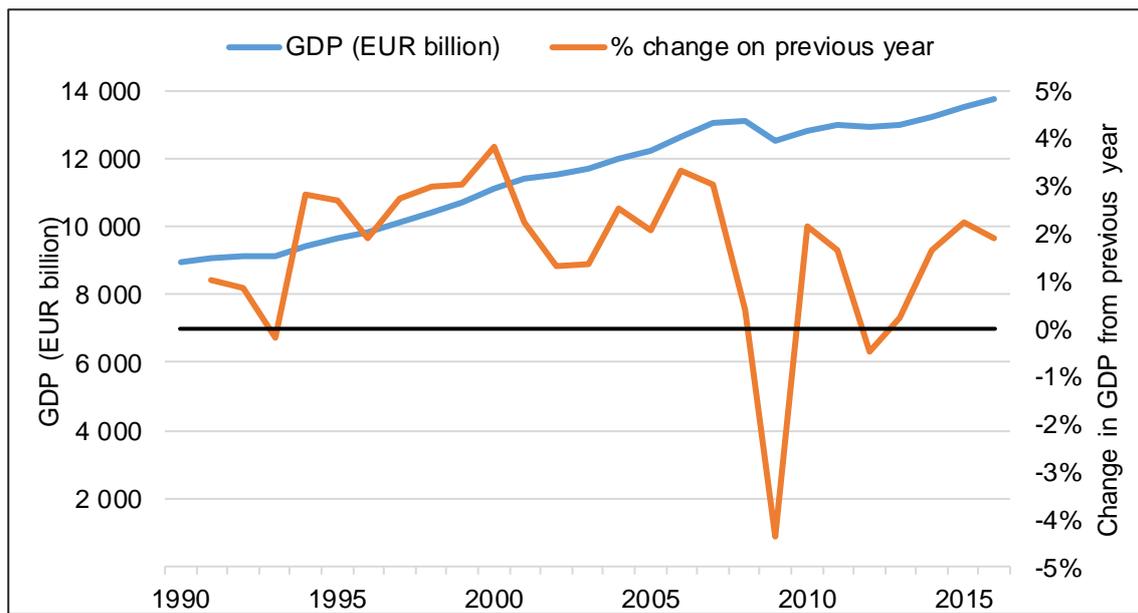
The economic profile of a country has a strong link to greenhouse gas emissions, with the overall level and types of economic activity strongly correlated to energy consumption. Greenhouse gas emissions also depend on factors such as energy efficiency and the structure of the economy. Trends in key economic factors are discussed below with the overall impact on energy intensity discussed in Section 2.6.

2.5.1. Changes in overall Gross Domestic Product (GDP)

For the EU-28, GDP has increased by 53 % (in volume terms) from 1990 to 2016 (see Figure 2-11). Economic growth in the EU slowed down in 2008 and declined in 2009 due to the global financial and economic crisis. Since 2010, the growth rate has slowly increased and the GDP has recovered. Nevertheless, in 2012 the Euro currency crisis in the Southern European countries contracted growth of the European economy again, and this continued in 2013¹¹, although the EU economy overall began to grow again in 2013. In 2016 all of the EU Member States showed positive growth, headed by Ireland (5.2 %), Malta (5.0 %) and Romania (4.8 %), and with an average increase across the EU of 1.9 % from 2015.

¹¹ Eurostat, "National accounts and GDP", Eurostat Statistics Explained, 2017, http://ec.europa.eu/eurostat/statistics-explained/index.php/National_accounts_and_GDP, Accessed on: 10.05.2017

Figure 2-11 Development of GDP 1990-2016



Source: EEA and AMECO database, European Commission
Note: GDP expressed at market prices with a reference year of 2010.

Figure 2-12 (below) shows GDP in purchasing power standards (PPS) per capita in 2015. This provides a better comparison of the potential for total consumption in each country, as it is based on the purchasing power for a “representative” basket of goods and services. The countries’ GDP per capita is compared relative to the EU-28 average, which is set to 100. The highest relative GDP per capita on a purchasing power basis is in Luxembourg, where it is more than 2.6 times higher than the EU average. This can partly be explained by the impact of cross-border workers from neighbouring countries. At the other end of the scale are Bulgaria, Romania and Croatia where GDP per capita is less than 60 % of the EU average.

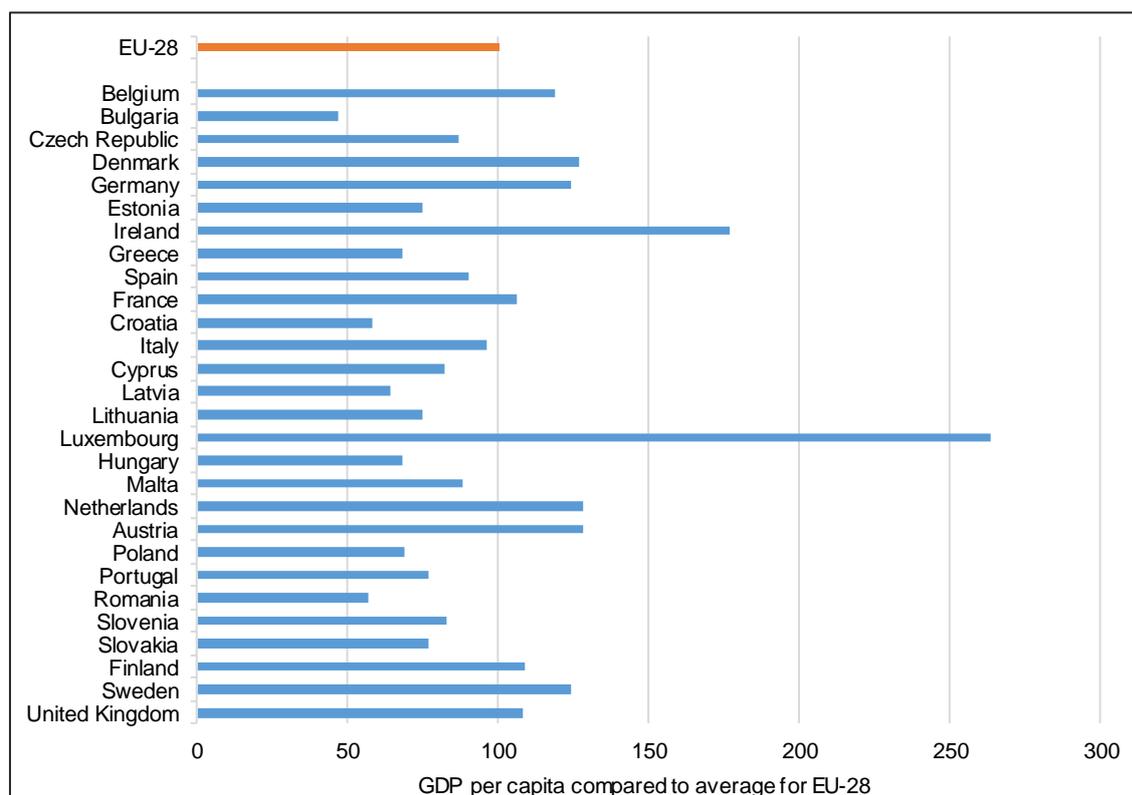
2.5.2. *Development of economic sectors*

Between 1995 and 2016 the Gross Value Added (GVA) in the EU-28 almost doubled (see Table 2-1). Almost three-quarters (74 %) of GVA is generated by the services sector, which is of particularly high importance in Cyprus, Luxembourg, Malta, Greece, United Kingdom and France, where it contributes more than 80 % of the GVA.

During the same period, the share of the industry sector decreased from 23 % in 1995 to 19 % in 2016, with output falling substantially (by 13.8 %) during the financial and economic crisis of 2007 to 2009. Construction output also contracted significantly; falling by 10.4 % between 2007 and 2010.

Within the services sector, the largest contribution to the GVA originates from financial intermediation/real estate followed by public administration/community services/households. Both sectors experienced a growth of their share in overall GVA. Agriculture/fishing and construction have the smallest contributions to GVA (1 % and 5 % respectively in 2016).

Figure 2-12 Percentage of GDP per capita in relation to EU-28 average (2015)



Source: Eurostat

Note: Percentage of EU-28 total (based on PPS per inhabitant).

Table 2-1 Gross-value added (at basic prices) of economic sectors in EU-28 (€ billion)

Economic Sector	1995	%	2016	%
Agriculture; fishing	172	3 %	195	1 %
Industry (except construction)	1 546	23 %	2 560	19 %
Construction	405	6 %	705	5 %
Wholesale and retail trade; hotels and restaurants; transport	1 260	19 %	2 526	19 %
Financial intermediation; real estate ¹²	1 836	28 %	4 280	32 %
Public administration, community services, activities of households	1 405	21 %	2 982	23 %
Total -	6 624	100 %	13 246	100 %

Source: Eurostat

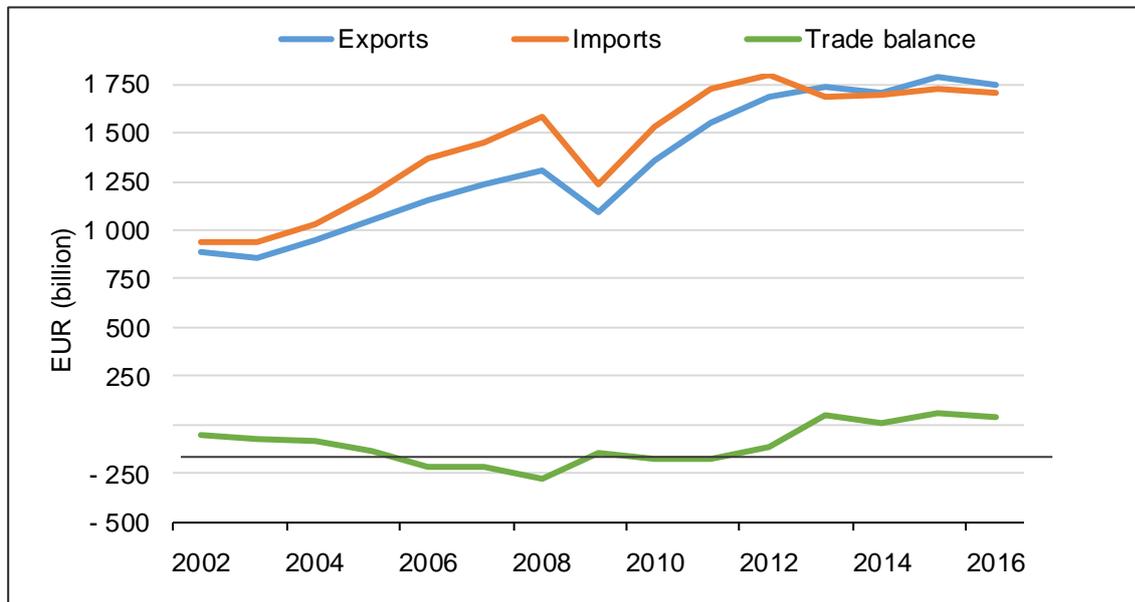
Note: GVA expressed in billions of euro in 2016 and billions of ECU in 1995.

¹² Information, Financial, Real estate, Scientific

2.5.3. Trade patterns

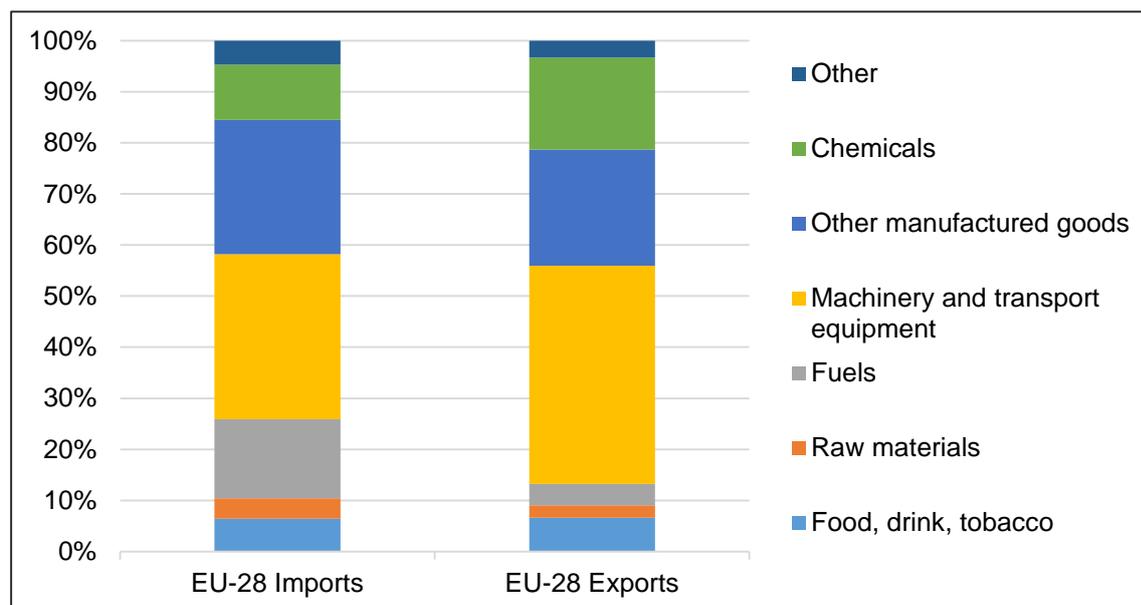
From 2002 to 2008, the EU experienced an increasingly negative trade balance, but since then this trend has reversed and since 2013, exports have exceeded imports (Figure 2-13). Figure 2-14 shows the percentage (as a proportion of total trade value) of extra- EU-28 trade for imports and exports in 2016 by SITC (Standard International Trade Classification) category. In comparison to the 6NC, mineral fuels, lubricants and related materials no longer make up the highest proportion of EU imports. The leading imported product category is now manufactured products such as machinery and transport equipment at 32.3 %. This category, as at the time of the 6NC, also accounts for the largest share of exports at 42.7 %. With regard to GHG emissions, machinery and transport equipment as well as chemicals and related products tend to have lower emissions intensity, given the much higher value added of the products compared to energy use, mineral fuels and others, lubricants and related materials and other raw materials.

Figure 2-13 Development of extra-EU-28 trade



Source: Eurostat

Figure 2-14 Composition of extra-EU trade by value in 2016



Source: Eurostat. Fuels = Mineral fuels, lubricants and related materials

2.6. Energy profile

This section provides a high-level overview of the most relevant factors concerning energy use, which is the largest source of GHG emissions in the EU. The Eurostat Pocketbook “Energy, Transport and Environment Indicators – 2016 Edition”¹³ provides more detail on the key drivers, environmental pressures and impacts from the production and consumption of energy.

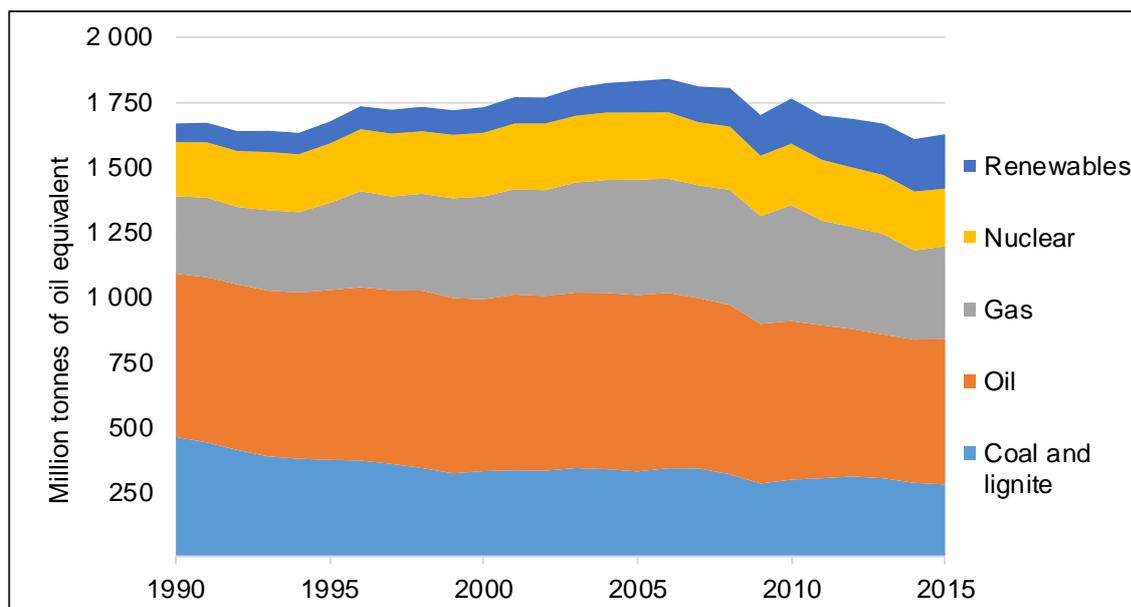
Climate policy drivers have had a clear impact in the EU energy system. The drivers have played a significant role in the increased share of renewables, with the EU ETS’s contribution to reductions in emissions and national climate and energy policies, often linked to the implementation of EU Directives, helping to improve energy efficiency¹⁴. Other factors such as the shift to gas as a result of price differentials have also helped to reduce emissions historically. Historical trends in GHG emissions from energy-related activities are shown in Section 3.2.3. The impacts of climate policy in the energy sector (see Section 4.4.1.2 for further details) are expected to become more significant in the future, particularly as a result of the new climate and energy package. This is expected to lead to an even greater increase in the use of renewables (as well as gas) as well as impacts on primary and final energy consumption due to improvements in energy efficiency.

Gross inland energy consumption in the EU-28 increased over the period from 1990 until 2006 despite continued efforts to improve energy efficiency, but subsequently began to decrease (see Figure 2-15). This downward trend was interrupted by a large increase in 2010, caused by the recovery from the economic crisis which itself had led to a significant drop of primary energy supply in 2009, but has since continued, apart from a small increase in 2015.

¹³ Eurostat Pocketbook: Energy, transport and environment indicators — 2016 edition, <http://ec.europa.eu/eurostat/documents/3217494/7731525/KS-DK-16-001-EN-N.pdf/cc2b4de7-146c-4254-9521-dcbd6e6fafa6>. Accessed on 11.05.2017

¹⁴ Decomposition analysis of the changes in GHG emissions in the EU and Member States. ICF international, 201

Figure 2-15 Gross inland energy consumption¹⁵ by fuel for the EU-28



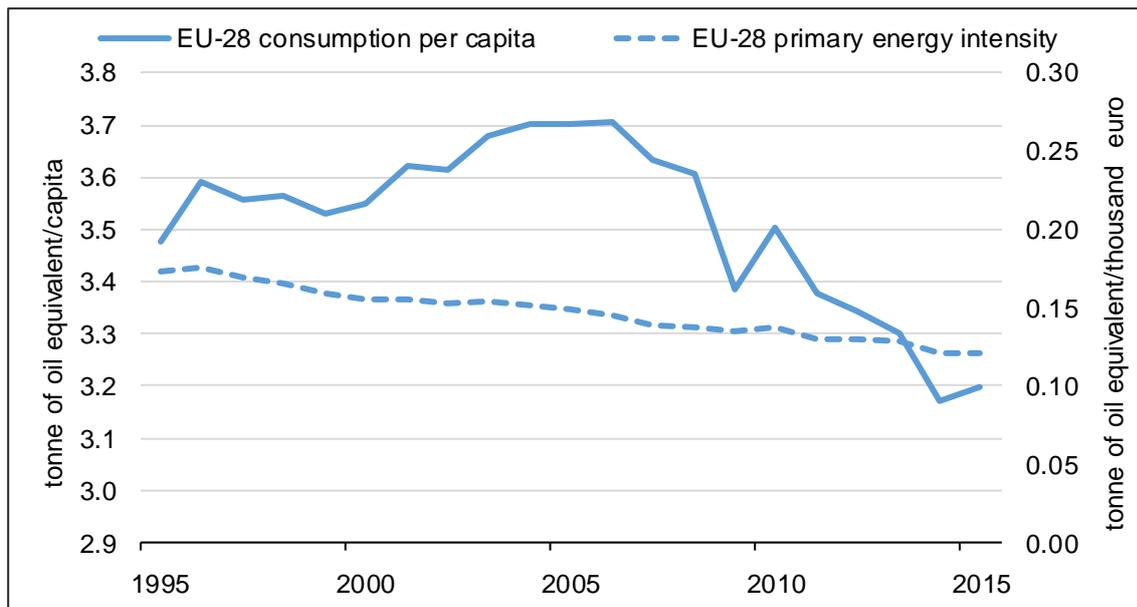
Source: Eurostat

Trends in the consumption of different energy carriers within the total have changed significantly in the period 1990 to 2015, with a decrease of 40 % in the consumption of carbon-intensive coal and lignite, and of 11 % in the consumption of oil. Meanwhile there has been an increase of over 20 % in the consumption of gas, which, in comparison to other fossil fuels, produces less greenhouse gas emissions. Renewables have seen the most marked increase with consumption increasing by over 190 % from 1990 levels. Consumption of energy generated from nuclear power increased by 6 %. These increases have had a positive effect on the EU's GHG emissions as shown in Section 3.2.3. Nevertheless, fossil fuels continue to dominate total energy consumption, making up 73 % of total primary energy consumption in total. The share of renewable energy sources has increased to 13 % of gross final energy consumption.

Figure 2-16 shows primary energy intensity (toe/unit GDP) and per capita primary energy consumption for the EU-28 Member States from 1990- 2015. Since 2006 per capita energy use has continued to decrease even more strongly with a short interruption in 2010, where it increased due to the recovery from the global economic crisis, and a small rise in consumption in 2015. In addition, energy intensity has decreased steadily since 2006, except for 2010; see for the reasons mentioned above. Both these trends are having a positive impact in reducing GHG emissions. More information on GHG emission intensity can be found in Section 3.2.3.

¹⁵ Gross inland energy consumption is the total energy demand of a country or region. It represents the quantity of energy necessary to satisfy inland consumption of the geographical entity under consideration.

Figure 2-16 Per capita gross inland energy consumption and primary energy intensity



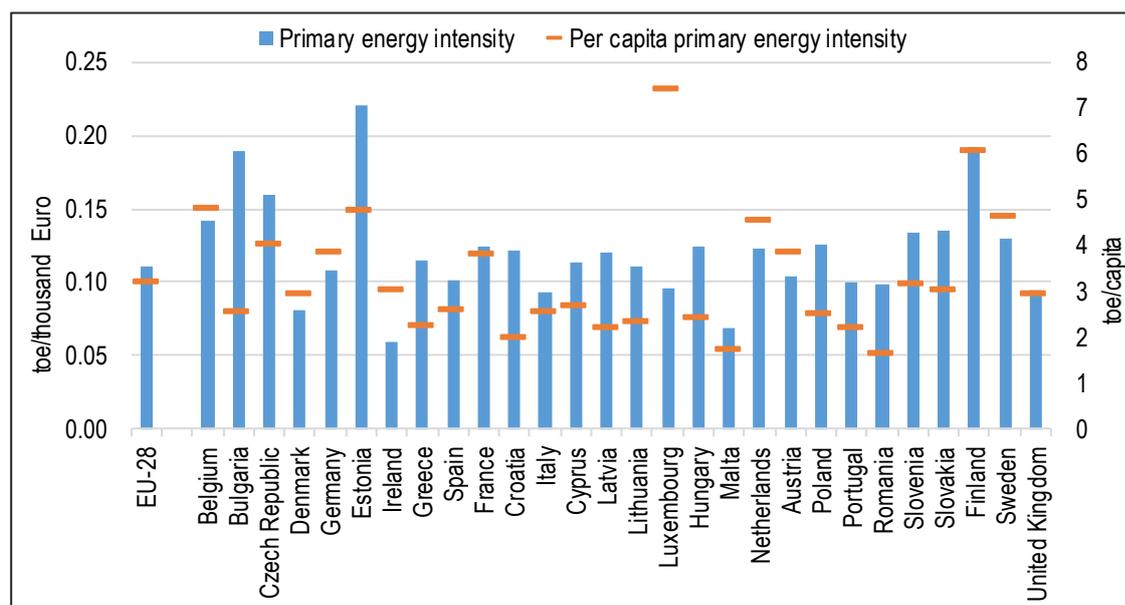
Source: Eurostat, European Commission, EEA

Note: Estimate of GDP as billions of Euro at 2005 market prices. Primary energy intensity is the ratio between gross inland energy consumption and gross domestic product

Figure 2-17 shows primary energy intensity (toe/unit GDP at purchasing power standards) and per capita energy intensity by Member State in 2015. Countries with lower energy intensity such as Ireland, Malta and Denmark may have an economy structured less around heavy industry and more around the service industries. In addition, or alternatively, they may have a higher degree of energy efficiency (both in energy generation and end-use) throughout the economy. Member States with higher energy intensities include Estonia, Finland and Bulgaria.

Per capita energy consumption is particularly low in Romania, Malta and Croatia – over a third below the EU-28 average of 3.2 toe/capita. In contrast, per capita consumption in Luxembourg at 7.4 toe/capita is more than double the EU average.

Figure 2-17 Primary energy intensity and per capita consumption in 2015



Source: Eurostat

2.6.1. Energy Supply

Figure 2-18 shows the supply of fossil fuels in the EU-28 from 1990 to 2015, split into fuels produced in the EU and net imports of fuels from 1990 to 2015. There is a trend of increasing dependence on imported fossil fuels, which now account for around 76 % of fossil fuel supply and 55 % of total primary energy supply. This has led to growing concerns over security of supply. Oil accounts for the largest share (47 %) of fossil fuel consumption, followed by gas (30 %) and then solid fuels (22 %).

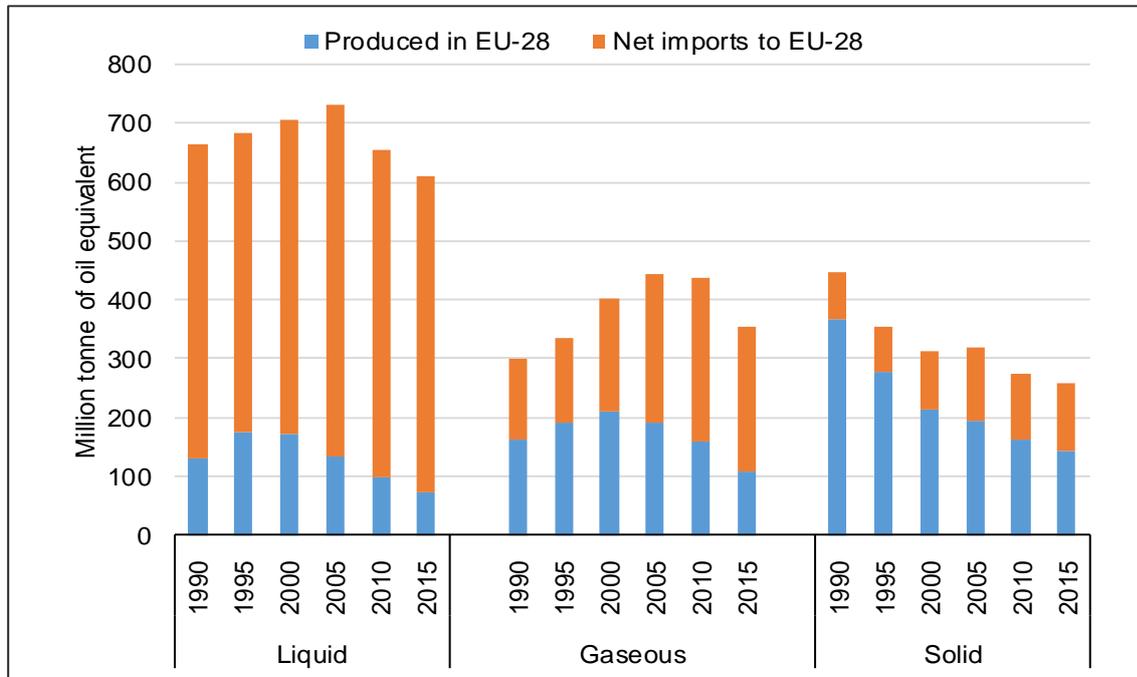
The vast majority of oil consumed is from imports and the trend had been an upward one until 2006; since then net imports declined until 2015, when there was a slight increase. Oil consumption rose in the period to 1998, but then remained relatively constant until 2005, when it began to decline significantly, falling by 18 % in the period 2005 to 2015. Production in the EU during this period declined even more significantly (by 44 %) and imports now account for 88 % of consumption compared to 80 % in 1990. A similar trend is seen in gas consumption, with imports exceeding production for the first time in 2002. Imports now make up over two thirds (69 %) of EU gas consumption. In the case of solid fuels, overall consumption is decreasing, with slight increases from 2010 to 2012. Although imports have risen in recent years, with a short decline in 2009 and more recently in 2015, production volumes still exceed imports. If current trends continue, however, it is likely that imports will exceed production volumes in the next few years.

Overall electricity generation has risen by 25 % between 1990 and 2015 (see

Figure 2-19). Electricity production from renewables has almost tripled in that period and now accounts for 30 % of generation compared to 13 % in 1990. The proportion produced by nuclear has slightly increased and was 31 % of total electricity production in 2015. There have been large decreases in both oil and coal and lignite production; together they accounted for 26 % of total production in 2015 (down from 48 % in 1990).

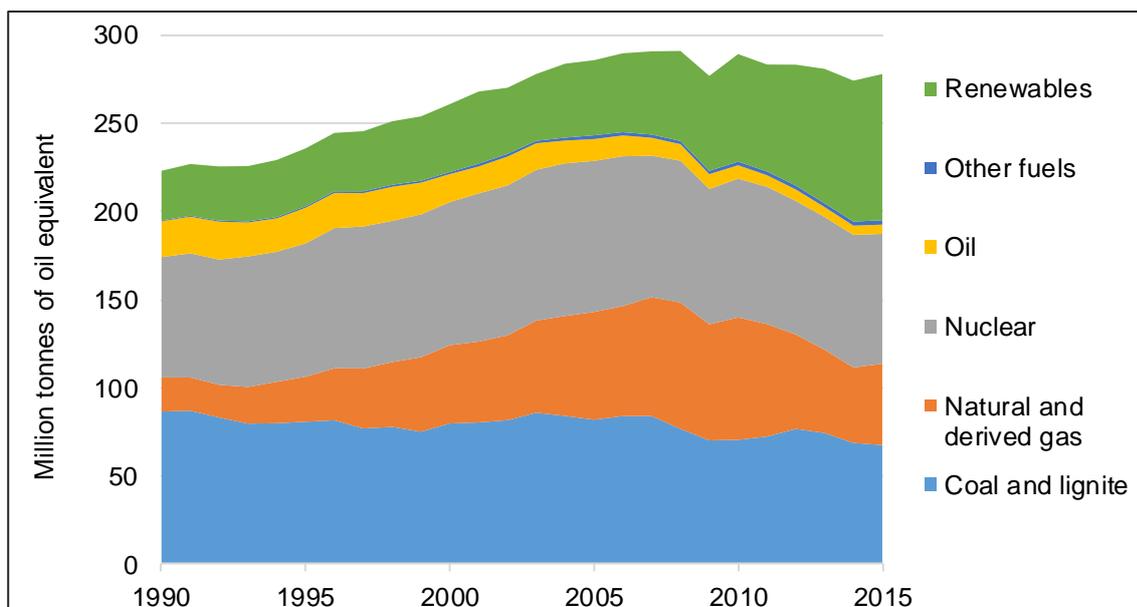
Production from gas has increased from 9 % of the overall mix in 1990 to 17 % in 2015. Overall, the generation mix of electricity in the EU-28 has become less carbon intensive since the beginning of the 1990s. However, the lower carbon intensity has been somewhat counterbalanced by the overall rise in total electricity production.

Figure 2-18 Supply of fossil fuels in the EU-28



Source: Eurostat

Figure 2-19 Gross electricity production by fuel for EU-28

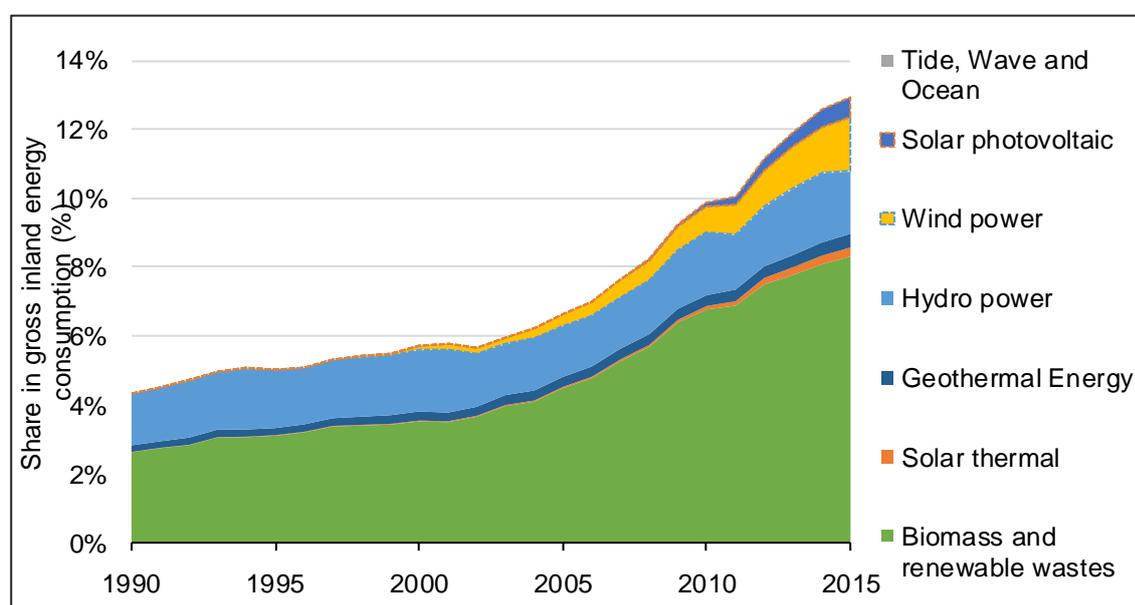


Source: Eurostat

The share of gross inland energy consumption from renewables has increased substantially over the last 25 years to around 13 % in 2015 (Figure 2-20). Very large increases have been seen in wind power generation and photovoltaics, with substantial but lesser growth in solar thermal, biomass and geothermal. Production from hydro, tidal, wave and ocean technologies has remained relatively constant.

The bulk of renewable energy consumed, over two thirds, is renewable heat (solar, biomass, geothermal and waste). Hydropower is the second biggest contributor, providing about 14 % of total renewable energy in 2015, with wind power the third largest, contributing 12 % - an enormous increase from its share in 1990 of 0.1 % of renewable energy consumed. Consumption from solar photovoltaics has also grown substantially, with output almost 8 000 times higher in 2015 than in 1990 and its share increasing from 0.002 % of renewable energy consumed in 1990 to 4.2 % in 2020.

Figure 2-20 Share of renewable energy in gross inland energy consumption, EU-28



Source: Eurostat

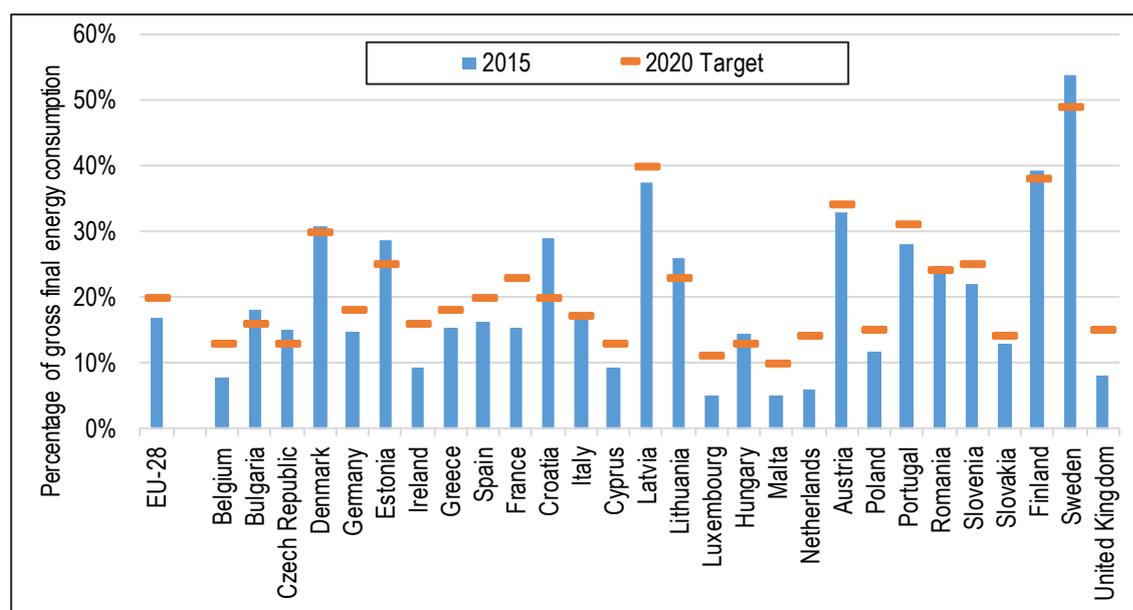
Based on data for 2015, eleven Member States (Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Finland, Hungary, Italy, Lithuania, Romania, and Sweden) have already met their Renewable Energy Sources (RES) targets for 2020, but the remainder still need to take action to ensure that it is achieved (Figure 2-21). This shows significant progress since the time of the 6NC when no Member States had met their RES target. The RES targets include all sources of electricity, heat and transport fuel, aiming at a 20 % of RES to gross final energy consumption for the EU as a whole by 2020 (see also Section 4.4.1.2 on the EU energy policy).

The Commission' most recent progress report (2017)¹⁶ states that the vast majority of Member States which have not yet met their targets are well on track in terms of renewable energy deployment, but will need to continue their efforts to meet their targets. Countries

¹⁶ 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.

which still need to make significant progress to meet their targets include Netherlands, Luxembourg, Malta and the United Kingdom. The report also concludes that Member States have made progress on administrative barriers which may hinder deployment, but this progress has not been uniform across the Union and there is still ample room for improvement.

Figure 2-21 Share of renewable energy in gross final energy consumption in 2015 by Member State



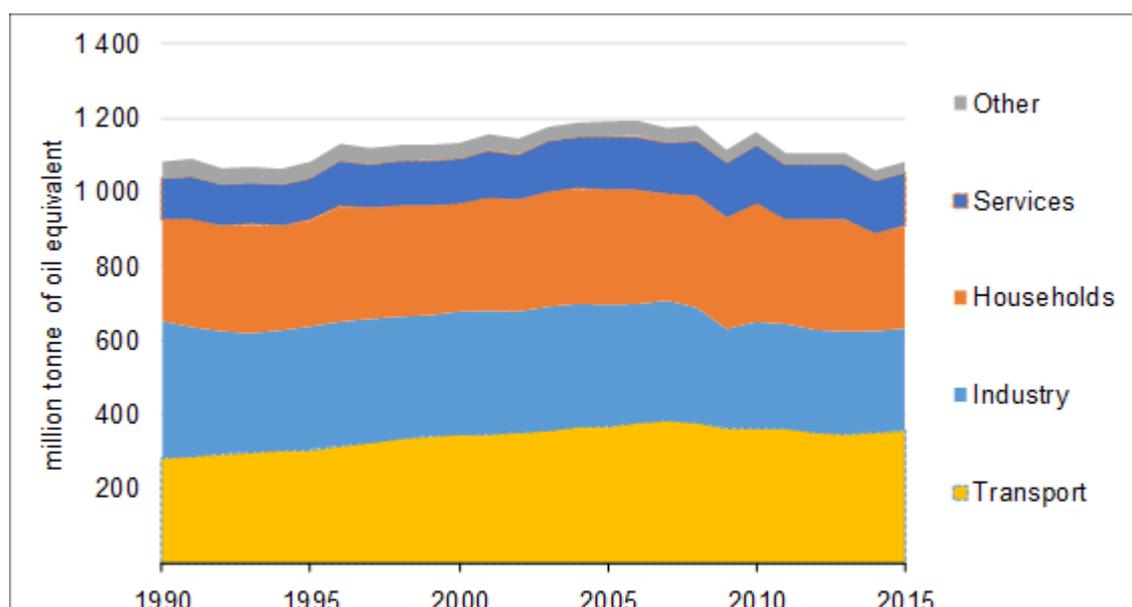
Source: Eurostat

2.6.2. Energy consumption in different sectors

Final energy consumption by sector is shown in Figure 2-22. This is less than two thirds of the EU’s primary energy consumption, as there are very significant energy losses linked to the transformation and distribution of useful energy (e.g. as heat and electricity) to the end-users. These energy losses broadly depend on the average efficiency of conventional thermal power stations and combined heat and power (CHP) plants, the use of nuclear power for electricity production, and the penetration of non-thermal renewables.

Final energy consumption in the EU-28 increased from 1990 to 2006, but has since shown a general downward trend, so that in 2015, it was very slightly less (by 0.03 %) than consumption in 1990. A decline in consumption in the industry sector (of 26 %), largely as a result of a shift towards less energy-intensive manufacturing industries, as well as the continuing transition to a more service-oriented economy, was offset by significant increases in consumption in the transport sector (of 26 %) and the services sector (of 35 %). Transport now accounts for the largest share (33 %) of final energy consumption. The developments in the transport sector are further explored in Section 2.7 and Section 3.2.3.. The increase in energy consumption in the services sector correlates with an increasing share of GVA from this sector.

Figure 2-22 Final energy consumption by sector in the EU-28



Source: Eurostat

Households are also one of the largest consumers of final energy in the EU, and in 2015, as in 1990, accounted for 25 % of total final energy consumption. Space heating and cooling are the most significant components of household energy demand, and can vary substantially from year to year depending on climatic conditions.

2.6.3. *Liberalisation and privatisation of energy markets*

The creation of a genuine internal market for energy is one of the EU's priority objectives. The existence of a competitive internal energy market is a strategic instrument both in terms of giving European consumers a choice between different companies supplying gas and electricity at reasonable prices, and of making the market accessible for all suppliers. To this end, the Commission put forward the Third Energy Package¹⁷ in 2007. The Third Energy Package includes two Directives, distinguishing electricity market and gas market, and three Regulations.

2.6.4. *Energy prices*

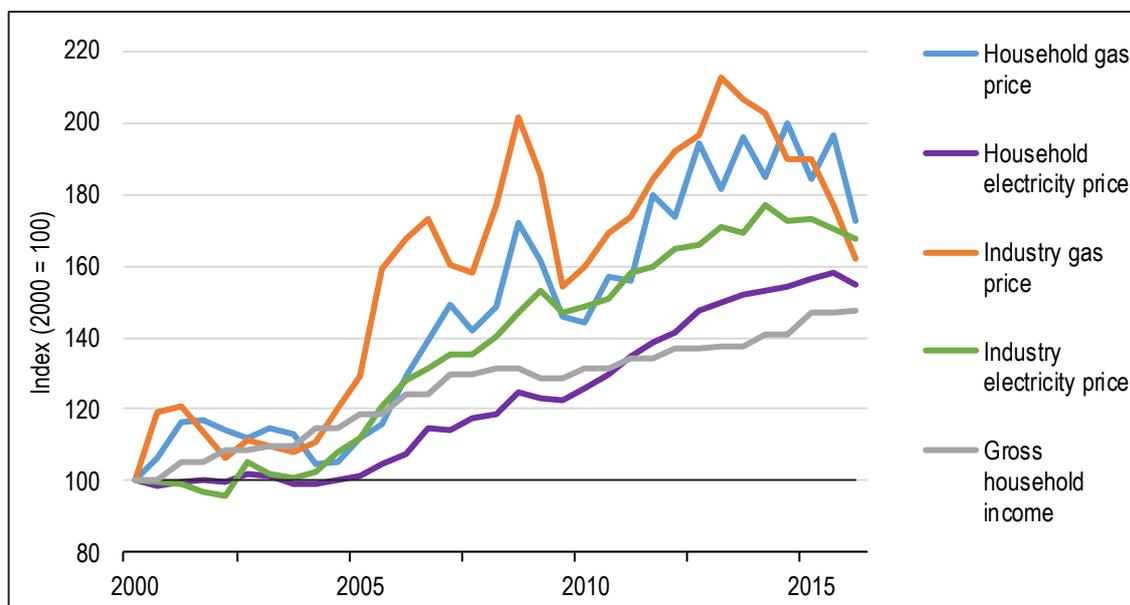
Figure 2-23 illustrates how the average end-user prices of both electricity and gas have varied since 2000 for industry and households in the EU. In addition, it illustrates how gross household disposable income has varied over this period, as this provides a very broad indication of how expenditure on energy varies as a share of income.

The price of natural gas has generally increased over the period, although it has fluctuated considerably. In the case of industrial gas prices there has been a drop in prices since 2013. The price of electricity rose less steeply over the period and has fluctuated much less than the gas price.

¹⁷ http://ec.europa.eu/energy/gas_electricity/legislation/third_legislative_package_en.htm

Increasing gas and electricity prices should have a positive impact on the EU's GHG emissions as both industry and households make efforts to conserve energy and improve their level of energy efficiency. This may particularly be the case for households as their disposable income has not risen as much as fuel prices. On the other hand, substitution effects may play a negative role, whereby consumers opt for cheaper fuels such as coal, which is more carbon-intensive.

Figure 2-23 Change in average end-user energy prices in the EU, 2001-2016

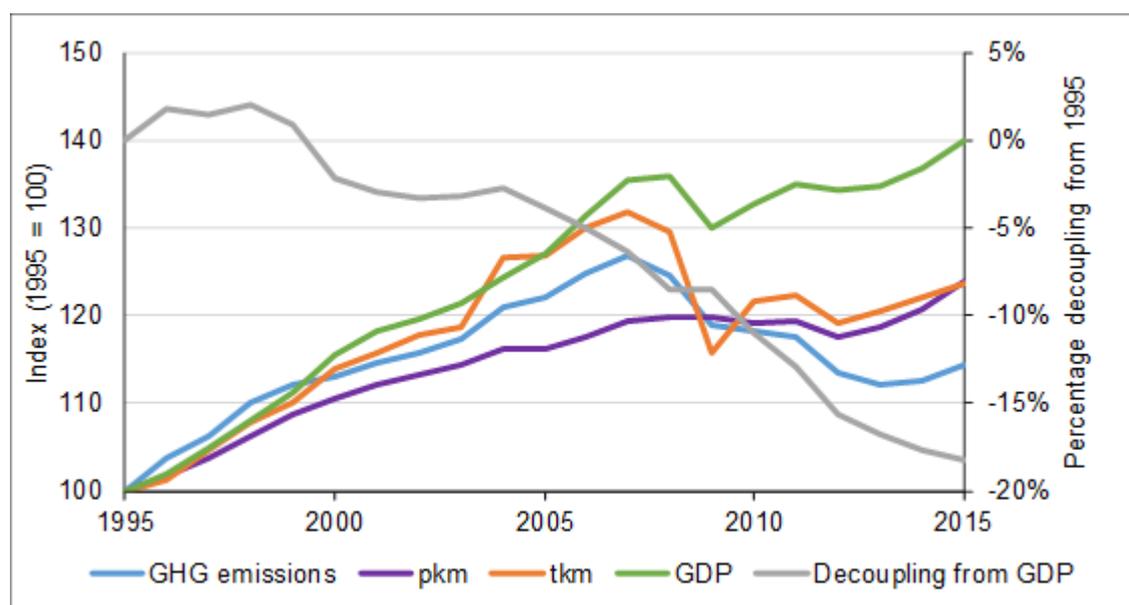


Source: Eurostat

2.7. Transport profile

Both freight and passenger transport grew strongly from 1995 until the economic crisis in 2008 (Figure 2-24). Freight transport growth was largely in line with real GDP growth until the economic crisis, followed by a strong decline in 2008 and 2009 and a recovery in 2010. While this growth has continued, it is still below levels seen in 2007 before the economic crisis. Passenger transport has shown a lower but more constant rate of growth than freight transport, with its overall growth since 1995 being less than the increase in real GDP. Overall these trends have resulted in GHG emissions from transport increasing from until 2007, when the trend was reversed due to the drop in freight transport demand caused by the economic crisis. Emissions then continued to fall until 2014, when an increase was observed, driven by rising transport energy use, caused by the low oil price environment.

Figure 2-24 Growth in transport volumes, GHG emissions and GDP in the EU-28



Source: European Commission, DG Mobility and Transport and Eurostat

Note: Estimate of GDP as billions of Euro at 2010 market prices. Freight transport data from DG Mobility and Transport. Air and sea: only domestic and intra-EU-28 transport; estimates for 1995-2004. Road: national and international haulage by vehicles registered in the EU-28. Passenger transport (pkm = passenger kilometres) includes passenger cars, powered two-wheelers, buses & coaches, tram & metro, railways, intra-EU air, intra-EU sea. Decoupling is calculated as the percentage change in transport GHG intensity (ton CO₂ per unit of GDP) compared to the 1995 baseline.

2.7.1. Freight transport

Figure 2-25 below shows the modal split for freight transport in 1995 and 2015. Overall freight transport volume has increased by 23.6 %, with volume increases in all modes. In 2015, the major part of freight was transported via road (49 %), followed by sea transport (31.6 %). Road slightly increased its share of freight transport (from 45.3 % in 1995 to 49 % in 2015) and as a result, the modal shares of other transport modes (particularly rail and sea transport) decreased. This is important as road transport is substantially more carbon intensive per tonne km than rail¹⁸.

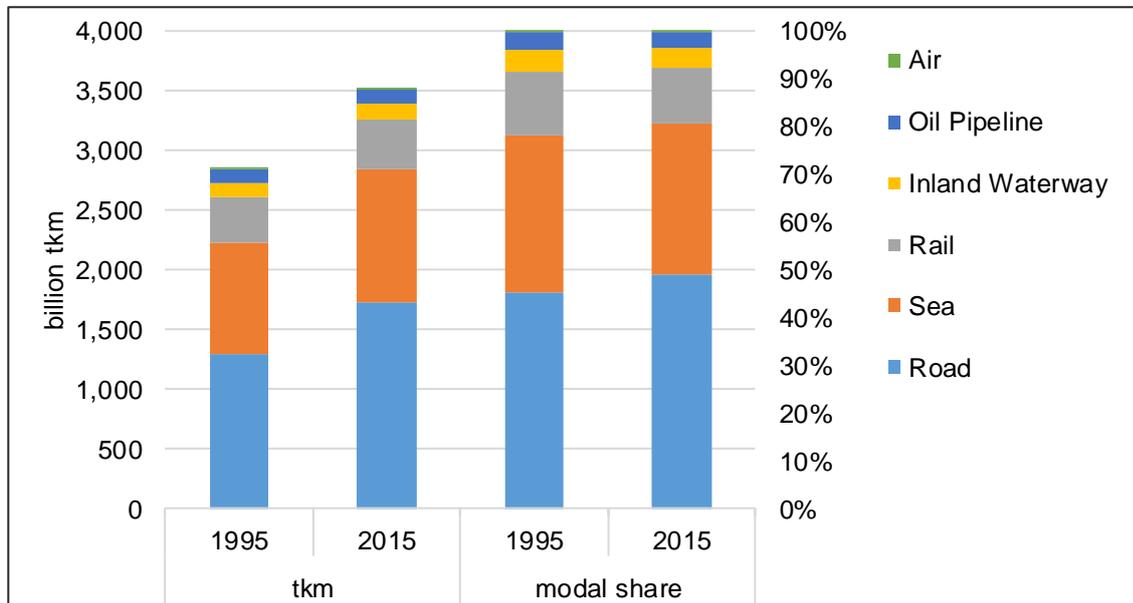
2.7.2. Passenger transport

Between 1995 and 2007, passenger transport in the EU increased at a lower rate than GDP. The effect of the financial and economic crisis is far less distinct than for freight transport, temporarily halting the increase in passenger transport, rather than leading to a significant decrease. Figure 2-26 shows the total distance travelled by passengers, comparing 1995 with 2015. Overall passenger transport has increased by 23.8 %, with car transport increasing by 20.9 %. Regarding the modal split, 71.5 % of the total passenger kilometres are travelled by passenger cars. Air travel (domestic and intra EU-28), comes second in the modal split,

¹⁸ European Environment Agency. Indicators: Energy efficiency and specific CO₂ emissions. <https://www.eea.europa.eu/data-and-maps/indicators/energy-efficiency-and-specific-co2-emissions/energy-efficiency-and-specific-co2-9>

accounting for 9.8 %. However, this is an increase from 1995 when it accounted for 6.5 % of the total passenger kilometres, thus registering the highest increase since 1995 (+86.5 %). This is important as growth in air transport has exceeded the improvements in aircraft fuel efficiency, leading to significant increases in emissions.

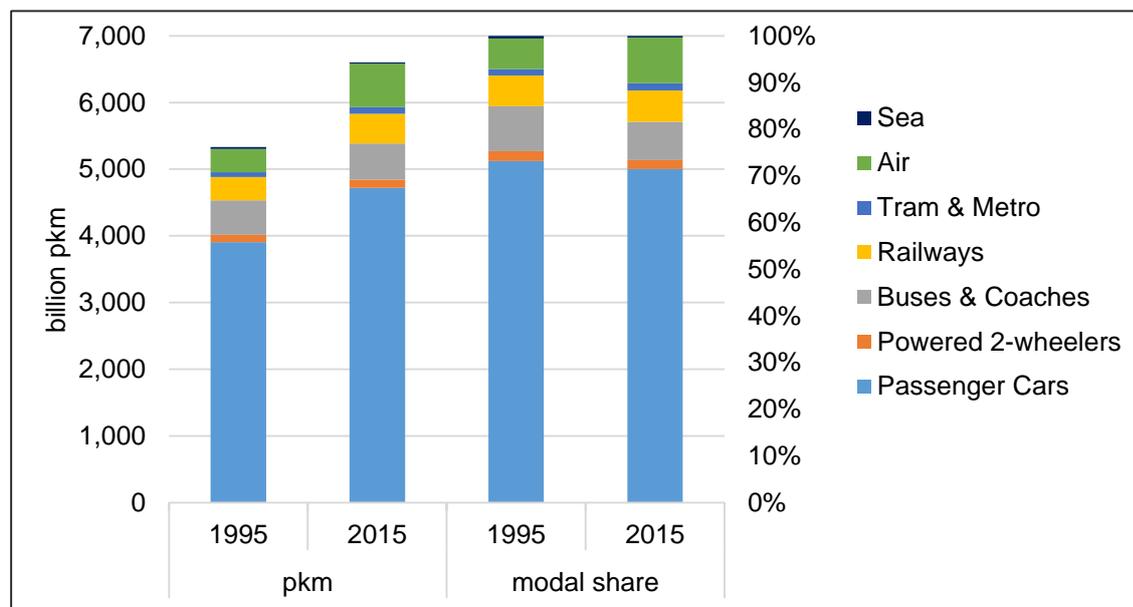
Figure 2-25 Modal split of freight transport in the EU-28



Source: DG Mobility and Transport

Note: Air and Sea: only domestic and intra-EU-28 transport, estimates for 2015. Road: national and international haulage by vehicles registered in the EU-28 in 1995, activity performed by European drivers within the EU territory in 2015.

Figure 2-26 Modal split of passenger transport in the EU-28

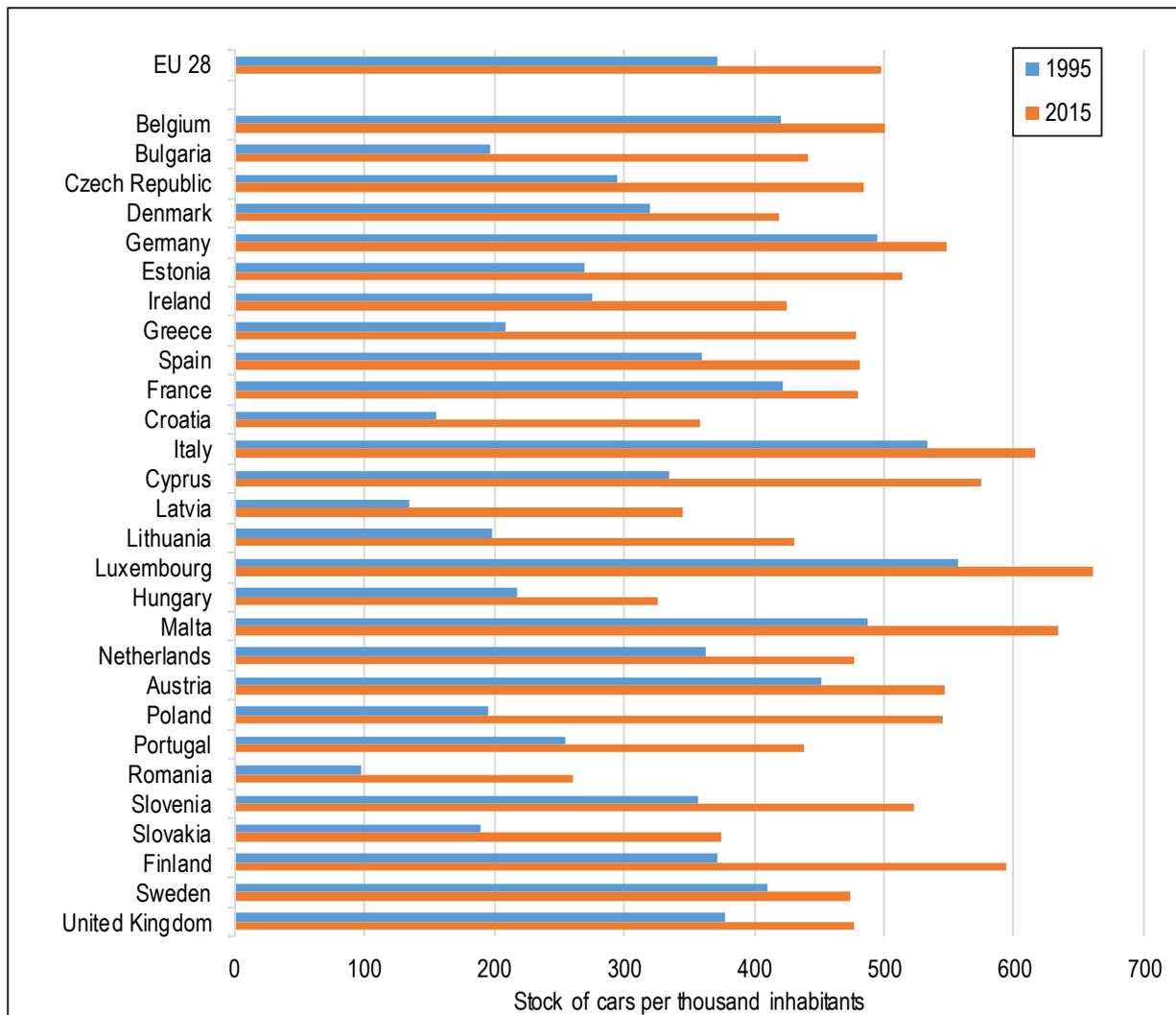


Source: Eurostat, DG MOVE

Note: Air and Sea: only domestic and intra-EU-28 transport; provisional estimates.

Figure 2-27 shows that in each of the EU-28 Member States the level of car ownership has increased between 1995 and 2015, with the overall level of ownership in the EU-28 increasing by 34 %. In Poland, Romania, Latvia, Croatia, Greece, Bulgaria and Lithuania car ownership levels have more than doubled, whereas Germany experienced the smallest increase at 11 %. Romania has the lowest level of ownership in the EU-28 (261 per 1 000 inhabitants). Luxembourg has the highest level of ownership with 661 cars per 1 000 inhabitants, followed by Malta with 634 cars per 1 000 inhabitants.

Figure 2-27 Level of car ownership



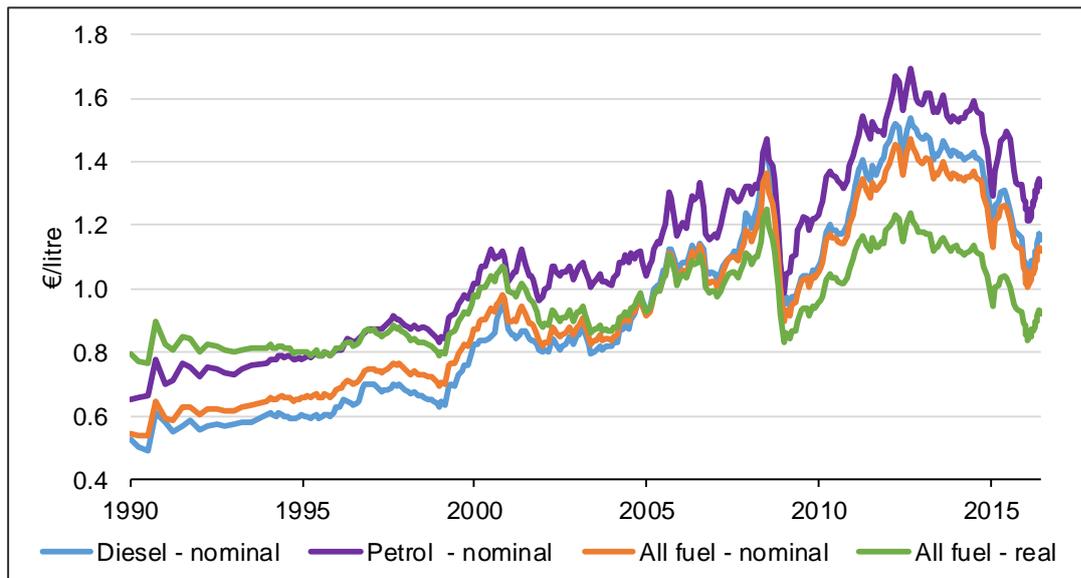
Source: Eurostat, DG Mobility and Transport

Note: Passenger car stock at end of year n divided by the population on 1st January of year n+1.

2.7.3. *Prices of transport fuels*

Figure 2-28 shows the trend in average diesel and petrol prices in the EU Member States since 1990. Overall, the prices for petrol increased by 8 % and diesel more than doubled between 1990 and 2016 due to substantial increases in oil prices; real prices (when adjusting for inflation) increased by around 9 % for all fuels.

Figure 2-28 Average EU road transport fuel prices



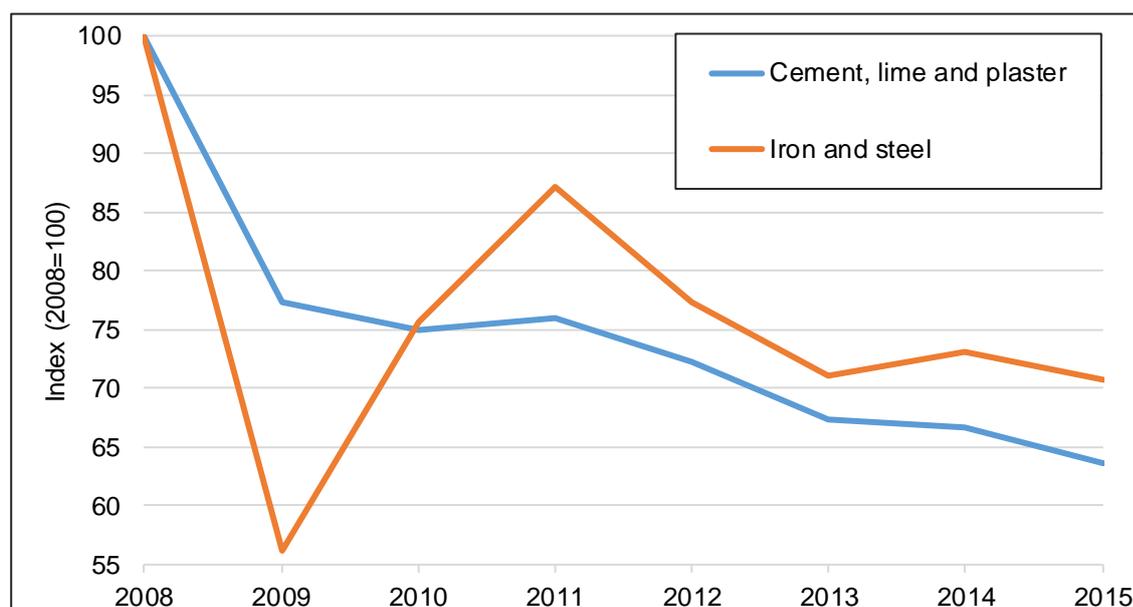
Source: EEA

Note: 'Real' is the price corrected for inflation, using 2005 as the baseline year.

2.8. Industry

The largest shares of gross value added in the industry sector in 2014 were contributed by construction (20 %), electricity, gas, steam and air conditioning (9 %); manufacture of machinery and equipment (8 %), and manufacture of motor vehicles (7 %). Figure 2-29 shows trends in the production value of two very energy-intensive industry sectors (iron and steel and cement). The decline in production during the economic crisis in 2009 is clearly visible, in particular for iron and steel.

Figure 2-29 Trends in production value of iron, steel and cement industry



Source: Eurostat

Note: Production value measures the amount actually produced by the unit, based on sales, including changes in stocks and the resale of goods and services. The production value is defined as turnover, plus or minus the changes in stocks of finished products, work in progress and goods and services purchased for resale, minus the purchases of goods and services for resale, plus capitalised production, plus other operating income (excluding subsidies). Income and expenditure classified as financial or extraordinary in company accounts is excluded from production value. Annual average exchange rates vis-à-vis the euro in EUR millions (reference year 2005).

2.9. Waste

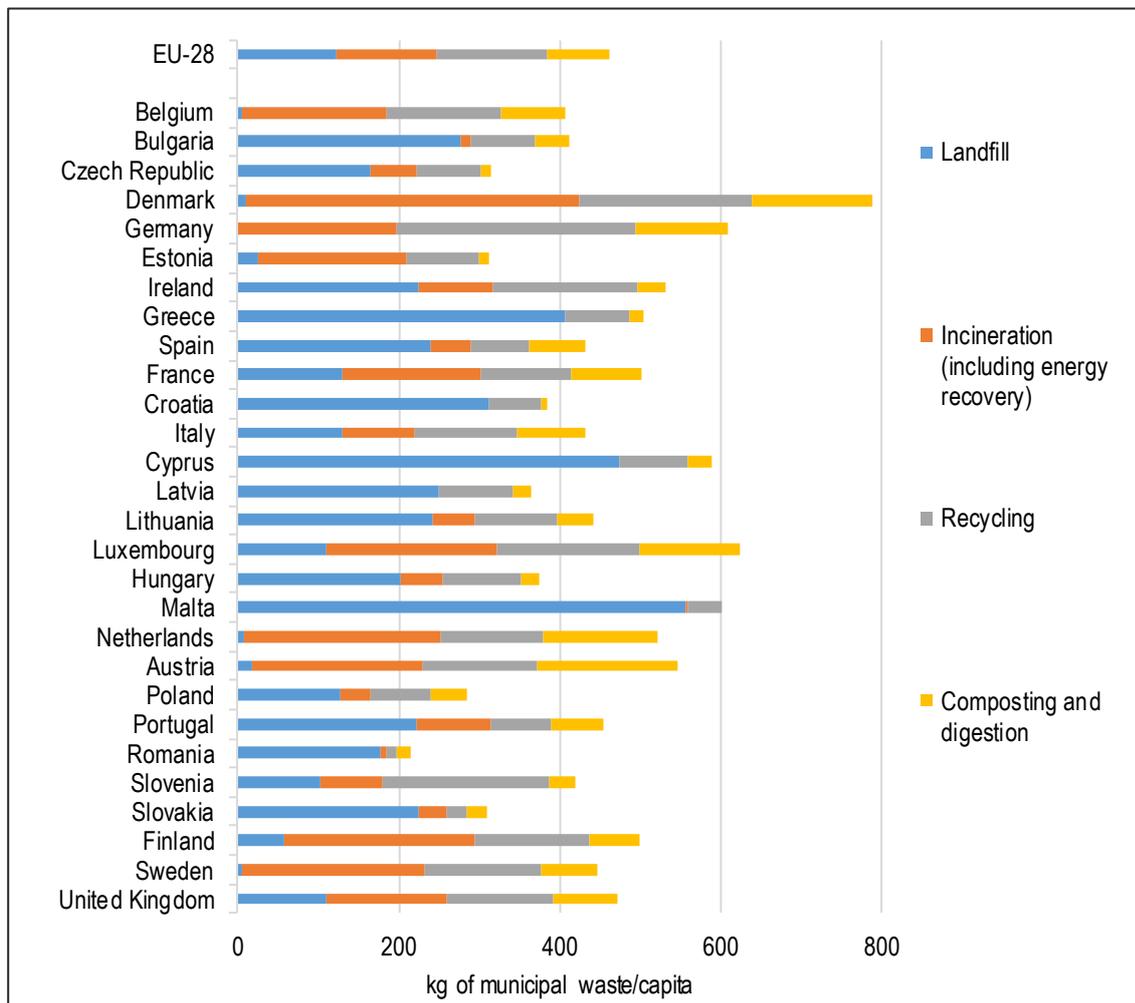
Greenhouse gas emissions from waste depend on the quantity of waste and how it is disposed of (including recycling, landfill and incineration). All types of waste treatment have an impact on emissions, including the consumption of energy in the collection, treatment and production of waste. The trends in emissions from waste can be seen in Section 3.2.3. Waste to landfill produces large methane emissions if not managed correctly (e.g. via methane recovery and diversion of biodegradable municipal waste from landfill).

Recycling and incineration of waste with energy recovery generally result in lower greenhouse gas emissions than disposing of the waste to landfill, and these types of waste treatment are increasingly being used, in part as a result of the policy drivers discussed in Section 4.4.1.7.

Figure 2-30 below shows the amount of municipal waste per capita in each Member State in 2015, which goes to each type of treatment. For the EU-28 on average 46 % of waste per capita is recycled, 26 % is sent to landfill and 27 % is incinerated. There has been a significant move away from disposal to landfill since the 6NC, when 36 % was sent to landfill. The lowest recycling rates are in Malta – at less than 7 %, with the remaining 93 % of waste landfilled. In contrast, Germany, Sweden and Belgium send less than 1 % of the municipal waste to landfill. In Estonia, Denmark and Sweden, more than half of the

municipal waste is incinerated. In terms of recycling, the Germany is the leader with over two-thirds (68 %) of waste recycled.

Figure 2-30 Treatment of municipal waste per capita in 2015

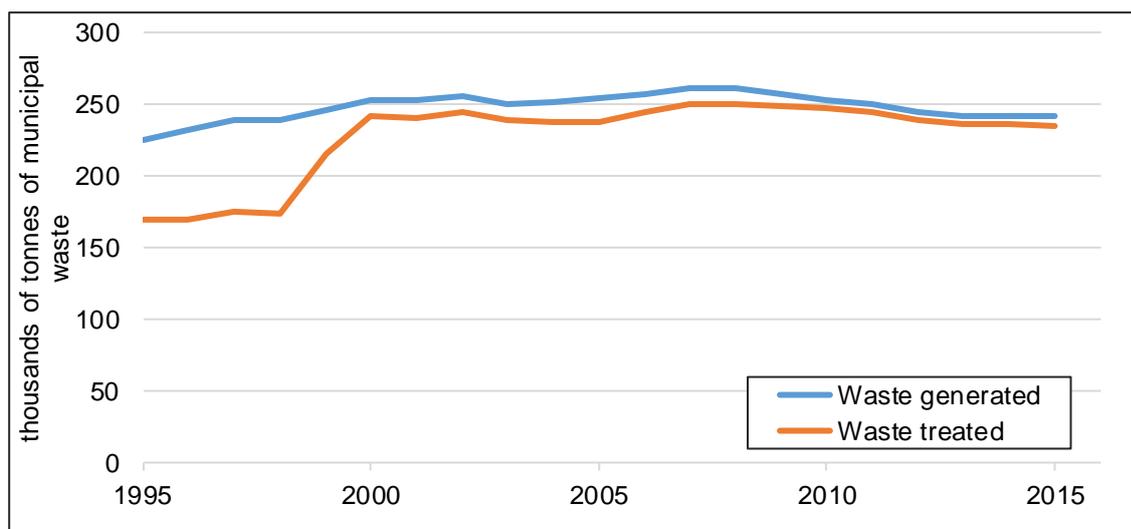


Source: Eurostat

Note: Data for Greece and Ireland is for 2012 and for Portugal 2014

As can be seen in Figure 2-31 municipal waste generation increased markedly in the 1990s but showed a slight decrease during the financial and economic crisis in 2009. The amount of waste treated roughly follows the trend of waste generated. It can be seen that the gap between the two has been reduced in recent years, as more of the waste generated has been treated.

Figure 2-31 Development of municipal waste generation and treatment since 1995



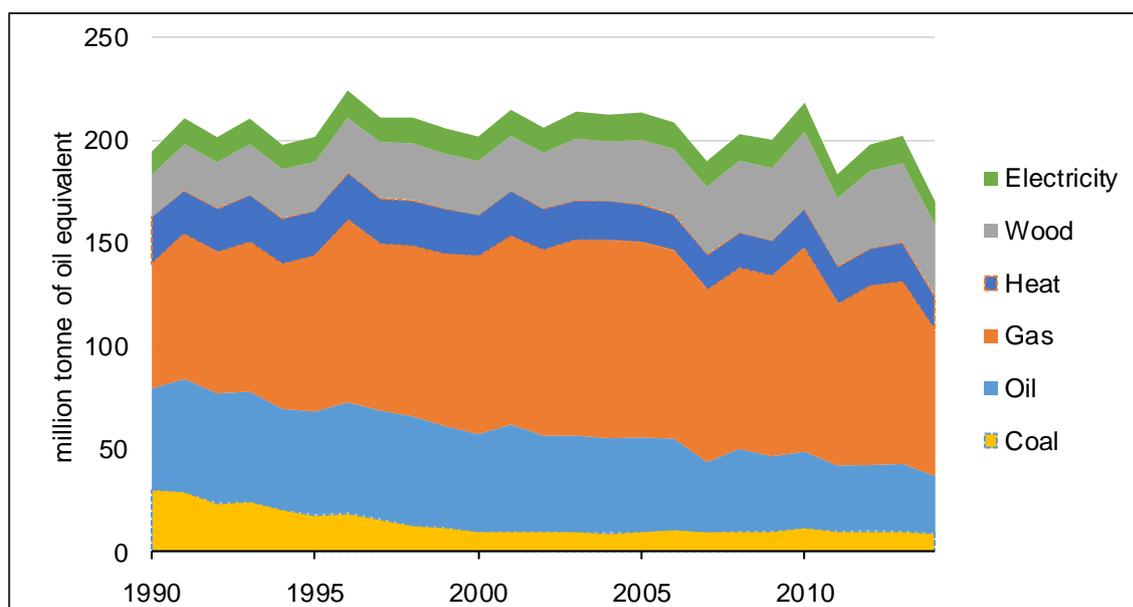
Source: Eurostat

Note: Data before 2006 not available for Croatia.

2.10. Building stock and urban structure

Energy consumption for space heating in buildings is a significant component of EU energy consumption. Figure 2-32 shows the energy consumption of residential space heating by fuel types. The main form of fuel for heating is gas, which has increased its share from 31 % in 1990 to 42 % in 2014. Wood has also increased its share – from 11 % to 20 %. The more carbon intensive oil and coal have seen their shares fall, to 16 % and 5 % respectively. This has important implications for overall GHG emissions from residential heating, as the CO₂ emission intensity of natural gas is much lower than for oil or coal.

Figure 2-32 Energy consumption of residential space heating in the EU-28 (1990 to 2014)



Source: Odyssee

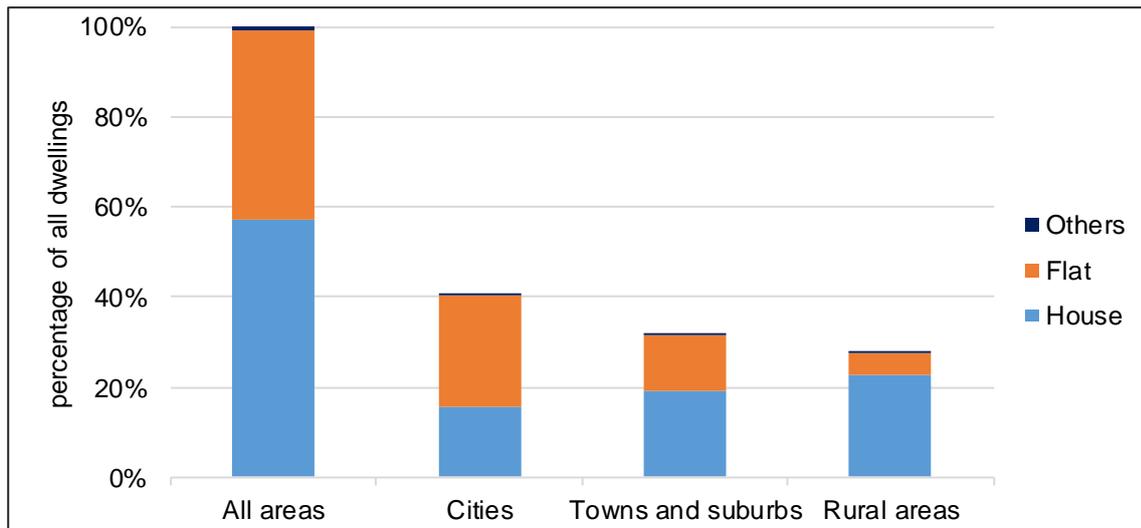
Note: data for Cyprus, Luxembourg, Malta, Portugal and Slovenia are not available for all years.

The overall energy consumption of residential heating has not changed significantly over the past 15 years. Factors that affect overall energy consumption include increased energy efficiency, type of housing, residential area per capita and overall population. Annual fluctuations in the figure above can be explained by weather patterns such as a mild winter in 2007, 2011 and 2014.

The type of housing is important because generally the ratio of residential area to outer wall area is more advantageous in flats compared to houses, resulting in lower energy consumption for heating. Densely populated areas with their high share of flats (see Figure 2-33) are in many cases characterised by lower energy consumption per square metre. Although overall energy consumption of residential heating has not changed significantly over the past decade, the energy consumption per unit area has decreased, as a result of higher energy efficiency. For example, the EU average energy consumption per square metre has decreased by 28 % from 14.1 to 10.1 kilogrammes of oil equivalents (see Figure 2-34).

Climate-corrected energy consumption per square metre is also shown in Figure 2-34. It provides a good proxy for the thermal and heating system efficiency of households as it is corrected for the effect of size of building and average climate of the various Member States.

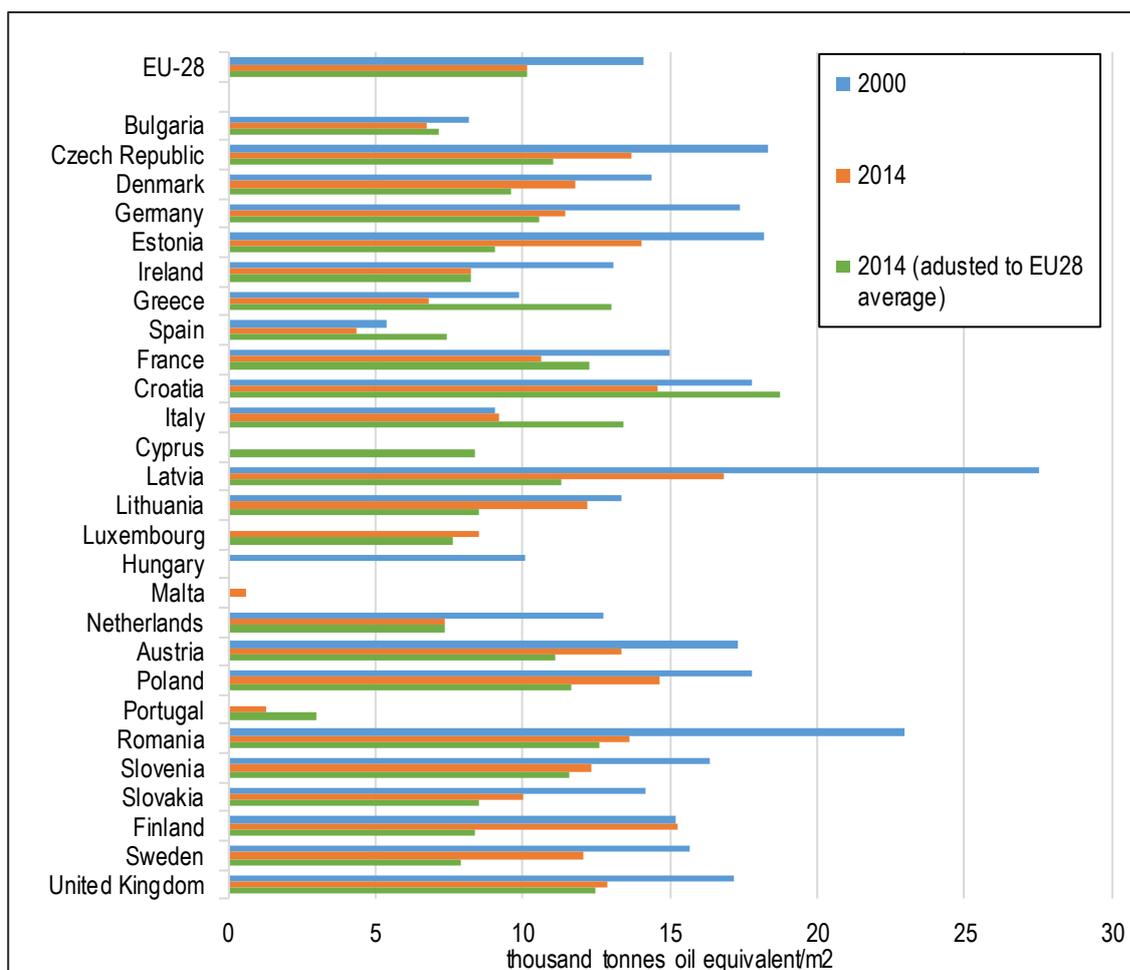
Figure 2-33 Breakdown of types of housing in the EU-28 in 2015



Source: Eurostat

The buildings sector has one of the highest potentials for improved energy efficiency. Measures to reduce the space heating/cooling demand in buildings represent a significant part of this potential. Many of these measures (e.g. improved insulation) are highly cost-effective, but a number of barriers to their implementation exist, for example, high costs of initial investment. With regard to unit consumption of total energy and heating per square metre, it can be seen in Figure 2-35 that households reduced this energy consumption by about 30 % since 1990. On the other hand, total electricity consumption per dwelling increased by 3 %, electricity consumption for lightning and appliances even increased by 12 % compared to 1990 levels, caused by the increasing stock of electrical appliances and larger homes. However the upward trend observed since 1990, has been reversed since 2010, with consumption falling between 2010 and 2014, due to the improved energy efficiency of lighting and appliances.

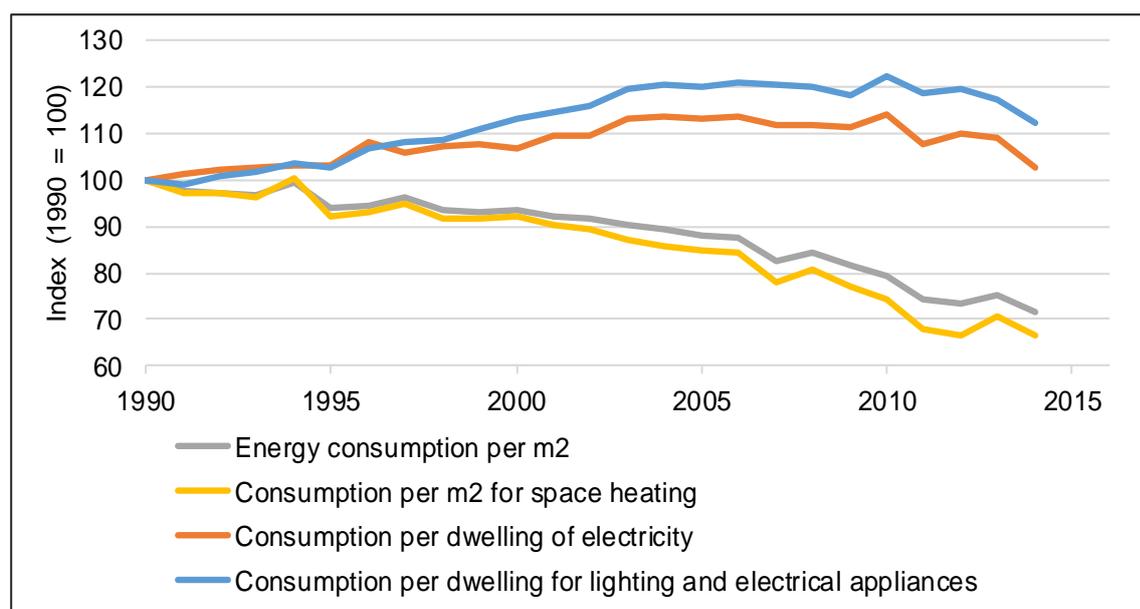
Figure 2-34 Household energy consumption per m² for space heating



Source: Odyssee

Note: Data for 2000 and 2014 are climate corrected against each country's long-term average climate, whereas the last series is climate corrected and scale against the EU - 28 long-term average climate to account for temperature differences between countries. Data not available for Belgium. Latest available data used where 2014 data not available (Romania, 2011; Lithuania and Malta 2012, Portugal and UK, 2013)

Figure 2-35 Unit consumption of energy in households



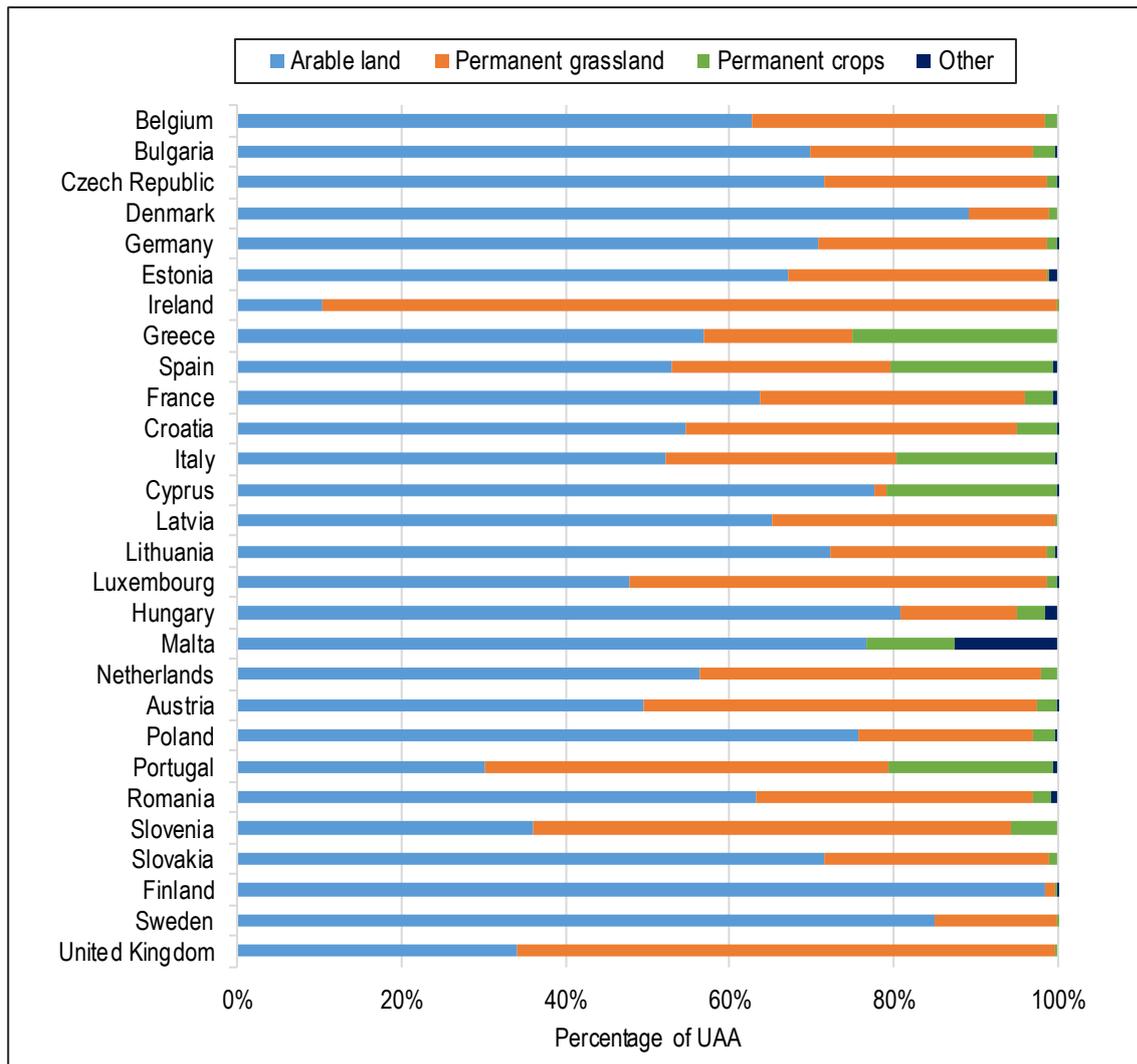
Source: Odyssee

2.11. Agriculture

In 2015 the total utilised agricultural area (UAA) in the EU-28 was 1.79 million km² which corresponds to 40 % of the total EU-28 area. The UAA declined slightly (by 4 %) between 2004 and 2015, but trends varied considerably between Member States. Significant increases were seen in Croatia, Estonia, Latvia and Lithuania, but were largely offset by decreases in countries such as Italy, Poland and Spain. Figure 2-36 shows the land use patterns of the Member States. Overall in the EU, about 60 % of the UAA is arable land, and 33 % is permanent grass land, but there is considerable variation between Member States. For example in Finland, where only 7% of land is used for agriculture, 99 % of the UAA is arable land, and only 1 % grass land. In contrast, in Ireland where 60% of land is used for agriculture, 90 % of the UAA is grassland and only 10 % arable land.

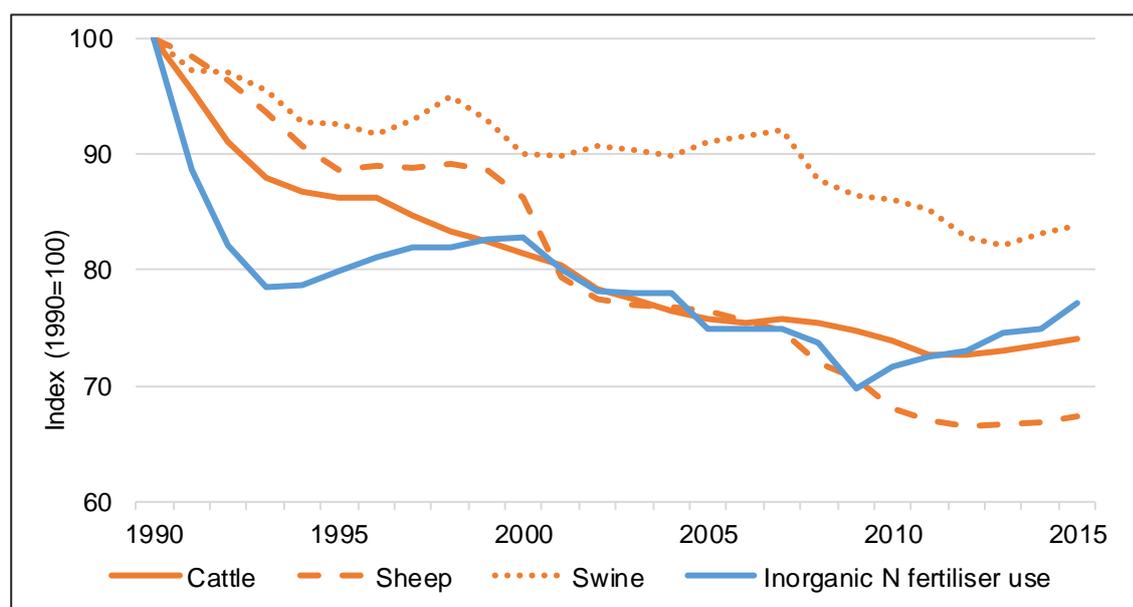
Agriculture constitutes a significant source of GHG emissions, for example due to nitrous oxide (N₂O) associated with fertilizer use and methane (CH₄) emissions from livestock (as well as energy consumption in the sector itself). Related trends are highlighted in more detail in **Figure 2-37**; trends in agriculture emissions are outlined in Section 3.2.3.

Figure 2-36 Total utilised agricultural land and usage patterns in 2015



Source: Eurostat

Figure 2-37 Trends in livestock populations and inorganic fertiliser use in EU-28



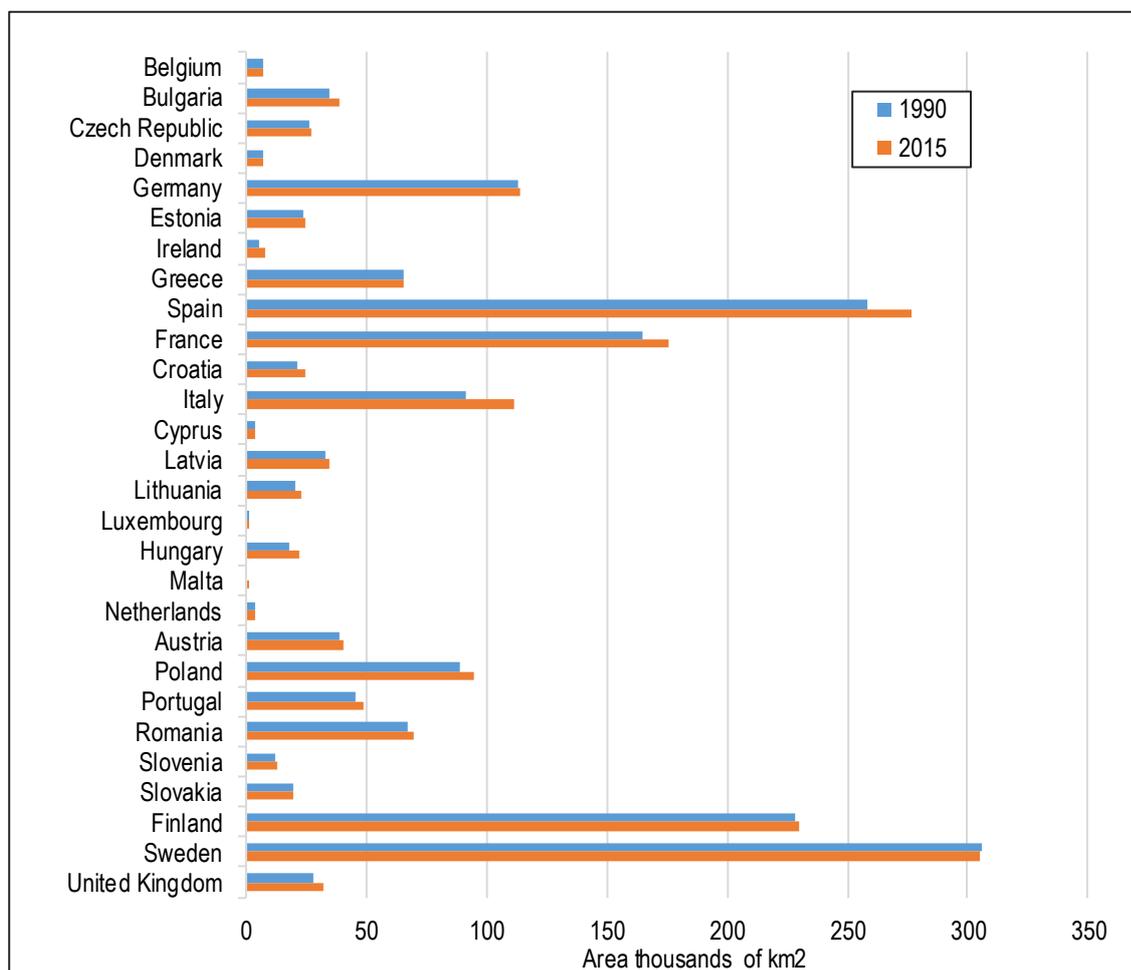
Source: Annual European Union greenhouse gas inventory 1990–2015

The use of nitrogenous fertilizers (in mineral and organic form) is an important factor driving agricultural emissions. The use of mineral nitrogenous fertilizer in the EU-28 fell substantially between 1990 and 2009, but has subsequently started to increase; in 2015 it was 23 % below 1990 levels. The number of livestock has substantially decreased since 1990, with cattle, which are emitters of enteric methane, falling by about a quarter.

2.12. Forests

Overall, the total forested area across the EU-28 Member States increased by 5 % between 1990 and 2015 (see Figure 2-38). In 2015, the forested area amounted to approx. 1.8 million km² which is 41 % of the total EU-28 area. The forest area increased in all countries, with the exception of Denmark, Luxembourg and Sweden (showing decreases of -3 %, -0.5 % and -0.3 % respectively between 1990 and 2015). Six countries make up two thirds of the total forested area: Sweden, Spain, Finland, France, Germany and Italy. The increase in forested and wooded areas throughout the EU is important for climate change mitigation, given their role as a carbon sink. Trends in emissions related to Land Use, Land-Use Change and Forestry are provided in Section 3.2.3.

Figure 2-38 Forested area in 1990 and 2015



Source: Eurostat

Note: Total forested area including other wooded land.

3. GREENHOUSE GAS INVENTORY INFORMATION

Key Developments

- Total greenhouse gas (GHG) emissions in the EU-28 plus Iceland (ISL) (without LULUCF and without international aviation, with indirect CO₂ emissions, and with NF₃ emissions) were 4 317 million tonnes CO₂ equivalent in 2015. Total GHG emissions decreased by 23.6 % from 1990 to 2015. In the EU-28 plus ISL the biggest relative change has been in the waste sector where the emissions of CH₄ from managed waste disposal on land decreased substantially.
- In 2015, total GHG emissions in the EU-28 plus ISL (without LULUCF and without international aviation, with indirect CO₂ emissions, and with NF₃ emissions) increased by 23.1 million tonnes, or 0.54 % compared to 2014. The increase in emissions was triggered by the higher heat demand by households and services due to slightly colder winter conditions in Europe, as well as by higher road transport demand.
- Total energy consumption increased overall, with fossil emissions increasing, particularly for natural gas and crude oil. The consumption and emissions of solid fuels decreased in 2015 for the third consecutive year. The sustained increase in renewables, particularly biomass, wind and solar, offset otherwise higher emissions in 2015. Electricity production from hydro and nuclear electricity production declined in 2015. The decline in hydro was due to low rainfall¹⁹.
- In spite of the 2015 increase in emissions, there were further improvements in the carbon intensity of the EU energy system because of the increased shares of renewables and gas relative to coal in the fuel mix. The energy intensity of GDP also improved as total energy consumption increased less rapidly than economic growth. The improvement in energy intensity was largely driven by lower energy-transformation losses and better energy efficiency of the overall EU economy²⁰.

3.1. Introduction

This chapter provides the key points about the EU GHG inventory. Further detail is provided in the 3BR.

Under the Kyoto Protocol, for its second commitment period, the EU, its Member States and Iceland have agreed to fulfil their quantified emission limitation and reduction commitments jointly. The Union, its Member States and Iceland agreed to a quantified emission reduction commitment that limits their average annual emissions of greenhouse gases during the second commitment period to 80 % of the sum of their base year emissions, which is reflected in the Doha Amendment²¹.

19 Analysis of key trends and drivers in greenhouse gas emissions in the EU between 1990 and 2015, Available at <https://www.eea.europa.eu/publications/analysis-of-key-trends-and>

20 See reference above

21 See https://ec.europa.eu/clima/policies/strategies/progress/kyoto_2_en

The GHG data presented in this chapter are consistent with the 2017 submission of the EU to the Secretariat of the United Nations Framework Convention on Climate Change (UNFCCC), under the Convention and the Kyoto Protocol²². In this Communication, the EU plus ISL is referred to EU-28+ISL.

The GHG inventory data presented in this chapter of the National Communication refers to the GHG inventory of the EU-28+ISL, as submitted by the EU in 2017 under the Kyoto Protocol. The third biennial report contains the GHG inventory information pertaining to the EU-28 alone and is consistent with the annual inventory submission made by the EU under the Convention in 2017. Emissions in 2015 from the EU-28 were 4 310 million tonnes CO₂ eq., and 4 317 million tonnes CO₂ eq. from the EU-28+ISL.

The GHG inventory data presented in this chapter of the National Communication refers to the GHG inventory of the EU-28+ISL, as submitted in 2017 under the Kyoto Protocol. As the EU inventory is the sum of the Member States' inventories, the EU-28 inventory covers the same geographical area as the inventories of the 28 Member States. For complete information on the geographical coverage, please refer to Table 1.17 of the EU national inventory report, as submitted to the UNFCCC in 2017 (EU NIR 2017).

The sectoral scope of the emissions presented in this chapter aligns with the reporting requirements of the second commitment period (CP2). Indirect emissions of CO₂ are included in all the emission data quoted in the National Communication. Emissions from international aviation are excluded in this chapter.

The legal basis of the compilation of the EU inventory and the inventory methodology and data availability are described in Chapter 1 of the EU NIR 2017 "*Introduction to the EU GHG inventory*".

The legal basis for the compilation of the EU inventory is Regulation (EU) No 525/2013 of the European Parliament and of the Council of 21 May 2013 on a mechanism for monitoring and reporting GHG emissions and for reporting other information at national and EU level relevant to climate change and repealing Decision No 280/2004/EC (MMR)²³. The EU inventory has been compiled from data delivered by the 28 Member States and Iceland by 15 March 2017 under Regulation (EU) No 525/2013, and subsequent updates to these data received by 15 May 2017.

Summary tables of GHG emissions for EU-28+ISL in the common reporting format are presented in Appendix II. These data and the complete submissions of the Member States (Member States) under Regulation (EU) No 525/2013 are available on the EEA website (<http://www.eea.europa.eu/>).

3.2. Descriptive Summary of GHG Emissions Trends

This section only has a brief description of the trends in GHG emissions. For a full description of the trends, please see relevant sections in the EU National Inventory Report (NIR) and [3BR] Section 2.3.

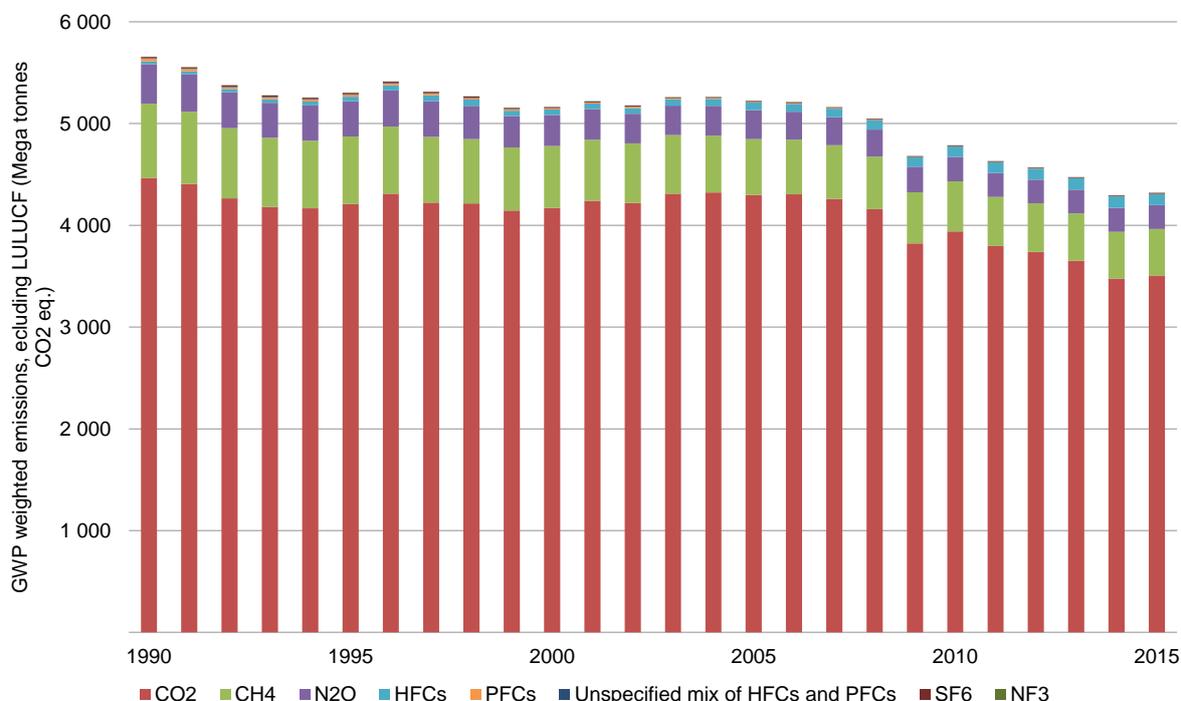
²² Available at http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/10116.php

²³ Available at <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32013R0525&from=EN>

3.2.1. Trends in total GHG emissions

In 2015 total GHG emissions in the EU-28+ISL, without LULUCF, were 23.6 % (1 336 million tonnes CO₂ equivalents) below 1990, (see Figure 3-1). Between 2014 and 2015 emissions increased by 0.5 % (23 million tonnes of CO₂ equivalents).

Figure 3-1 EU-28+ISL GHG emissions 1990 to 2015, excluding LULUCF.



Source: EEA

3.2.2. Trends in emissions by GHG

Table 1 in Appendix II provides an overview on the main trends in the EU-28+ISL GHG emissions and removals for 1990–2015. In the EU-28+ISL the most important GHG is CO₂, accounting for 81.2 % of total EU-28+ISL emissions in 2015. In 2015, EU-28+ISL CO₂ emissions without LULUCF were 3 506 million tonnes, which was 21.5 % below 1990 levels. CH₄ and N₂O emissions account for 10.6 % and 5.5 % of total GHG emissions respectively in 2015; both gases show falling trends. As a group of gases, fluorinated gases (HFCs, PFCs, SF₆ and NF₃) are increasing and account for the remaining 2.7 % of total GHG emissions.

3.2.3. Trends in emissions by main source and sink categories

Table 1 Appendix II provides an overview of EU-28+ISL GHG emissions in the main source categories for 1990 to 2015. Emissions from international aviation and shipping are excluded from national totals and are presented in the table as memo items.

The energy sector contributed 77.9 % to total GHG emissions in 2015. This sector is the largest source of emissions in the EU-28+ISL. Total GHG emissions from this sector decreased by 22.5 % from 4 341 in 1990 to 3 362 million tonnes in 2015. The main reasons

for the falling emissions since 1990 are efficiency improvements and fuel shifts from coal to gas in electricity and heat production, and also, in manufacturing industries. In addition, efficiency improvements, fuel shifts and better insulation of buildings contributed to the decline. The use of renewables is an important factor also.

The agriculture sector is the second largest source of emissions in the EU-28+ISL, and contributed 10.1 % to total GHG emissions in 2015. Total GHG emissions from this sector decreased by 23.3 % from 549 million tonnes CO₂ equivalent in 1990 to 438 million tonnes CO₂ equivalent in 2015, reflecting falling cattle population and lower fertiliser and manure use on agricultural soils.

The industrial processes and product use sector is the third largest source of emissions, and contributed 8.7 % to total EU-28+ISL GHG emissions in 2015. Total GHG emissions from this sector decreased by 27.4 % from 518 million tonnes CO₂ equivalent in 1990 to 376 million tonnes CO₂ equivalent in 2015, mainly due to emission reduction measures in adipic acid production, nitric acid production and production of halocarbons.

The remaining emissions arise from the waste sector, contributing 3.2 % to total EU-28+ISL GHG emissions in 2015. Total GHG emissions from this sector decreased by 42.1 % from 241 million tonnes CO₂ equivalent in 1990 to 140 million tonnes CO₂ equivalent in 2015. Key EU policies such as the Landfill Waste Directive have been successful in reducing greenhouse gas emissions from the waste sector.

In addition, net removals from land use, land use change and forestry (LULUCF) increased in the EU over the same 25-year period. Based on the 2017 EU GHG inventory, net removals increased by 32.9 % in the EU 28 between 1990 and 2015 and the net sink has increased from 4.1 % of total net GHG emissions in 1990 to 7.3 % in 2015. In 2015, net removals from the LULUCF sector in the EU 28 amounted to 295 million tonnes of CO₂ equivalent. The key driver for the increase in net removals is a significant build-up of carbon stocks in forests. Environmental policies have also resulted in less intensive agricultural practices and an increase in forest and woodland conservation areas for the purpose of preserving biodiversity and landscapes. In 2015, cropland and grassland were sources of emissions.

International bunker emissions of the EU inventory are the sum of the aviation bunker and maritime bunker emissions of the Member States. These emissions are reported as memo items and excluded from national totals. Emissions of greenhouse gases from international aviation increased between 1990 and 2008, with some inter-annual fluctuations. In 2009 there was a clear decline in emissions, mainly due to the global financial crisis of 2007 to 2009. From 2010 onwards emissions steadily rose, approximately returning to their 2008 levels by 2015. Emissions of greenhouse gases from international navigation increased between 1990 and 2008, with some inter-annual fluctuations. In 2009 there was a clear decline in emissions, mainly due to the global financial crisis of 2007 to 2009. From 2011 onwards emissions have steadily declined. In 2015, emissions were similar to those in 2000.

Total GHG emissions from international transport reached 278 million tonnes of CO₂ equivalents in 2015. Emissions from these two categories are equivalent to 3.5 % for international aviation (143 million tonnes of CO₂ equivalents) and 3.4 % for international navigation (135 million tonnes of CO₂ equivalents) of total EU-28+ISL GHG emissions in

2015. In 2015, emissions from aviation bunkers and maritime bunkers were 106 % and 23 %, respectively, above 1990 levels.

3.2.4. *Further details about the GHG inventory and interpretation of results*

Sections in the 3BR provide further details about the following points:

- Changes in emissions from Key Categories (see [3BR] Section 2.3.4);
- Key drivers affecting emission trends (see [3BR] Section 2.3.5);
- Information on indirect GHG emissions (see [3BR] Section 2.3.6);
- Accuracy and uncertainty of the data (see [3BR] Section 2.3.7);
- Details of the gap filling procedure (see [3BR] Section 2.5.1).

3.2.5. *Changes since the 6th National Communication*

Since the publication of the 6NC, various updates and revisions to methodologies have been implemented in the EU GHG inventory, which have impacted on the time-series of emissions. The 2013 EU GHG inventory was used in the 6NC. This means changes to the GHG inventory used in this Communication are a result of four GHG inventory updates.

Cross cutting changes that affect the GHG inventories of all the Member States since 6NC include:

- Implementation of the IPCC 2006 guidelines (moving from the 1996 GLs, the 2000 Good Practice Guidelines and the 2003 LULUCF Good Practice Guidance);
- Changes to the Global Warming Potentials that are used;
- The KP scope of the EU GHG inventory is now the EU-28 and ISL.

Because of these cross cutting changes, direct comparisons of the changes in the magnitude of emissions between the 6NC and 7NC are not valid.

3.3. **National system**

In accordance with the MMR Article 6(1), the EU has established a Union Inventory System to ensure the timeliness, transparency, accuracy, consistency, comparability and completeness of Member State national inventories. Commission delegated regulation (EU) 666/2014 establishes the substantive requirements for the EU national system²⁴. This in turn ensures the integrity and coherence of the Union greenhouse gas inventory.

The Commission's Staff Working Document, SWD (2013) 308 final²⁵ outlines the main elements of the Union inventory system. This Communication presents a summary of the EU's system. Complete details of the system can be found in the EU NIR 2017 in Section 1.2 "*A description of the institutional arrangements*".

24 Commission Delegated Regulation (EU) No 666/2014 of 12 March 2014 establishing substantive requirements for a Union inventory system and taking into account changes in the global warming potentials and internationally agreed inventory guidelines pursuant to Regulation (EU) No 525/2013 of the European Parliament and of the Council; http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AAOJ.L_.2014.179.01.0026.01.ENG

25 Commission Staff Working Document SWD (2013)308 final on Elements of the Union greenhouse gas inventory system and the Quality Assurance and Control (QA/QC) programme http://ec.europa.eu/clima/policies/strategies/progress/monitoring/docs/swd_2013_308_en.pdf

3.3.1. *Institutional, legal and procedural arrangements*

This section summarises the legal, institutional, and procedural arrangements of the EU for preparing, reporting and checking its GHG inventory.

Legal arrangements

In the EU, the legal basis for the compilation of the Union greenhouse gas inventory is Regulation (EU) No 525/2013 of the European Parliament and of the Council of 21 May 2013 on a mechanism for monitoring and reporting GHG emissions and for reporting other information at national and EU level relevant to climate change and repealing Decision No 280/2004/EC (MMR). Commission delegated regulation (EU) 666/2014 establishes the substantive requirements for the EU national system. The EU national inventory system as well as the QA/QC programme is described in more detail in Commission Staff Working Document SWD (2013) 308 final²⁶.

Institutional and procedural arrangements

The European Commission's DG Climate Action in consultation with the Member States has the overall responsibility for the EU inventory. Member States are required to submit their national inventories and inventory reports under the Monitoring Mechanism Regulation to the European Commission, DG Climate Action; and the European Commission. DG Climate Action itself submits the inventory and inventory report of the EU to the UNFCCC Secretariat, on behalf of the European Union. In the actual compilation of the EU inventory and inventory report, the European Commission, DG Climate Action, is assisted by the European Environment Agency (EEA) including the EEA's ETC/ACM and by Eurostat and the Joint Research Centre (JRC)²⁷.

The Directorate General for Climate Action of the European Commission is the overall body responsible for preparing the inventory of the EU. Each Member State (MS) is responsible for the preparation of its own inventory and these inventories provide the necessary data for the inventory of the EU, which is the sum of MS inventories. All Member States of the EU are Annex I parties to the UNFCCC and have committed to preparing individual GHG inventories and submitting them to the UNFCCC Secretariat by 15 April each year.

The main institutions involved in the compilation of the EU GHG inventory are:

- Member States;
- European Commission Directorate General for Climate Action (DG Climate Action);
- European Environment Agency (EEA) and its European Topic Centre on Air Pollution and Climate Change Mitigation (ETC/ACM);
- Eurostat (also a Directorate General of the European Commission), and,
- JRC (also a Directorate General of the European Commission).

²⁶ Commission Staff Working Document SWD (2013)308 final on Elements of the Union greenhouse gas inventory system and the Quality Assurance and Control (QA/QC) programme. http://ec.europa.eu/clima/policies/strategies/progress/monitoring/docs/swd_2013_308_en.pdf

²⁷ The Statistical Office of the European Communities (Eurostat) and the Joint Research Centre (JRC) are DGs of the European Commission. For simplicity reasons, these institutions are referred to as 'Eurostat' and the 'JRC' in this report

The roles and responsibilities of various agencies and entities in relation to the inventory development process, as well as the institutional, legal and procedural arrangements made to prepare the inventory are schematically shown in Figure 3-2 below. The entity with the overall responsibility for the Union inventory system is the European Commission, more specifically DG Climate Action.

DG Climate Action is assisted by the European Environment Agency (EEA), which is an agency of the EU. Article 24 of the Monitoring Mechanism Regulation provides the legal basis for the cooperation between the European Commission and the EEA. The EEA's main task in the inventory process is the compilation of the Union inventory (CRF tables) and preparation of the Union inventory report. The EEA is assisted in its work by a European Topic Centre on Air Pollution and Climate Change Mitigation (ETC/ACM), which is an international consortium working with the EEA under a framework partnership agreement. The Commission's DGs Eurostat and JRC are also involved in the process of inventory preparation, with their respective roles related to energy statistics for Eurostat and LULUCF and agriculture for JRC²⁸.

While the Union GHG inventory is the sum of the sectoral emissions data from the Member States, the only case where this is different is with regard to the CO₂ emissions for the Reference Approach based on Eurostat energy data. The Reference Approach is a top-down approach, using high-level energy supply data to calculate the CO₂ emissions from the combustion of mainly fossil fuels.

The Union inventory for the complete time series, including the base year and all other inventory years, is established on the basis of the inventories supplied by Member States. The total estimates in the Union GHG inventory should accurately reflect the sum of Member States' national GHG inventories. The quality of the Union inventory therefore depends on the quality of Member States' inventories. The only case where this is different is with regard to the CO₂ emissions for the Reference Approach based on Eurostat energy data. The Reference Approach is a top-down approach, using high-level energy supply data to calculate the CO₂ emissions from the combustion of mainly fossil fuels.

Member States are responsible for the quality of activity data, emission factors and other parameters used for their national inventories as well as the correct application of methodologies provided in the IPCC Guidelines. Member States are also responsible for establishing QA/QC programmes for their inventories. The QA/QC activities of each MS are described in the respective national inventory reports and summarised in the Union inventory report. The detailed QA/QC activities of the Union inventory system are described in the EU national inventory report and also summarised in Section 3.3.3, below.

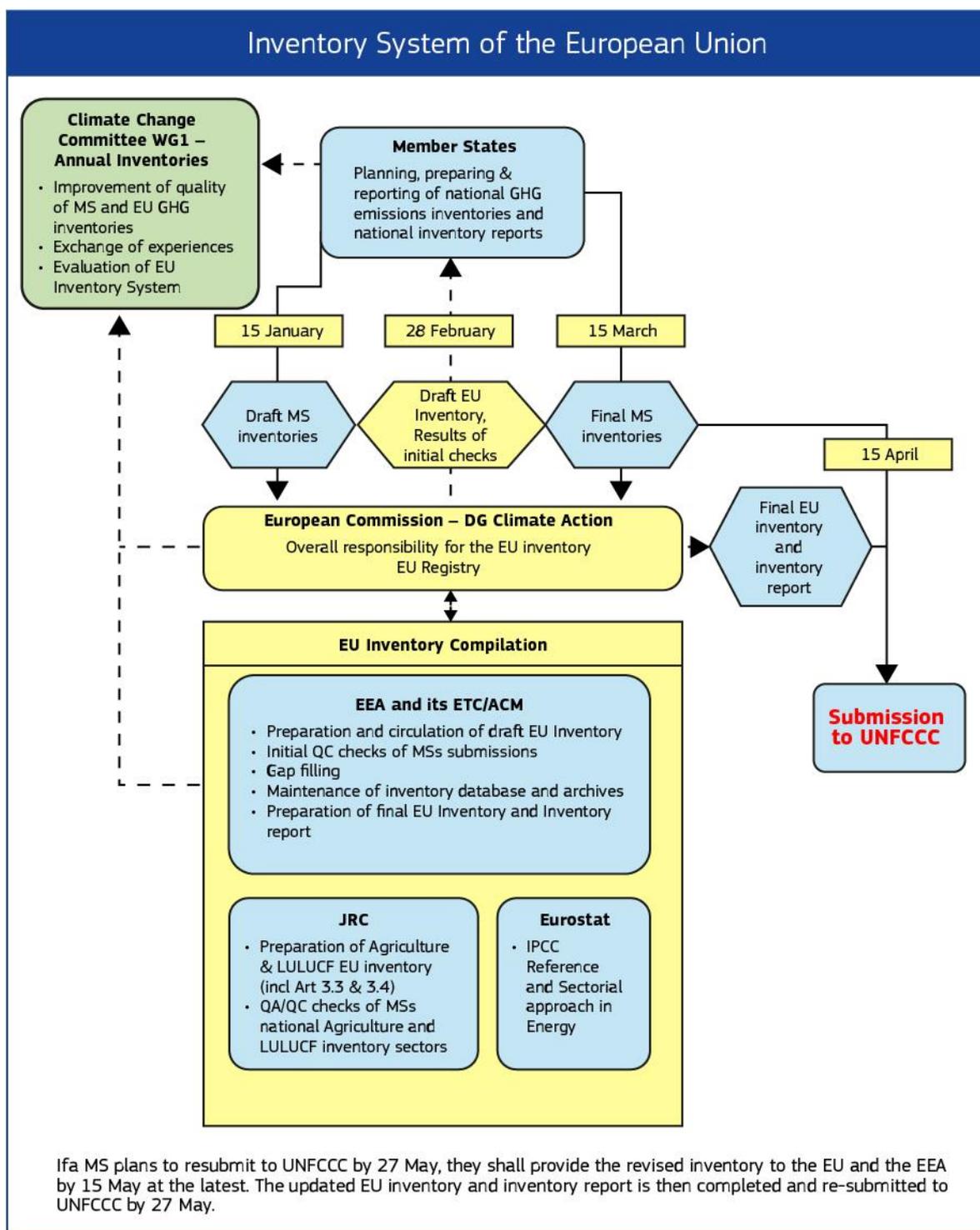
The consultation between the DG Climate Action and the Member States takes place in the Climate Change Committee established under Article 26 of the MMR. The Committee is composed of the representatives of the Member States and chaired by the representative of the DG Climate Action. Procedures within the Committee for decision-making, adoption of measures and voting are outlined in the rules of procedure, adopted in November 2003. In

²⁸ The Statistical Office of the European Communities (Eurostat) and the Joint Research Centre (JRC) are DGs of the European Commission. For simplicity reasons, these institutions are referred to as 'Eurostat' and the 'JRC' in this report

order to facilitate decision-making in the Committee, working groups have been established, one of which is Working Group 1 on ‘Annual inventories’.

The MMR sets out the annual cycle of preparation of the EU inventory, as shown schematically by Figure 3-2 below. By 15 January each year, Member States submit draft national inventories to the European Commission. The EEA, assisted by it ETC/ACM, Eurostat and JRC, carries out quality checks and prepares a draft EU inventory by 28 February. Member States submit final inventories (CRF tables and national inventory reports) to the Commission by 15 March, which contain the same information as the submission on 15 April to the UNFCCC Secretariat. The EEA, assisted by the ETC/ACM, Eurostat and JRC, together with DG Climate Action then prepare the final EU inventory (CRF tables and EU national inventory report). Both the EU and Member States individually make their official submissions to the UNFCCC Secretariat on 15 April.

Figure 3-2. Inventory system of the EU



3.3.2. The EU inventory methodology and data

This National Communication has been compiled using the Union inventory and with regards to the UNFCCC guidance for parties preparing their National Communications. The Union

inventory is compiled, in accordance with the UNFCCC guidelines²⁹, on the basis of the inventories of the 28 Member States and Iceland. The estimates of emissions in the Union inventory are, where appropriate and feasible, consistent with the IPCC 2006 Guidelines for National Greenhouse Gas Inventories³⁰. In addition to the Monitoring Mechanism Regulation, Commission Delegated Regulation (EU) No 666/2014 and Commission Implementing Regulation (EU) No 749/2014³¹ provide the legal framework for the compilation of the Union GHG inventory.

The emissions of each source and sink category are the sum of the emissions of the respective source and sink categories of the 28 Member States and Iceland. This also applies for the base year estimate of the EU-28 GHG inventory.

Table 3-1 Base year emissions for EU-28+ISL Member States under KP CP2

Source: EEA³²

[Considering that the numbers are not final as the numbers reflect MS data before their individual reviews and that the review of the EU's initial report is not completed at the time the report was written, detailed numbers would only be presented after calculations are completed.]

The EU, its Member States and Iceland have agreed to fulfil their quantified emission limitation and reduction commitments under Article 3 of the Kyoto Protocol for the second commitment period to the Kyoto Protocol jointly, in accordance with the provisions of Article 4 thereof. The Union, its Member States and Iceland agreed to a quantified emission reduction commitment that limits their average annual emissions of greenhouse gases during the second commitment period to 80 % of the sum of their base year emissions, which is reflected in the Doha Amendment.

Member States use different national methodologies, national activity data or country specific emission factors in accordance with IPCC and UNFCCC guidelines. The EU believes that this is consistent with the UNFCCC reporting guidelines and the IPCC good practice guidelines, provided each methodology is consistent with the IPCC good practice guidelines. In general, no separate methodological information is provided at EU level except summaries of methodologies used by Member States. Details can be found in the Annual EU greenhouse gas inventory 1990 to 2015 and Inventory Report 2017 submission to the UNFCCC Secretariat³³. For some sectors quality improvement projects, including expert workshops, have been started with the aim of further improving estimates at MS level. These sectors

29 UNFCCC, 2013 <http://unfccc.int/resource/docs/2013/cop19/eng/10a03.pdf#page=2>. The Kyoto Protocol's monitoring procedures are based on existing reporting and review procedures under the Convention (decisions 24/CP.19 and 13/CP.20), building on experience gained in the climate change process over the past decades. They also involve additional accounting procedures that are needed to track and record Parties' holdings and transactions of Kyoto Protocol units: assigned amount units (AAUs), certified emission reductions (CERs), emission reduction units (ERUs) and removal units (RMUs).

30 <http://www.ipcc-nggip.iges.or.jp/public/2006gl/>

31 Commission Implementing Regulation (EU) No 749/2014 of 30 June 2014 on structure, format, submission processes and review of information reported by Member States pursuant to Regulation (EU) No 525/2013 of the European Parliament and of the Council

32 Report from the Commission. Report to facilitate the calculation of the assigned amount of the European Union, and the report to facilitate the calculation of the joint assigned amount of the Union, its Member States and Iceland pursuant to Article 3(7bis), (8) and (8bis) of the Kyoto Protocol for the second commitment period, as required under Article 3(2) of Council Decision (EU) 2015/1339 {SWD(2016) 316 final} <http://ec.europa.eu/transparency/regdoc/rep/1/2016/EN/COM-2016-618-F1-EN-MAIN.PDF>

33 http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/10116.php

include energy background data, emissions from international bunkers, emissions and removals from LULUCF, emissions from agriculture, and waste.

Table 3-2 shows the geographical coverage of the EU-28+ISL Member States' national inventories. The EU-28+ISL inventory and the EU-28 inventory, respectively, are the sums of the Member States' inventories and cover the same geographical area as the inventories of the Member States, to the extent to which their territories are part of the Union (see some differences for Denmark, France and the United Kingdom).

Table 3-2 Geographical coverage of the EU-28+ISL inventory³⁴

Member State	Geographical coverage	EU and MS Party coverage (Kyoto Protocol, second commitment period)	EU-territory coverage (UNFCCC)	Party Coverage (UNFCCC)	Country code
Austria	Austria	√	√	√	AUT
Belgium	Belgium consisting of Flemish Region, Walloon Region and Brussels Region	√	√	√	BEL
Bulgaria	Bulgaria	√	√	√	BGR
Croatia	Croatia	√	√	√	HVR
Cyprus	Area under the effective control of the Republic of Cyprus	√	√	√	CYP
Czech Republic	Czech Republic	√	√	√	CZE
Denmark	Denmark (excluding Greenland and the Faeroe Islands)	√	√		DNM
Estonia	Estonia	√	√	√	EST
Finland	Finland including Åland Islands	√	√	√	FIN
France	Metropolitan France, the overseas departments (Guadeloupe, Martinique, Guyana and Reunion) and the overseas communities (Saint-Barthelemy, Saint-Martin and Mayotte), excluding the French overseas communities (French Polynesia, Wallis and Futuna, Saint-Pierre and Miquelon) and overseas territories (the French Southern	√	√		FRK

³⁴ Commission Staff Working Document. Report to facilitate the calculation of the assigned amount of the European Union, and the report to facilitate the calculation of the joint assigned amount of the Union, its Member States and Iceland pursuant to Article 3(7bis), (8) and (8bis) of the Kyoto Protocol for the second commitment period, as required under Article 3(2) of Council Decision (EU) 2015/1339. [SWD(2016) 316 final]. Brussels, 23.9.2016. COM(2016) 618 final. <http://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A52016DC0618>

Member State	Geographical coverage	EU and MS Party coverage (Kyoto Protocol, second commitment period)	EU-territory coverage (UNFCCC)	Party Coverage (UNFCCC)	Country code
	and Antarctic Lands)and New Caledonia.				
France	Metropolitan France, the overseas departments (Guadeloupe, Martinique, Guyana and Reunion), the overseas communities (French Polynesia, Saint-Barthelemy and Saint-Martin, Wallis and Futuna, Mayotte, Saint-Pierre and Miquelon) and overseas territories(the French Southern and Antarctic Lands) and New Caledonia.			√	FRA
Germany	Germany	√	√	√	DEU
Greece	Greece	√	√	√	GRC
Hungary	Hungary	√	√	√	HUN
Ireland	Ireland	√	√	√	IRE
Italy	Italy	√	√	√	ITA
Latvia	Latvia	√	√	√	LVA
Lithuania	Lithuania	√	√	√	LTU
Luxembourg	Luxembourg	√	√	√	LUX
Malta	Malta	√	√	√	MLT
Netherlands	The reported emissions have to be allocated to the legal territory of The Netherlands. This includes a 12-mile zone from the coastline and also inland water bodies. It excludes Aruba and The Netherlands Antilles, which are self-governing dependencies of the Royal Kingdom of The Netherlands. Emissions from offshore oil and gas production on the Dutch part of the continental shelf are included.	√	√	√	NLD
Poland	Poland	√	√	√	POL

Member State	Geographical coverage	EU and MS Party coverage (Kyoto Protocol, second commitment period)	EU-territory coverage (UNFCCC)	Party Coverage (UNFCCC)	Country code
Portugal	Mainland Portugal and the two Autonomous regions of Madeira and Azores Islands. Includes also emissions from air traffic and navigation bunkers realized between these areas.	√	√	√	PRT
Romania	Romania	√	√	√	ROU
Slovakia	Slovakia	√	√	√	SVK
Slovenia	Slovenia	√	√	√	SVN
Spain	Spanish part of Iberian mainland, Canary Islands, Balearic Islands, Ceuta and Melilla.	√	√	√	ESP
Sweden	Sweden	√	√	√	SWE
United Kingdom	England, Scotland, Wales and Northern Ireland, and Gibraltar, excluding the UK Crown Dependencies (Jersey, Guernsey and the Isle of Man) and the UK Overseas Territories (except Gibraltar).		√		GBE
United Kingdom	England, Scotland, Wales and Northern Ireland and the UK Overseas Territories and UK Crown Dependencies to whom the UK's ratification of the Kyoto Protocol has been extended and whose emissions are included for the second commitment period (the Cayman Islands, the Falkland Islands, Gibraltar, Jersey, Guernsey and the Isle of Man).	√			GBK
United Kingdom	England, Scotland, Wales and Northern Ireland and the UK Overseas Territories and UK Crown Dependencies for whom the UK's ratification of the UN Framework Convention on Climate Change is			√	GBR

Member State	Geographical coverage	EU and MS Party coverage (Kyoto Protocol, second commitment period)	EU-territory coverage (UNFCCC)	Party Coverage (UNFCCC)	Country code
	extended (the Cayman Islands, the Falkland Islands, Gibraltar, Bermuda, Jersey, Guernsey and the Isle of Man).				
European Union	EU-28		√	√	EUA
Iceland	Iceland	√		√	ISL
European Union and Iceland	EU-28, Iceland and the UK's Overseas Territories and Crown Dependencies that have ratified the Kyoto Protocol	√			EUC

3.3.3. *Quality Assurance/Quality Control (QA/QC) procedures*

Section 2.5 of the EU Third Biennial Report provides a summary of the QA/QC procedures that are applied to the EU GHG inventory. Section 3.4 of the EU NIR 2017 “*Sector-specific quality assurance and quality control*” provides further details.

3.3.4. *Accuracy/Uncertainty of the data*

This section of the Communication provides a summary of the uncertainty associated with the EU-28+ISL inventory. Full details of the uncertainty analysis are provided in the EU NIR; see Section 1.6 “*General uncertainty evaluation*”.

The EU uncertainty analysis was made on basis of the Tier 1 uncertainty estimates, which were submitted from the Member States, using a more sophisticated approach than required under the IPCC guidelines. Uncertainties were estimated at detailed level and aggregated to six main sectors ‘Energy’, ‘Fugitive emissions’, ‘Industrial processes and product use’, ‘Agriculture’, ‘LULUCF’ and ‘Waste’.

For the total GHG net emissions (including LULUCF), the uncertainty estimate in the level was 6.1 %, and the estimate uncertainty in the trend was 1.1 %.

3.4. **National registry**

This section of the National Communication summarises the national registry of the EU. Further details can be found in Chapter 14 of the EU NIR, and in the NIRs of the Member States.

Directive 2009/29/EC adopted in 2009, provides for the centralization of the EU ETS operations into a single European Union registry operated by the European Commission as well as for the inclusion of the aviation sector. At the same time, and with a view to

increasing efficiency in the operations of their respective national registries, the EU Member States who are also Parties to the Kyoto Protocol (26) plus Iceland, Liechtenstein and Norway decided to operate their registries in a consolidated manner in accordance with all relevant decisions applicable to the establishment of Party registries - in particular Decision 13/CMP.1 and Decision 24/CP.8.

The consolidated platform which implements the national registries in a consolidated manner (including the registry of the EU) is called the Union registry and was developed together with the new EU registry on the basis the following modalities:

- Each Party retains its organization designated as its registry administrator to maintain the national registry of that Party and remains responsible for all the obligations of Parties that are to be fulfilled through registries;
- Each Kyoto unit issued by the Parties in such a consolidated system is issued by one of the constituent Parties and continues to carry the Party of origin identifier in its unique serial number;
- Each Party retains its own set of national accounts as required by paragraph 21 of the Annex to Decision 15/CMP.1. Each account within a national registry keeps a unique account number comprising the identifier of the Party and a unique number within the Party where the account is maintained;
- Kyoto transactions continue to be forwarded to and checked by the UNFCCC Independent Transaction Log (ITL), which remains responsible for verifying the accuracy and validity of those transactions;
- The transaction log and registries continue to reconcile their data with each other in order to ensure data consistency and facilitate the automated checks of the ITL;
- The requirements of paragraphs 44 to 48 of the Annex to Decision 13/CMP.1 concerning making non-confidential information accessible to the public is fulfilled by each Party through a publicly available web page hosted by the Union registry;
- All registries reside on a consolidated IT platform sharing the same infrastructure technologies. The chosen architecture implements modalities to ensure that the consolidated national registries are uniquely identifiable, protected and distinguishable from each other, notably:
 - (a) With regards to the data exchange, each national registry connects to the ITL directly and establishes a secure communication link through a consolidated communication channel (VPN tunnel);
 - (b) The ITL remains responsible for authenticating the national registries and takes the full and final record of all transactions involving Kyoto units and other administrative processes such that those actions cannot be disputed or repudiated;
 - (c) With regards to the data storage, the consolidated platform continues to guarantee that data is kept confidential and protected against unauthorized manipulation;

- (d) The data storage architecture also ensures that the data pertaining to a national registry are distinguishable and uniquely identifiable from the data pertaining to other consolidated national registries;
- (e) In addition, each consolidated national registry keeps a distinct user access entry point (URL) and a distinct set of authorisation and configuration rules.

Following the successful implementation of the Union registry, the 28 national registries concerned were re-certified in June 2012 and switched over to their new national registry on 20 June 2012. Croatia was migrated and consolidated as of 1 March 2013. During the go-live process, all relevant transaction and holdings data were migrated to the Union registry platform and the individual connections to and from the ITL were re-established for each Party.

The following changes to the national registry have occurred since the last NC report.

Table 3-3 Changes to the EU national registry in 2015

Reporting item	Description
15/CMP.1 Annex II.E paragraph 32.(a) Change of name or contact	None
15/CMP.1 Annex II.E paragraph 32.(b) Change regarding cooperation arrangement	No change of cooperation arrangement occurred during the reported period.
15/CMP.1 Annex II.E paragraph 32.(c) Change to database structure or the capacity of national registry	In 2016 new tables were added to the database for the implementation of the CP2 functionality. Versions of the Union registry released after 6.1.6 (the production version at the time of the last NC submission) introduced other minor changes in the structure of the database. These changes were limited and only affected EU ETS functionality. No change was required to the database and application backup plan or to the disaster recovery plan. No change to the capacity of the national registry occurred during the reported period.
15/CMP.1 Annex II.E paragraph 32.(d) Change regarding conformance to technical standards	Each release of the registry is subject to both regression testing and tests related to new functionality. These tests also include thorough testing against the DES and were successfully carried out prior to each release of a new version in Production. Annex H testing is carried out every year. No other change in the registry's conformance to the technical standards occurred for the reported period.
15/CMP.1 Annex II.E paragraph 32.(e) Change to discrepancies procedures	No change of discrepancies procedures occurred during the reported period.
15/CMP.1 Annex II.E paragraph 32.(f) Change regarding security	The mandatory use of hardware tokens for authentication and signature was introduced for registry administrators.
15/CMP.1 Annex II.E paragraph 32.(g) Change to list of publicly available information	Publicly available information is provided via the Union registry homepage for each registry e.g. https://ets-registry.webgate.ec.europa.eu/euregistry/XX/public/reports/publicReports.xhtml
15/CMP.1 Annex II.E paragraph 32.(h)	No change of the registry internet address occurred during the

Reporting item	Description
Change of Internet address	reporting period.
15/CMP.1 Annex II.E paragraph 32.(i) Change regarding data integrity measures	No change of data integrity measures occurred during the reporting period.
15/CMP.1 Annex II.E paragraph 32.(j) Change regarding test results	Both regression testing and tests on the new functionality are carried out prior to release of the new versions in Production. The site acceptance tests are carried out by quality assurance consultants on behalf of and assisted by the European Commission. Annex H testing is carried out on an annual basis.

4. POLICIES AND MEASURES

Key developments

Cross-cutting policies and measures

The EU Emission Trading System (EU ETS) is based on the 'cap and trade' principle, and has been operational since 2005. The EU ETS has undergone several revisions to strengthen its implementation in the course of its three trading periods, or phases, (2005-2007, 2008-2012, and the current one 2013-2020).

In July 2015, the Commission presented a legislative proposal to reform the EU ETS for Phase 4 which aims at achieving a 43 % reduction of emissions of installations in energy production and industry by 2030 compared to 2005 levels. In November 2017, the European Parliament and the Council agreed on a common position, and the legislation would be adopted before end 2017.

The **Effort Sharing Decision** has been effective in helping stimulate new national policies and measures, it has resulted in Member States becoming more active in considering new measures, as well as improved coordination between national, regional and local governments. This positive progress informed a new legislative proposal "Effort Sharing Regulation", which was presented by the Commission in July 2016. The regulation sets out binding annual greenhouse gas emission targets for Member States for the period 2021–2030, maintaining binding annual greenhouse gas emission limits for each Member State after 2020. Emissions limit will be set for each year in the 10 year period up to 2030 according to a decreasing linear trajectory. The main changes proposed from the current Decision are as follows:

- Existing flexibilities under the Effort Sharing Decision are retained, and two new flexibilities are added. These are:
 - A one-off flexibility to transfer a limited amount of allowances from the EU ETS: covering some emissions in the non-ETS sectors with EU ETS allowances which would normally have been auctioned.
 - A new flexibility to transfer a limited amount of credits from the land use (LULUCF) sector: to stimulate additional action in the land use sector.

The European Parliament adopted its position with respect to the proposed regulation on 14 June 2017, and the European Council had adopted its position later in 2017, enabling the start of trilogue negotiations.

The EU has agreed that at least 20 % of its **budget** for 2014-2020 – as much as € 180 billion – should be spent on climate change-related action. To achieve this increase, mitigation and adaptation actions are integrated into all major EU spending programmes. By current estimates, this target has been exceeded in 2016 and spending will remain close to it over 2017-2020. Key areas of climate related expenditure include:

- Climate change mitigation and adaptation support from European Structural and Investment Funds (ESIF) totals more than EUR 114 billion, of which almost half – about EUR 56 billion – comes from the European Agricultural Fund for Rural

Development (EAFRD). The European Regional Development Fund (ERDF) and the Cohesion Fund contribute EUR 55 billion collectively.

- Horizon 2020, the EU research and innovation (R&I) framework programme, provides nearly € 80 billion of funding over 7 years (2014 to 2020), in addition to private and national domestic investment. The EU aims to spend 35 % of the overall Horizon 2020 budget on climate relevant R&I, including physical and socio-economic sciences, Earth observations, technology research and innovation and climate policy analysis.

Energy

The Commission adopted the Clean Energy for All Europeans Package³⁵ on 30 November 2016 to keep the European Union competitive as the clean energy transition is changing global energy markets. The Package comprised eight legislative proposals, including proposals to amend three directives, respectively, the directives on energy efficiency, the Directive on the energy performance of buildings and the Directive on renewable energy. On the same day, the Commission adopted measures in relation to eco-design and energy labelling.

The EU has renewable energy targets for 2020 (20 % share of energy) and 2030 (at least a 27 % share of energy). Progress has been made towards achieving the 2020 target with a 16 % share of renewable energy in 2014 and an estimated 16.4 % share in 2015. Moreover, the vast majority of EU countries are well on track to reach their 2020 binding targets for renewable energy, but efforts should be continued to meet the 2020 target and to lay the foundations for achieving the 2030 target.

The Commission has made progress towards ensuring that the 2030 target is met, through the proposition of an amended Renewable Energy Directive. The proposal includes reforms across the three renewable energy sectors of electricity, heating and cooling and transport, including: the introduction of coordinated regional approaches, targeted financial instruments, administrative simplification, renewable heat and cooling obligations for fuel suppliers, facilitation of uptake of district heating and cooling system, finally the promotion of low carbon and energy diverse transport fuels whilst addressing land use change challenges of these fuels. These reforms have been supported through the introduction of an EU heating and cooling strategy.

The EU is on track to meet its 20 % 2020 energy efficiency target, provided that Member States continue to successfully implement their energy efficiency policies. In 2014, primary energy consumption was already only 1.6 % above its 2020 primary energy consumption target and 2.2 % below the 2020 final energy consumption target.

As regards 2030, the Commission proposed a 30 % energy efficiency target for 2030 in the Clean Energy for All Europeans Package. In order to ensure the 2030 target is met, the legislative framework needs to be adapted. Therefore the European Commission put forward proposals for amending the Energy Efficiency Directive and the Energy Performance of Buildings Directive.

³⁵ <https://ec.europa.eu/energy/en/news/commission-proposes-new-rules-consumer-centred-clean-energy-transition>; http://eur-lex.europa.eu/resource.html?uri=cellar:fa6ea15b-b7b0-11e6-9e3c-01aa75ed71a1.0001.02/DOC_1&format=PDF

The proposal for an amended Energy Efficiency Directive include provisions to align energy efficiency targets with the EU 2030 climate and energy framework, to extend beyond 2020 the energy saving obligation requiring energy suppliers and distributors to save 1.5 % of energy each year from 2021 to 2030 with a view to attracting private investment and supporting the emergence of new market actors and to improve metering and billing of energy consumption for heating and cooling consumers.

The proposal for an amended Energy Performance of Buildings Directive includes provisions to help achieve a decarbonised building stock by 2050, clarify feasibility study and inspection requirements and promote electric vehicle uptake through infrastructure provision. It includes the provision of a smartness indicator for buildings, it enhances flexibility of funding mechanisms and it increases building data availability and quality.

Progress is being made with the energy efficiency of products through a new Ecodesign Working Plan for 2016-2019, setting out existing and new product measures that have the potential to deliver more than 600 TWh of annual primary energy savings in 2030.

Transport

EU-level transport policies that can support climate action are a key element of the 2020, 2030 and 2050 GHG targets set out in Section 4.3. The 2011 White Paper on Transport put forward a goal of reducing EU transport GHG emissions by at least 60 % by 2050 relative to 1990. This target was reiterated by the EU low-emission mobility strategy, adopted in 2016, which additionally set the ambition of drastically reducing without delay the emissions of air pollutants from transport. The analytical work underpinning the strategy showed that cost-effective CO₂ emissions reductions of 18-19 % are needed by 2030 for transport, relative to 2005.

To optimise the transport system and improving its efficiency, the Commission has adopted a European Strategy for Low-emission mobility and an agenda for a socially fair transition towards clean, competitive and connected mobility for all. The Commission also adopted a European strategy on Cooperative Intelligent Transport Systems, a milestone towards cooperative, connected and automated mobility.

The proposed revision of the regulatory framework for road charging includes adjustments that will broaden the scope to include coaches and light vehicles including cars, support the shift to applying the "user and polluter pays" principles for all vehicles, and modernise road charging methods. The proposed revision for EU rules on buses and coaches targets a level playing field for all operators and better travel options for consumers. The proposed revision on combined transport will promote cleaner freight transport.

The proposed revision to the Renewable Energy Directive will support the development of advanced alternative fuels for transport. The Commission's favoured approach to achieve this is the incorporation of an obligation for advanced renewable transport fuels (including advanced biofuels), alongside a reduction of food-based biofuels. The Commission has adopted an Alternative Fuels Infrastructure Action Plan to support the deployment of an EU backbone charging infrastructure,

In order to further curb emissions from road transport, the Commission has proposed new CO₂ emissions standards for cars and vans for the period post 2020. Provisional data published by the European Environment Agency showed that good progress continues to be made on fuel efficiency of new cars, with the average emissions level of a new car sold in 2016 at 118.1 grams of CO₂ per kilometre, significantly below the 2015 target of 130 g (the 2020 target is 95 g CO₂/km). The Commission has made proposals for certifying, monitoring and reporting data on fuel consumption from heavy duty vehicles.

The proposed revision of the Clean Vehicle Directive will better promote the use of public procurement to incentivise the creation of markets for innovative and low-emitting vehicles.

Industry

Regulation of fluorinated greenhouse gases (F-gases), including hydrofluorocarbons (HFCs), at an EU level is through the adoption of two legislative acts: the ‘MAC Directive’, and the ‘F-gas Regulation’. For the first time in 13 years of growing emissions of F-gases, the latter have declined in 2015 compared to the previous year, a clear signal that the policy measures are being effective. The quota system for companies trading in HFCs, put in place by the 2014 update of the F-gas Regulation, is producing scarcity of HFCs on the EU market and strongly incentivising end-users to move to more climate-friendly alternatives. These pieces of legislation have enabled the EU to show leadership in this area and have facilitated the negotiations towards agreeing on the Kigali amendment of the Montreal Protocol in 2016. The policy measures are projected to lead to cumulative emission savings of 1.5 Gt CO₂eq by 2030 and 5 Gt CO₂eq by 2050.

Agriculture

Implementation of the new Common Agricultural Policy (CAP) regulations started only in 2015 (with 2014 being a transitional year). For direct payments, implementation choices by Member States were finalised and notified to the European Commission during 2014, with the rules coming into force on 1 January 2015. An initial analysis of implementation choices taken by Member States suggests that in most cases the choices made are relevant to the GHG emission reduction/ climate needs and priorities identified. Contribution to climate action will be achieved through the combined effects of a number of different CAP measures, encompassing cross-compliance Good Agriculture and Environmental Condition (GAEC) standards, direct payments under the EAGF and rural development policy under the European Agricultural Fund for Rural Development (EAFRD) and accompanied by support from the Farm Advisory Service, and the activities of the European Innovation Partnership for Agriculture and the national Operational Groups.

In relation to direct payments, the ‘greening’ rules within CAP mean that 30 % of the payments going directly to farmers are linked to improving the environmental performance, for example to adopt practices beneficial for the climate. Some 30 % of rural development funds are also aimed at specific regional environmental priorities. In 2015, € 13.6bn of the

committed allocations under the CAP budget were climate relevant; this value rose to € 18.7bn³⁶ in 2016.

Forestry

The European Commission presented in July 2016 a legislative proposal to integrate greenhouse gas emissions and removals from land use, land use-change and forestry (LULUCF) into the 2030 climate and energy framework. This marked significant progress towards the goal agreed by EU leaders that all sectors, including the land use sector, should contribute to the EU's 2030 emission reduction target as well as to the Paris Agreement objectives.

The proposal contains several provisions laying down the rules to account emissions and removals in the LULUCF sector. The proposal maintains the "no debit rule" from the Kyoto Protocol, ensures that emissions from the use of biomass for energy are accounted towards Member States' 2030 climate commitments, streamlines accounting methodologies, and introduces flexibilities to support Member States in adhering to the "no debit" commitment.

Waste

Implementation of the EU's Circular Economy Action Package has been key in progressing efforts to reduce emissions from waste. It provides a clear, systematic and holistic approach that focusses on a number of priority issues, including plastics, food waste, critical raw materials and construction and demolition and clearly delineates actions, commitments and timetables.

A collection of legislative proposals published by the Commission under various directives, (Waste, Packaging Waste, Landfill, End of Life vehicles, Batteries and Accumulators and Waste Batteries and Accumulators, and Waste Electrical and Electronic Equipment) offer targets (recycling 65 % municipal waste and 75 % packaging waste by 2030, reduce landfill to 10 % of municipal waste by 2030), commitments (ban on landfilling separately collected waste), and clarification of methods as well as introducing incentives for producers to produce greener products and offering measures to facilitate industrial material reuse.

Key developments in the implementation of the Circular Economy Action Package include the development of legislative proposals on the online sale of goods, and fertilisers, the launch of the Innovation Deals for a circular economy, the development of an Ecodesign working plan as part of the Clean Energy for All Europeans package (as described in the Energy key developments section, previous), the establishment of the EU Platform on Food Losses and Food Waste, the publication of a Communication on waste-to-energy processes and their role in the circular economy, the development of a proposal to amend the Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment and the launch of a platform to support the financing of circular economy.

Furthermore, several policies have been developed across various waste streams. Policies to reduce consumption of plastic bags and to raise the recycling target for plastic packaging and

³⁶ SWD(2016) 299 final. Commission Working Document Accompanying the document Communication from the Commission to the European Parliament and the Council. Mid-term review/revision of the multiannual financial framework 2014-2020: An EU budget focused on results.

reduce landfilling. A new dedicated plastics strategy is being developed that covers recycling, marine litter and dangerous chemicals.

Regarding the implementation of the Urban Waste Water Directive, a report published in 2016 found high compliance rates in the EU-15 and that implementation of the Directive had significantly reduced organic and nutrient pollution load discharges in the EU. However, full compliance was not achieved as gaps were found particularly on treatment.

Other local action

In 2015, Commissioner Miguel Arias Cañete launched the integrated Covenant of Mayors for Climate and Energy, extending the initiative to 2030 and incorporating adaptation into existing climate change and energy requirements. Since 2015, Covenant signatories have voluntarily pledged action to support the implementation of the EU's 40 % greenhouse gas reduction target by 2030 and have adopted a joint approach to tackling climate change mitigation and adaptation. More than 800 cities have committed to the new targets.

4.1. Introduction

This chapter of the European Union's 7NC should be read in conjunction with Chapter 4 of the accompanying EU 3BR. Together, these chapters provide an overview of the EU policy response designed to contribute to meeting the EU emission reduction targets as outlined in Section 3.

In the European Union, there are two distinct levels of policies and measures (PaMs) that have an impact on greenhouse gas emissions:

- European Union policies, which are proposed by the Commission and subsequently approved, amended or rejected by the Council of the European Union and the European Parliament. These EU policies and measures are applicable to all Member States, though Member States may implement Directives at different points in time;
- National policies and measures developed and implemented by Member States themselves.

The reporting in the EU NC and BR concentrates on the EU policies and measures; national policies and measures are outside the scope of the reports.

In the following sections of the NC information is provided on the:

- Policy-making process in the EU (4.2);
- Key strategies and programmes with respect to climate change (4.3);
- An overview of EU-level policies and measures, including a reference list (with more detail in the 3BR), and information on PaMs no longer in place, on interactions between PaMs and on the effect of PaMs on long-term emissions trends;
- Other relevant information on EU-level climate change policies and measures, including:

- Monitoring and evaluation of EU-level policies and measures (4.5.1);
- Assessments of their economic and social consequences (4.5.2);
- Compliance mechanisms (4.5.3);
- Information on the use of Kyoto Mechanisms (4.5.3).

The BR provides a more detailed breakdown of EU-level policies and measures, including those which are cross-cutting across more than one sector, and those that are specific to an individual sector. The BR focuses in particular on changes and updates to these policies and measures since the submission of the EU's 2BR in December 2015.

As outlined above, major parts of the contents of the PaMs chapter of the National Communication as required by the UNFCCC reporting guidelines for National Communications overlap with contents required for the Biennial Reports. Thus, in several sub-chapters of this section only a reference to the respective section in the 3BR is given.

Complementing the qualitative descriptions of policies and measures in the respective sectoral chapters, quantitative information on GHG emission reductions associated with the PaMs are summarised in CTF Table 3 in the Appendix: CTF for EU third Biennial Report. These (mostly) ex-ante estimates have been produced by the European Commission as part of the impact assessments of the individual policies. The estimates are for the EU as a whole, and assume full implementation of the PaMs. However, quantitative estimates are not available for all PaMs and all years covered in CTF Table 3. Some older estimates are also for the EU-15 while more recent estimates are for the EU-27 or the EU-28. In contrast to the estimates presented in CTF Table 3, the estimates of expected GHG emission savings presented in Section 5 (projections) are derived from the aggregation of Member States' estimates at an EU level.

4.2. The EU policy-making process

The EU policy-making process is outlined in Section 4.2.1 of the EU's 6NC, which explains the four key stages of the policy-making process under the co-decision procedure³⁷;

1. Initiation by the European Commission and articulation of policy demands;
2. Possible amendment by the Council and European Parliament;
3. Formal agreement by the Council and the European Parliament; and,
4. Implementation of the policy.

A key element of this process is better regulation and the use of Impact Assessments of the proposed policies or change to the policies. Since the 6NC and under its new President, the European Commission has redoubled its efforts to improve the quality of EU policy-making, with the launch of a communication on better regulation³⁸. This includes the appointment of a First Vice-President, to coordinate better regulation in the European Commission, to ensure that no EU intervention is proposed where the outcome could be more effectively dealt with

³⁷ See pages 79 and 80 of the Sixth NC - http://unfccc.int/files/national_reports/annex_i_natcom/application/pdf/eu_6NC.pdf

³⁸ https://ec.europa.eu/info/law/law-making-process/better-regulation-why-and-how_en#documents

by EU countries (subsidiarity) and that EU action must not exceed what is necessary to achieve the objectives (proportionality)³⁹.

The aim of the better regulation agenda is to ensure that:

- Decision-making is open and transparent;
- Citizens and stakeholders can contribute throughout the policy and law-making process;
- EU actions are based on evidence and understanding of the impacts;
- Regulatory burdens on businesses, citizens or public administrations are kept to a minimum.

There a number of key stages of the policy-making process and these include extensive planning and analysis at the policy preparation stage, improving consultation with stakeholders on proposed policies or changes to policies, making sure policies are ‘fit for purpose’, ensuring quality of impact assessments, increasing cooperation between EU institutions and improving regulatory cooperation with international partners. Some examples of activities relating to the above stages of the policy-making process are outlined below.

- Improving consultation with stakeholders – in July 2016, the Commission launched a new online feedback tool for stakeholders to provide input to the policy-making process;
- Making sure EU laws are fit for purpose – as part of the Regulatory Fitness and Performance (REFIT) programme established in 2012, the REFIT Platform was set up by the May 2015 Better Regulation Communication, and launched in January 2016, to advise the Commission on how to make EU regulation more efficient and effective while reducing burden and without undermining policy objectives⁴⁰;
- Ensuring quality – the Regulatory Scrutiny Board was set up in 2015 to review draft impact assessments and PaM evaluation reports (and fitness checks of multiple policies and laws). It replaces the Impact Assessment Board but has wider responsibilities than its predecessor. It is chaired by a Commission director-general and consists of three high-level Commission officials and three experts from outside the Commission. More information can be found on the Commission’s better regulation website⁴¹;
- Increasing cooperation between EU institutions – in April 2016, an agreement on better law-making between the Commission, Parliament and the Council entered into force⁴²;
- International regulatory cooperation – this is key element of bilateral free trade agreements, such as the EU-Canada Comprehensive Economic and Trade Agreement

39 https://ec.europa.eu/commission/priorities/democratic-change/better-regulation_en

40 https://ec.europa.eu/info/law/law-making-process/overview-law-making-process/evaluating-and-improving-existing-laws/reducing-burdens-and-simplifying-law/refit-platform_en

41 https://ec.europa.eu/info/law/law-making-process/regulatory-scrutiny-board_en

42 The text of the agreement can be found here - http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2016.123.01.0001.01.ENG&toc=OJ:L:2016:123:TOC

(CETA)⁴³ which the European Parliament voted in favour on 15 February 2017 (EU Member State parliaments must now approve CETA before it can come into effect).

4.3. The overall climate change policy context in the EU

This section describes some of the key over-arching strategies and programmes that guide the EU policy-making process on climate change.

4.3.1. *European Climate Change Programme*

The Second European Climate Change Programme (ECCP II) was launched in October 2005 to provide the framework for EU implementation of the Kyoto Protocol. Further information was included in the EU 4th National Communication.

4.3.2. *2020 Climate and Energy Package*

The 2020 Climate and Energy Package was formally adopted in 2009 and for the first time provided an integrated and ambitious package of policies and measures to tackle climate change. It includes the 20-20-20 targets, which set the following key objectives:

- To reduce greenhouse gas emissions by at least 20 % compared to 1990 by 2020, with a firm commitment to increase this target to 30 % in the event of a satisfactory international agreement being reached;
- To achieve 20 % of energy from renewable sources by 2020 (as a share of total EU gross final energy consumption), supplemented by a target to achieve a minimum of 10 % renewable transport fuel;
- To save 20 % of total primary energy consumption by 2020 compared to a business as usual baseline.

These are also headline targets of the Europe 2020 strategy for smart, sustainable and inclusive growth⁴⁴. In order to meet these key objectives, the Climate and Energy Package comprises four pieces of complementary legislation:

- A Directive revising the EU Emissions Trading System (see Section 4.2.2 of the 1BR);
- An Effort-Sharing Decision setting binding national targets for emissions from sectors not covered by the EU ETS (see Section 4.2.3 of the 1BR);
- A Directive setting binding national targets for increasing the share of renewable energy sources in the energy mix (see Section 4.3.2 of the 1BR);
- A Directive creating a legal framework for the safe and environmentally sound use of carbon capture and storage technologies (see Section 4.2.4 of the 1BR).

The package was complemented by two further legislative acts that were agreed at the same time: A regulation requiring a reduction in CO₂ emissions from new cars (see Section 4.4.3 of the 1BR for more details) and a revision of the Fuel Quality Directive (see Section 4.4.6 of

43 More information on CETA can be found here - <http://ec.europa.eu/trade/policy/in-focus/ceta/>

44 <http://eur-lex.europa.eu/legal-content/en/ALL/?uri=CELEX%3A52010DC2020>

the 1BR for more details). The Energy Efficiency Directive was adopted in 2012 to help achieve the energy efficiency target.

For information on progress towards the 20-20-20 targets, see [BR] Section 5.4.

4.3.3. *2030 Climate and Energy Framework*⁴⁵

This framework⁴⁶ was agreed by EU leaders in October 2014 and builds on the 2020 climate and energy package mentioned above. It sets three key targets for the year 2030:

- At least 40 % reduction in greenhouse gas emissions (from 1990 levels). To achieve this, EU ETS sectors would have to cut emissions by 43 % (compared to 2005), and the ETS will be reformed and strengthened to achieve this. Non-ETS sectors would need to cut emissions by 30 % (compared to 2005), and this will need to be translated into individual binding targets for Member States;
- At least 27 % share of EU energy consumption for renewable energy;
- At least 27 % improvement in energy efficiency.

The European Council asked the Commission to review the energy efficiency target by 2020 having in mind an EU level of 30 %. With the Clean Energy for All Europeans package from November 2016, the Commission has already proposed to set a binding EU-wide target of 30 % for energy efficiency by 2030.

The framework is in line with the longer-term perspective set out in the Roadmap for moving to a competitive low carbon economy in 2050, the Energy Roadmap 2050 and the Transport White Paper.

The framework will be underpinned by a new and transparent governance process that will the targets outlined above to be met in an effective and coherent manner. This governance process will be based on national plans for competitive, secure, and sustainable energy but will follow a common EU approach.

The European Commission has proposed a number of actions to help deliver the framework and the 2030 targets, including a reformed EU ETS (with a proposal for legislation being presented in parallel to the Communication on the 2030 framework – see 4.2.1 in the 3BR on the EU ETS for more details), a new Effort Sharing Regulation (see [3BR] 4.2.2), a proposal to integrate greenhouse gas emissions and removals from land use, land use-change and forestry (LULUCF) into the 2030 climate and energy framework (see [3BR] Section 4.3.5) a proposal for amending the Energy Efficiency Directive and the Energy Performance of Buildings Directive (see [3BR] Section 4.3.1) and a new set of indicators for the competitiveness and security of the energy system, such as price differences with major trading partners, diversification of supply, and interconnection capacity between EU countries.

An impact assessment for the framework was published in January 2014 and considers the costs and benefits of the proposed framework for 2030. It found that average annual

⁴⁵ <https://ec.europa.eu/energy/en/topics/energy-strategy-and-energy-union/2030-energy-strategy>

⁴⁶ <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52014DC0015&from=EN>

additional investments are projected to be in the order of € 38 billion for the EU as a whole over the period 2011-2030, with more than half of the investments needed in the residential and tertiary sectors. However it should also be noted that fuel savings will to a large extent compensate for these investments. Crucially, costs do not differ substantially from the costs of renewing an ageing energy system, which would be necessary in any case.

The European Commission adopted "A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy" in February 2015. This strategy is made up of five closely related and mutually reinforcing dimensions – ‘security, solidarity and trust’, ‘a fully-integrated internal energy market’, ‘energy efficiency’, ‘climate action – decarbonising the economy’ and ‘research, innovation and competitiveness’. Every year a State of the Energy Union review is conducted to assess progress and consider areas for further strengthening. The second State of the Energy Union report was published in February 2017, noting that 2016 had been a year of delivery, translating the overall vision into “concrete legislative and non-legislative initiatives”. It also looked forward to the low emission mobility strategy due to be published in late 2017.

4.3.4. *The 2020 Energy Strategy*⁴⁷

The communication ‘Energy 2020 – A strategy for competitive, sustainable and secure energy’ was published in November 2010. More information on the strategy can be found in Section 4.2.3.4 of the EU’s 6NC. In March 2017, data was published which showed that the share of energy from renewable sources in gross final consumption of energy in the EU reached 16.7 %, nearly double the figure for 2004 (8.5 %), the first year for which the data are available⁴⁸. Alongside this, information on the performance of each Member State was published, which showed that 11 Member States had already reached their individual renewable energy 2020 targets by 2015⁴⁹.

4.3.5. *European Bioeconomy Strategy*

The Bioeconomy Strategy (launched in February 2012) addresses the production of renewable biological resources and their conversion into vital products and bio-energy. It is structured around three pillars:

- Investments in research, innovation and skills;
- Reinforced policy interaction and stakeholder engagement;
- Enhancement of markets and competitiveness.

There is a currently planned review and update of the Strategy which will consider the need for new political impetus and orientation.

47 <https://ec.europa.eu/energy/en/topics/energy-strategy-and-energy-union/2020-energy-strategy>

48 <http://ec.europa.eu/eurostat/documents/2995521/7905983/8-14032017-BP-EN.pdf/af8b4671-fb2a-477b-b7cf-d9a28cb8beea>

49 Bulgaria, the Czech Republic, Denmark, Estonia, Croatia, Italy, Lithuania, Hungary, Romania, Finland and Sweden.

4.3.6. *Roadmaps 2050*

In 2011, the European Commission launched three roadmaps to promote the discussion on the long-term framework of climate and energy policies in Europe: a) the “Roadmap for Moving to a Competitive Low Carbon Economy in 2050” b) the “Roadmap to a Single European Transport Area - Towards a Competitive and Resource Efficient Transport System” and c) the “Energy Roadmap 2050”. Further information was included in the EU’s 6NC.

4.3.7. *7th Environmental Action Programme*

The 7th Environmental Action Programme (EAP) - proposed by the European Commission in 2012 - provides an overarching framework for environmental policy up to 2020. It does not include specific objectives for climate policy as this is now a separate policy area. More details can be found in Section 4.2.3.8 of the 6NC.

4.4. **Information on EU-level policies and measures**

4.4.1. *Reference list of cross-sectoral and sectoral policies and measures*

This section lists for ease of reference the various cross-sectoral and sectoral policies and measures at the EU-level. More information on the key updates to each of these can be found in the EU’s 3BR.

4.4.1.1. Cross Cutting Policies and Measures

- The EU Emissions Trading System (2003/87/EC amended by 2009/29/EC);
- The Effort Sharing Decision (Decision No 406/2009/EC);
- Carbon Capture and Storage Directive (2009/31/EC);
- Monitoring Mechanism Regulation (Regulation No 525/2013);
- Energy Taxation Directive (2003/96/EC);
- Horizon 2020;
- European Structural and Investment Funds (ESIF)⁵⁰;
- National Emissions Ceilings Directive (2016/2284/EU) ;
- Covenant of Mayors for climate and energy;
- Proposal for a revision to Directive 2003/87/EC to enhance cost-effective emission reductions and low-carbon investments (COM (2015) 337 final);
- Proposed Regulation on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 for a resilient Energy Union (COM(2016) 482 final).

⁵⁰ The five ESI Funds are the European Regional Development Fund, the Cohesion Fund, the European Social Fund, the European Agricultural Fund for Rural Development and the European Maritime and Fisheries Fund.

4.4.1.2. Sectoral policies and measures: Energy

- Directive 2009/28/EC on the promotion of the use of energy from renewable sources;
- Directive 2010/31/EU on the Energy Performance of Buildings;
- Directive 2012/27/EU on Energy Efficiency;
- Directive 2009/125/EC establishing a framework for the setting of eco-design requirements for energy-related products;
- Directive 2010/30/EU on the indication by labelling and standard product information of the consumption of energy and other resources by energy-related products;
- Proposal for a Regulation setting a framework for energy efficiency labelling and repealing Directive 2010/30/EU;
- Green Public Procurement;
- Energy Star Programme;
- EU Project Development Assistance (PDA) Facilities;
- European Energy Efficiency Fund (EEEEF);
- Motor Challenge Programme;
- Strategic Energy Technology Plan (COM(2007) 723);
- Energy Union Strategy (COM(2015) 80 final);
- Biomass Action Plan;
- Communication on Accelerating Clean Energy Innovation (COM(2016) 763 final);
- Communication on Ecodesign Working Plan (COM(2016) 773 final);
- Proposals for revised Energy Efficiency Directive (COM/2016/0761 final);
- Proposal for revised Energy Performance of Buildings Directive (COM/2016/0765 final);
- Proposal for revised Renewable Energy Directive (COM(2016) 767 final/2);
- Commission Implementing Decision on energy labelling, in support of and as regards: Commission Delegated Regulation (EU) 2015/1186, Commission Regulation (EU) 2015/1188, Commission Regulation (EU) 2015/1185;
- Commission Regulation (EU) 2016/2281 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for air heating products, cooling products and high temperature process chillers
- Commission Regulation (EU) 2015/1189 of 28 April 2015 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for solid fuel boilers
- Commission Regulation (EU) 2015/1188 of 28 April 2015 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for local space heaters

- Commission Regulation (EU) 2015/1095 of 5 May 2015 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for professional refrigerated storage cabinets, blast cabinets, condensing units and process chillers
- EU heating and cooling strategy (COM(2016) 51 final).
- Voluntary Industry Agreement to improve the energy consumption of games consoles within the EU (version 1.0)
- Proposal for a Directive of the European Parliament and of the Council on common rules for the internal market in electricity (recast)
- Proposal for a Regulation of the European Parliament and of the Council on the electricity market (recast)
- Proposal for a Regulation of the European Parliament and of the Council establishing a European Union Agency for the Cooperation of Energy Regulators (recast)
- Proposal for a Regulation of the European Parliament and of the Council on risk preparedness in the electricity sector

4.4.1.3. Sectoral policies and measures: Transport

- CO₂ and Cars Regulation (EC 443/2009)
- CO₂ and Vans Regulation (EC 510/2011)
- Strategy for reducing Heavy-Duty Vehicles' fuel consumption and CO₂ emissions
- Car and tyre labelling Directives (1999/94/EC and EC 1222/2009 respectively)
- Regulation of Safe motor vehicles and trailers (EC 661/2009)
- Renewable Energy Directive (2009/28/EC)
- Fuel Quality Directive (2009/30/EC)
- Infrastructure charging for heavy goods vehicles (1999/62//EC, amended by 2006/38/EC and 2011/76/EU)
- Directive 2014/94/EU on Deployment of Alternative Fuels Infrastructure
- Clean Vehicles Directive (2009/33/EC)
- Integrating maritime transport emissions in the EU's greenhouse gas reduction policies (COM(2013) 479 final and Regulation (EU) 2015/757)
- White Paper: Roadmap to a Single European Transport Area COM(2011) 144 final
- A European Strategy for Low-Emission Mobility (COM(2016) 501 final)
- European strategy on Cooperative Intelligent Transport Systems (COM(2016)766 final)
- Europe on the move: An agenda for a socially fair transition towards clean, competitive and connected mobility for all (COM(2017)283 final)
- Action Plan on Alternative Fuels Infrastructure

- Fuel Cells and Hydrogen Joint Undertaking (JU)
- Proposal for revised Eurovignette Directive (COM(2017)275 final)
- Proposal for revised European Electronic Tolling Services Directive (COM(2017)280 final)
- Proposal for monitoring and reporting systems for heavy duty vehicles (COM(2017)279 final)
- Proposal for revision of the Clean Vehicles Directive
- Proposal for revised Combined Transport Directive
- Proposal for revised market access rules for coach and bus services
- Proposal for revision of cars and vans CO₂ performance standards

4.4.1.4. Sectoral policies and measures: Industry / industrial processes

- Mobile Air Conditioning Systems (MAC) Directive (Directive 2006/40/EC);
- Fluorinated greenhouse gases regulation (Regulation (EU) No 517/2014);
- Industrial Emissions Directive 2010/75/EU (IED).

4.4.1.5. Sectoral policies and measures: Agriculture

- Agricultural Market and Income support (1st pillar of Common Agricultural Policy / CAP);
- Rural Development Policy (2nd pillar of CAP);
- Soil Thematic Strategy (COM(2006) 231);
- Nitrates Directive (91/676/EEC).

4.4.1.6. Sectoral policies and measures: Forestry / LULUCF

- LULUCF accounting (Decision 529/2013/EU);
- Proposal to integrated greenhouse gas emissions and removals from land use, land use-change and forestry (LULUCF) into the 2030 climate and energy framework (COM/2016/0479).

4.4.1.7. Sectoral policies and measures: Waste

- Directive on Waste (2008/98/EC);
- Landfill Directive (1999/31/EC);
- Management of biodegradable waste (COM/2008/0811 final);
- Urban Waste Water Directive (91/271/EEC);
- Directives on end-of-life vehicles (2000/53/EC);
- EU action plan for the Circular Economy (COM(2015) 614 final);

- Motor Vehicles Directive (2005/64/EC);
- Directive on batteries and accumulators and waste batteries and accumulators (2006/66/EC);
- Directive on waste electrical and electronic equipment (2012/19/EU);
- Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment (Directive 2011/65/EU);
- Packaging and Packaging Waste Directive ((EU) 2015/720 regarding 94/62/EC);
- A legislative proposal on online sales of goods (December 2015);
- A legislative proposal on fertilisers (March 2016);
- Launch of the Innovation Deals for a circular economy (May 2016);
- Ecodesign Working Plan 2016-2019 (COM(2016) 773 final);
- Establishment of the EU Platform on Food Losses and Food Waste (August 2016);
- A Communication on waste-to-energy processes and their role in the circular economy (January 2017).

4.4.2. *Policies and measures no longer in place*

There are no policies and measures that are no longer in place, although various regulatory proposals have been made to amend Directives.

4.4.3. *Interaction of policies and measures*

Broadly speaking there are interactions between the three core elements of the 2020 and 2030 climate and energy frameworks – GHG emissions, renewable energy and energy efficiency⁵¹. One of the most noticeable interactions is between the EU Emissions Trading System (EU ETS) and other climate-related policies and measures. Energy efficiency measures which lead to reductions in electricity demand, will not result in GHG reductions in the power sector, as the capped nature of the EU ETS (which covers power generation), will mean that GHG emissions will rise by a similar amount elsewhere within the EU ETS. This is not to say that GHG reduction and energy efficiency measures in the ‘traded sector’ are not important – they can help meet the GHG reductions set by the cap in the EU ETS more efficiently.

Interactions are also important between policies and measures that target the same outcome, and in many cases it may be easier to group such PaMs together for the purpose of measuring GHG impacts, rather than trying to assign GHG reductions to the different measures by taking account of interactions. One clear example is with transport, where a number of measures, such as the new car CO₂ regulations, vehicle labelling and CO₂-based vehicle taxation, will all be seeking the same outcome (greater sales of fuel efficient vehicles) and the interactions between the different policies may make assessment of individual contributions to GHG reductions difficult to make.

51 <http://climatepolicyinfohub.eu/interactions-between-climate-policies-examples-europe>

It should be noted that there are different types of interaction between PaMs and it is important to understand the nature of any interaction that is being assessed. As described in the WRI Policy and Action Standard⁵², interactions could be:

- Overlapping (where the combined effect of implementing the policies together is less than the sum of the individual effects of implementing them separately);
- Reinforcing (where the combined effect of implementing the policies together is greater than the sum of the individual effects of implementing them separately);
- Overlapping and reinforcing (where multiple policies interact, with some overlapping and some reinforcing, with the net effect being with an overlapping or reinforcing effect).

A hierarchical approach to PaMs interactions can be taken to minimise risk of double-counting. For example, savings might only be counted if they are additional to the policies placed higher in the policy hierarchy.

4.4.4. *Effect of policies and measures on the modification of long-term trends*

Information on the effects of policies and measures on long-term GHG emissions trends can be found in Section 4.13 of the EU's 6NC.

4.5. **Other information**

This section contains other information relevant to the implementation of climate change policies and measures at the EU level.

4.5.1. *Monitoring and evaluation*

The monitoring and evaluation of progress towards the GHG targets outlined in [3BR] Section 3 is driven by the Monitoring Mechanism Regulation (MMR)⁵³, adopted in 2013. More information on the (MMR) can be found in Section 4.9.1 of the EU's First BR. Under the MMR, Member States are required to report on, inter alia:

- A greenhouse gas inventory from all sectors: energy, industrial processes, agriculture, land use, land use change & forestry (LULUCF) and waste
- GHG projections, and information on policies & measures to reduce greenhouse emissions;
- Information on national adaptation actions
- Information on low-carbon development strategies
- Information on financial & technology support to developing countries
- Information on national governments' use of revenues from the auctioning of allowances in the EU emissions trading system.

52 https://www.wri.org/sites/default/files/Policy_and_Action_Standard.pdf

53 <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32013R0525>

Under the MMR, the Commission is also required to produce an annual report on progress to Kyoto and EU targets for the EU, covering actual (historical) emissions and projected future emissions. It also includes information on EU policies and measures, climate finance and adaptation. The most recent report was published in November 2017⁵⁴, which assessed progress towards the EU's 2030 GHG reduction target as well as considering future GHG projections.

The monitoring and reporting of GHG emissions under the EU ETS prescribed in two Commission Regulations, which were introduced for Phase III of the system starting on 1st January 2013. The scope, purpose and legal status of these Regulations is described in Section 2.2.2 of the EU's 2BR, which explains that one relates to the monitoring and reporting of GHG emissions (EU No 601/2012), while the other concerns verification and accreditation activities (EU No 600/2012).

4.5.2. *Assessment of the economic and social consequences of response measures*

An assessment of the economic and social consequences of response measures is important to ensure the maximum wider benefits to the EU of its climate and energy policy framework⁵⁵. This is done through the impact assessment process, described in more detail in Section 4.10 of the EU's 1BR and 2BR and the EU's National Inventory Report, as well as in Section 4.2 above. Also see chapter 4.4 of the [3BR].

4.5.3. *Legislative Arrangements and Enforcement/ Administrative Procedures Relevant to Kyoto Protocol Implementation*

Section 4.2.5 of the EU's 6NC gives more details of the compliance procedures for Member States, both under the Kyoto Protocol and directly to the EU with respect to the Effort Sharing Decision.

4.5.4. *Additional information required under the Kyoto Protocol*

Article 7, Paragraph 2 of the Kyoto Protocol, and UNFCCC Decision 15/CMP.1 and 3/CMP.11, set out additional reporting requirements that Parties to the Kyoto Protocol must meet. This information is summarised here for ease of reference, and includes:

- Member State use of Kyoto mechanisms;
- Complementarity relating to the mechanisms pursuant to Articles 6, 12 and 17;
- Policies and Measures Promoting Sustainable Development (Art. 2 (1) Kyoto Protocol) (Section 4.5.4.1);
- Policies and Measures Related to Bunker Fuels (Art. 2 (2) Kyoto Protocol) (Section 4.5.4.4);
- Minimisation of adverse impacts (Art. 2 (3) Kyoto Protocol) (Section 4.5.4.5).

⁵⁴ https://ec.europa.eu/clima/policies/strategies/progress/monitoring_en

⁵⁵ Response measures is understood to mean climate change mitigation activities and therefore the phrase is seen as analogous to 'policies and measures'.
http://unfccc.int/cooperation_support/response_measures/items/4294.php

4.5.4.1. Member State use of Kyoto mechanisms

Under the second commitment period of the Kyoto Protocol, the EU, its Member States and Iceland jointly committed to a quantified emission reduction to 80% of the base year levels over the period 2013-2020.

The final use of mechanisms for CP2 shall be available upon completion of CP2.

The use of units from market-based mechanisms and land use, land-use change and forestry activities (LULUCF) from 2008 to 2012 counted towards achievement of the Kyoto Protocol targets for the first commitment period (CP1).

The Final Compilation and Accounting Report for the European Union⁵⁶, published on 2 August 2016, provided a breakdown of the total number of each Kyoto unit used for CP1 compliance for the EU15, as shown in Table 4-1.

Table 4-1 EU use of Kyoto units for first commitment period

Units	Quantity
AAUs	17 368 888 639
ERUs	445 838 157
RMUs	302 009 951
CERs	725 166 210
tCERs	1 615 811
ICERs	0
Total quantity	18 843 518 768

Abbreviations: AAU = assigned amount unit, CER = certified emission reduction, ERU = emission reduction unit, ICER = long-term certified emission reduction, RMU = removal unit, tCER = temporary certified emission reduction

The use of Kyoto units for CP1 for each of the EU15 that comprised the EU at the time of ratification of the Protocol is reported within the EU's True-up report⁵⁷, shown below in Table 4-2.

⁵⁶ Final compilation and accounting report for the European Union for the first commitment period of the Kyoto Protocol. CC/ERT/2016/CAR/EU.

⁵⁷ Technical information to the Report on the additional period for fulfilling commitments under the Kyoto Protocol. SWD(2015) 288 final

Table 4-2 Use of Kyoto Units for CPI

	AAUs	ERUs	RMUs	CERs	tCERs	ICERs	Total
Austria	362 501 669	11 975 750	6 786 726	33 393 909			414 658 054
Belgium	590 701 837	9 451 546		26 162 846			626 316 229
Denmark	257 813 160	14 510 576	8 654 523	17 005 884			297 984 143
Finland	304 541 813	4 088 755	17 449 492	12 273 471			338 353 531
France	2 425 839 655	24 706 979	23 648 026	64 661 871			2 538 856 531
Germany	4 245 979 938	194 764 982	39 728 163	226 101 588			4 706 574 671
Greece	568 566 201	11 322 449	2 052 032	16 563 409			598 504 091
Ireland	280 189 478	4 294 121	16 291 152	6 512 114	1 221 981		308 508 846
Italy	2 258 521 514	46 715 521	75 276 599	98 993 939	131 267		2 479 638 840
Luxembourg	53 190 972	395 536	373 279	5 893 782	262 563		60 116 132
Netherlands	928 949 317	29 763 371		38 406 579			997 119 267
Portugal	302 650 818	4 567 634	44 760 045	10 119 578			362 098 075
Spain	1 568 312 827	65 062 121	52 780 585	105 824 516			1 791 980 049
Sweden	295 466 371	2 113 323		7 994 055			305 573 749
United Kingdom	2 925 663 069	22 105 493	14 209 329	55 258 669			3 017 236 560

4.5.4.2. Supplementarity relating to the mechanisms pursuant to Articles 6, 12 and 17

As explained in Section 4.3.3 of the EU's 6NC, supplementarity obligations under the Kyoto Protocol require that any international credit purchases by Member States must be in addition to emission abatement action taken domestically.

As was explained in the 6NC, use of flexible mechanisms within the EU takes place by operators in the EU ETS and by governments in their achievement of Kyoto targets. Within the EU ETS Member States were required to inform the European Commission in their Phase II NAPs on the maximum amount of JI and/or CDM credits that can be used. This limit was then assessed according to the principle of supplementarity, and where appropriate approved or revised by the European Commission. The percentages vary from 4 % of free allocation in Estonia to 22 % in Germany. In total, this adds up to 1.4 billion CERs or ERUs that could have been used in the second trading period.

As explained in the EU's 6NC, under current reporting of SEF tables, it is impossible to distinguish between governmental use of flexible mechanisms and changes to the number of units induced by operators in the EU ETS. For the first commitment period the use of flexible mechanisms by the EU-15 towards CP1 is described in Section 4.5.4.1 above. A total of 1 474 630 129 flexible units were used out of a total of 18 843 518 768 units, which equates to 7.8 %. The total CP emission reduction against the EU-15 baseline was 8.0 %. Thus the EU-15 use of flexible mechanisms was similar to the level of emission reductions against the Kyoto baseline.

There is no clear picture on the likely use of flexible mechanisms for CP2. The European Environment Agency Trends and projections in Europe 2017 notes that the latest projections from Member States indicate that the EU seems on track to reach its target for the second commitment period of the Kyoto Protocol. Unlike previous EEA reports cited in earlier BRs, there is no detailed analysis of the potential use of flexible mechanisms by the EU or Member States.

4.5.4.3. Policies and measures promoting sustainable development

As explained in the EU's 6NC, sustainable development is an overarching objective of the European Union set out in the Treaty, governing all the Union's policies and activities. It has been effectively mainstreamed in all that the EU does, through the EU Sustainable Development Strategy (SDS), but also through other key strategies and programmes such as the EU 2020 Strategy and the 7th Environment Action Programme⁵⁸. Information on the EU's Sustainable Development Strategy (SDS) was included in the EU's 5NC and information on the 2009 review of the SDS was included in Section 4.3.4.1 of the EU's 6NC.

The UN's 2030 Agenda for Sustainable Development⁵⁹, and the 17 Sustainable Development Goals (SDGs) within it, were agreed by world leaders in September 2015. In November

58 http://ec.europa.eu/environment/sustainable-development/index_en.htm

59 <https://sustainabledevelopment.un.org/post2015/transformingourworld>

2016, the EU presented its response to the 2030 Agenda and the SDGs by publishing a sustainable development package⁶⁰ that included the following:

- An overarching Communication on next steps for a sustainable European future accompanied by a Staff Working Document that describes in broad terms the contribution of the various EU policies and legislation to the SDGs;
- A proposal for a revision of the European Consensus on Development that will serve as the basis for further discussions with the Council and the European Parliament;
- A post-Cotonou framework⁶¹ on the future relations with the African, Caribbean and Pacific Group of States.

The work outlined in the Communication has two broad elements. Firstly, it commits the Commission to mainstreaming the SDGs into EU policies and initiatives. It will provide regular reporting of the EU's progress as of 2017 (including in the context of the UN High Level Political Forum), and promote sustainable development globally in cooperation with external partners. The second element involves developing further the EU's longer term vision and the focus of sectoral policies after 2020, and reorient the EU budget's contributions towards the achievement of the EU's long-term objectives through the new Multiannual Financial Framework beyond 2020.

4.5.4.4. Policies and measures related to bunker fuels

Policies and measures relating to bunker fuels are described in the EU's 3BR, in [3BR] Section 4.3.2 for international marine transport and 4.2.1 for the EU Emissions Trading System.

4.5.4.5. Minimisation of adverse impacts

For information on how the EU strives to implement policies and measures under Article 2 of the Kyoto Protocol in such a way as to minimize adverse effects, see Section 4.3.4.3 of the EU's 6NC, chapter 15 of the EU NIR 2017, and section 4.4. of 3BR.

60 http://europa.eu/rapid/press-release_IP-16-3883_en.htm

61 The framework for EU relations with the Africa, Caribbean and Pacific Group of States (ACP) post 2020, when the Cotonou Framework expires.

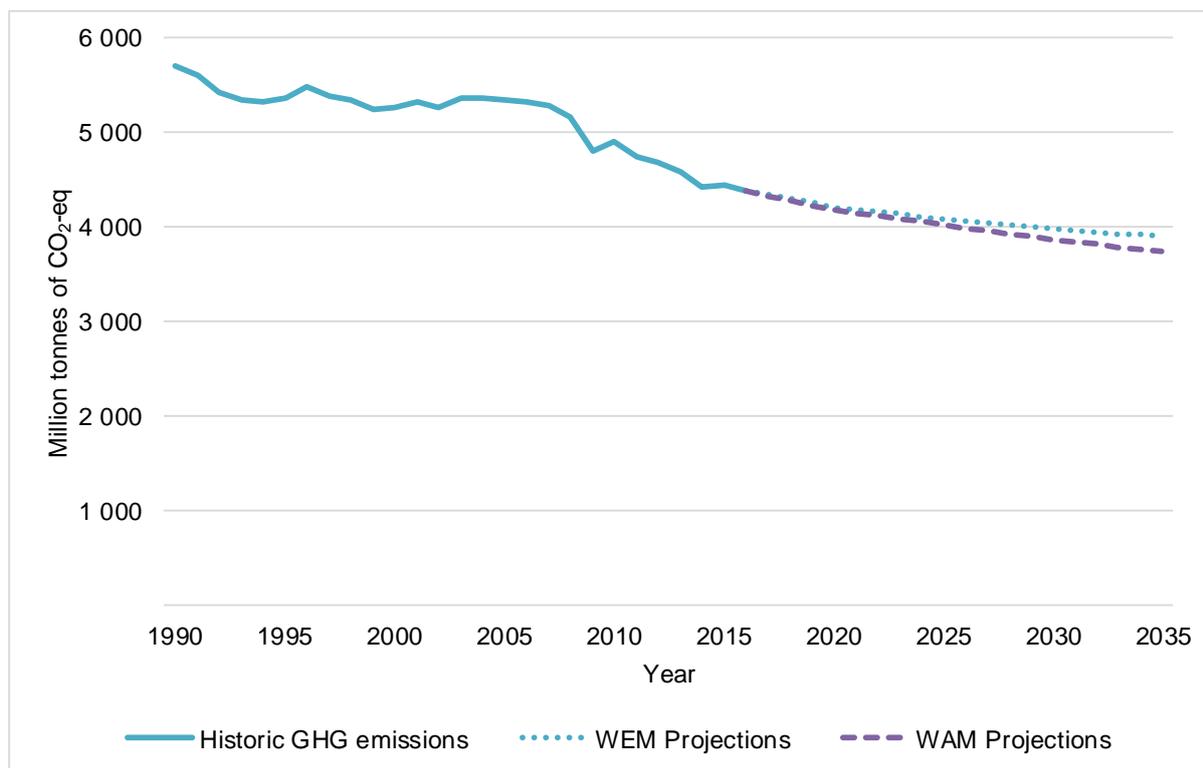
5. PROJECTIONS AND THE TOTAL EFFECTS OF POLICIES AND MEASURES

Key developments

- The GHG projections prepared by EU Member States and aggregated at EU-level (which take into account the implementation of the 2020 Climate and Energy Package) show that the EU-28 is on track to achieve its 2020 target. Under the "With Existing Measures" (WEM) scenario, total GHG emissions (including international aviation, excluding LULUCF) are projected to be 26.2 % lower in 2020 than in 1990 and 30.2 % lower in 2030 compared to 1990.
- Under the "With Additional Measures" (WAM) scenario, as reported by Member States, the projected GHG emissions compared to 1990 would decrease by 26.8 % in 2020, and 32.2 % in 2030.
- The most significant sectoral contribution in absolute GHG emission reductions in the EU-28 WEM scenario from 1990 to 2020 is projected to stem from the energy sector (without transport) where emissions are projected to decrease by 36.5 % compared to 1990 in 2020 and by 41.8 % up to 2030 under the WEM, and 37.1 % in 2020 and 44.0 % in 2030 under the WAM scenario. The energy sector is followed by agriculture, industry and the waste sector.
- The transport sector is the only sector where emissions would still be higher by 2030 relative to 1990, due to high emissions growth during the '90s. Under the WEM scenario GHG emissions from the transport sector are projected to be 13.8 % higher than 1990 levels in 2020 and 13.4 % higher in 2030, under the WAM scenario 12.7 % higher in 2020 and 9.9 % higher in 2030.
- Reductions in CO₂ emissions are expected to contribute most to overall emission reductions in the EU-28. Throughout the two scenarios and the timeline from 2020-2025, CO₂ contributes between 85-90 % to total emissions, followed by N₂O with roughly 4-8 % and CH₄ with roughly 4-6 %.
- Total estimated GHG reductions amount to 562 Mt CO₂-eq in 2020 under the WEM and 596 Mt CO₂-eq under the WAM scenario.

Figure 5-1 presents total aggregate GHG emission trends for EU-28. The figure includes historical values (solid lines) and projected values (dotted lines) for the WEM and WAM scenario. In the WEM scenario, total EU-28 GHG in 2020 are projected to be 26.2 % below 1990 GHG emissions (including international aviation, excluding LULUCF). Up to 2030 GHG emissions are projected to decrease further. Considering also planned measures (WAM scenario), the projected GHG emission reductions decline further to 26.8 % below 1990 levels in 2020 and 32.2 % below 1990 levels in 2030.

Figure 5-1 Total, aggregate, absolute historic and projected EU-28 GHG emissions



For information about the aggregate emissions of specific sectors including trends, see [3BR] section 5.1.2.

5.1. Introduction

Please refer to [3BR] Section 4.1.1 for information on the context and scenarios presented in the seventh National Communication.

5.2. Projections

See [3BR] section 5.1.1 for information on the total, aggregate, absolute historic and projected total greenhouse gas (GHG) emissions for the EU-28. [3BR] Section 5.3 provides all information reported in Sections 5.2 through 5.3 in tabular format.

The common factors which drive historic trends and projections are discussed in more detail in Section 2 and in the national inventory and projection reports of individual Member States. Policies and measures which influence GHG emissions in each sector are discussed in more detail in 4.4.1.

Projections by sector. For detailed sectoral developments see [3BR] Section 5.1.2.

Projections by gas. For information on how projected GHG emissions will change disaggregated by gas see [3BR] Section 5.1.3.

Projections of indirect GHGs. It is not possible to present indirect GHG emission projections as the EU Monitoring Mechanism does not require the reporting of projections of indirect GHG emissions.

5.3. Assessment of aggregate effects of policies and measures

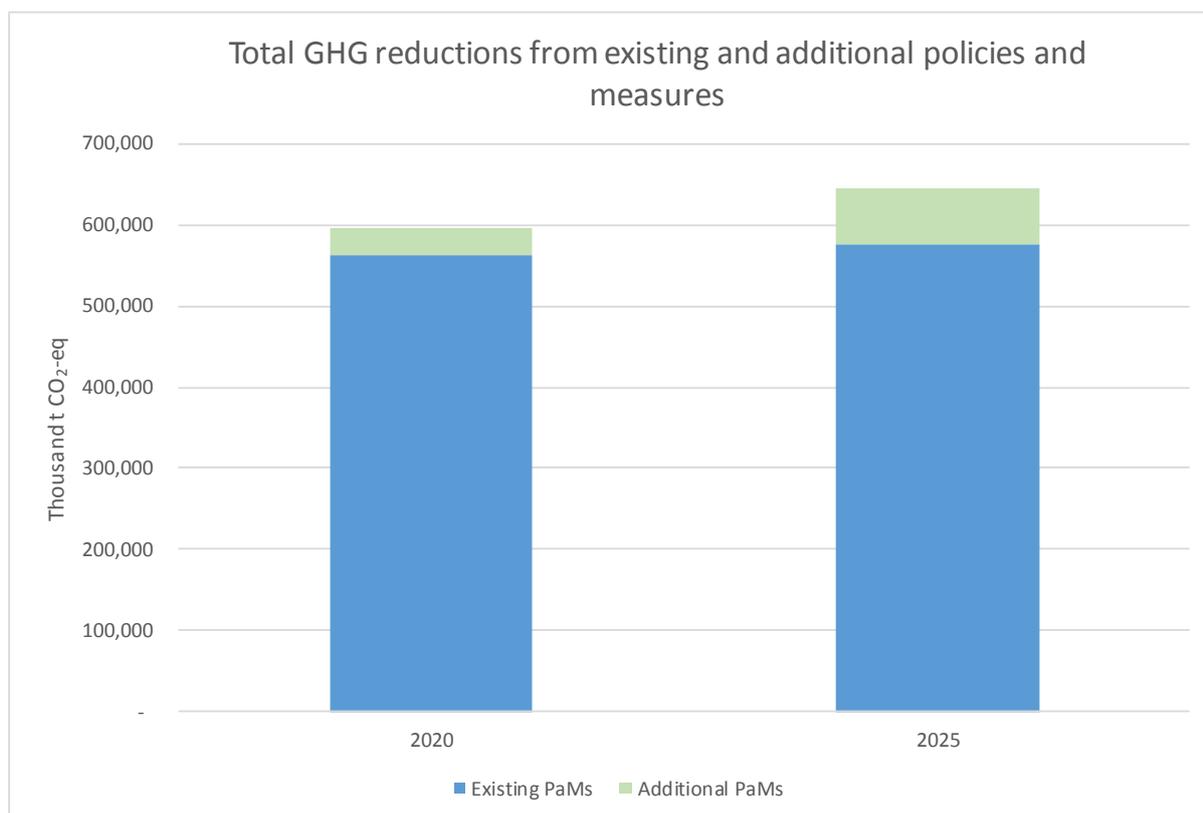
For the EU-28, the assessment of the aggregate effects of policies and measures is accomplished for the years 2020 and 2025. Effects are presented separately for existing – i.e. included under the WEM scenario - and for additional policies and measures – i.e. included under the WAM scenario additionally to the policies and measures also included under the WEM scenario.

Information on aggregate effects of policies and measures in earlier historic years (e.g. 1990-2015) cannot be provided as no EU-wide Without Measures (WOM) scenario is compiled⁶². The compilation of such a WOM scenario would require high costs. At the same time, the value provided would be limited as this backwards-looking exercise would not provide value in steering forward-looking policy decisions.

62 The impacts of mitigation measures presented in figures 5-2 with regards to the WEM have been calculated with the help of data from the EEA PaMs database (see <http://pam.apps.eea.europa.eu>; data from the version 2016 was used). The most recent version of this database offers data for 2020-2035. While information for 2015 is available from previous reporting cycles to the database, it is not methodologically consistent with the 2020-2035 data reported by EU MS in 2016 and has thus not been included.

Figure 5-2 displays total GHG reductions from existing and from additional policies and measures.

Figure 5-2 Total GHG reductions from existing and additional policies and measures



The disaggregation of the total effects of existing and additional policies and measures into sectors and gases is provided in Table 5-1 and Table 5-2.

For the aggregate effects of existing policies and measures, a bottom-up approach based on the EEA's PaMs database was used whereas a top-down approach comparing GHG emissions under the WEM and the WAM scenario was used to assess the aggregate effects of additional policies and measures. The PaMs database does not offer the same sectoral breakdown as the IPCC 2006 Guidelines for national GHG inventories on which the WEM and WAM projections are based. The GHG reduction impacts of existing PaMs are therefore presented according to the sectoral categorisation available from the EEA's PaMs database, while the impacts of additional PaMs are generally presented according to sectors as foreseen under the IPCC 2006 Guidelines (for reasons of transparency, the transport sector is presented separately and not as part of the energy sector).

Table 5-1 GHG reductions from existing and additional PaMs by sector⁶³

Scenario	2020 Reductions in kt CO ₂ -eq	2025 Reductions in kt CO ₂ -eq
Existing PaMs		
Total	562 240	575 892
Cross cutting	31 225	12 971
Energy consumption, Energy supply	392 161	432 573
Transport	75 321	66 134
Industry	39 566	47 567
Agriculture	8 607	7 780
Waste	15 360	8 866
Additional PaMs		
Total	33 879	69 276
Energy without transport	19 861	44 219
Transport	8 691	15 533
Industrial Processes and other product use	957	3 518
Agriculture	3 718	4 292
Waste	652	1 713

⁶³ Effects from existing and additional PaMs related to international aviation are not presented. This EEA PaMs database does not include PaMs related to international aviation, so no information related to existing measures for this subsector is available. Additional measures are not reported as only 2 out of the 28 EU Member States reported GHG reductions related to international aviation under the WAM scenario.

Table 5-2 GHG reductions from existing and additional PaMs by gas

Scenario	2020 Reductions in kt CO₂-eq	2025 Reductions in kt CO₂-eq
Existing PaMs		
Total	562 240	575 892
CO ₂	473 575	499 708
CH ₄	35 094	27 220
N ₂ O	45 379	25 117
F-gases	8 192	23 847
Additional PaMs		
Total	33 879	69 276
CO ₂	28 221	59 789
CH ₄	2 091	3 257
N ₂ O	2 704	3 005
F-gases	488	2 853

5.4. Sensitivity Analysis

For the sensitivity analysis of EU-28 projections, please refer to [3BR] Section 5.3.6.

5.5. Supplementarity

Please see [3BR] Section 5.2.

5.6. Methodology

All methodological aspects, including parameters used and strengths and weaknesses of the modelling approach used are documented in detail in [3BR] Section 5.6.

6. VULNERABILITY ASSESSMENT, CLIMATE CHANGE IMPACT AND ADAPTATION MEASURES

Key developments

The EU recognises that some climate change impacts are unavoidable due to past emissions. The EU is investing in efforts to understand climate change impacts and is taking action to reduce vulnerability and adapt to a changing climate.

Since the 6NC was published in 2014, the EU has continued to strengthen the evidence base that supports climate change adaptation decision-making and has enhanced efforts to increase climate resilience. The EU is also strengthening cooperation with developing countries on adaptation. More information can be found in the related chapters.

Key developments include:

- Since 2014, yearly calls for proposals with adaptation-relevant priorities have been launched by The LIFE Programme, which is the EU's financial instrument supporting environmental, nature conservation and climate action projects in the EU Member States. Funding can be used for adaptation activities in vulnerable areas in Europe⁶⁴.
- In 2014, the Commission developed an 'adaptation preparedness scoreboard', identifying key indicators for measuring Member States' level of readiness⁶⁵.
- In 2014, the EEA published a report on national adaptation policy processes in European countries⁶⁶.
- In 2015, Member States provided reports on their adaptation activities within the EU climate monitoring and reporting system, MMR⁶⁷. These included information on Member States' national adaptation planning and strategies, outlining their implemented or planned actions to facilitate adaptation to climate change. The information reported has been incorporated into the country pages of Climate-ADAPT⁶⁸.
- In 2016, the EEA published the fourth 'Climate change, impacts and vulnerability in Europe report'⁶⁹. It is an indicator-based assessment of past and projected climate change and its impacts on ecosystems and society. It also looks at society's vulnerability to these impacts, at the development of adaptation policies, and at the underlying knowledge base.
- In 2016, the fourth macro-regional strategy (MRS) in the EU was published for the Alpine region, building on the experiences of the existing strategies. The emergence of MRS has been driven by several EU countries and regions as a complement to

64 EEA (2017) Climate change impacts and vulnerability in Europe 2016, European Environment Agency. <https://www.eea.europa.eu/publications/climate-change-impacts-and-vulnerability-2016>

65 <http://climate-adapt.eea.europa.eu/eu-adaptation-policy/strategy>

66 <https://www.eea.europa.eu/publications/national-adaptation-policy-processes>

67 The climate Monitoring Mechanism Regulation (MMR) establishes a mechanism for reporting by the Union and its Member States on its climate commitments, including those made in the Paris Agreement. Monitoring and reporting on climate change adaptations actions is included in the MMR.

68 EEA (2017) Climate change impacts and vulnerability in Europe 2016, European Environment Agency. <https://www.eea.europa.eu/publications/climate-change-impacts-and-vulnerability-2016>

69 EEA (2017) Climate change impacts and vulnerability in Europe 2016, European Environment Agency. <https://www.eea.europa.eu/publications/climate-change-impacts-and-vulnerability-2016>

traditional country policies on territorial management. They are designed to tackle common challenges such as climate change, using a bottom-up approach involving national, regional and local actors.

- By 2017, 24 Member States had adaptation strategies compared to 15 in 2013. This progress has been catalysed by the implementation of the ‘EU Strategy on adaptation to climate change’ adopted in 2013. The strategy takes a coherent approach by complementing the activities of Member States, promoting adaptation action across the EU, ensuring that adaptation considerations are addressed in all relevant EU policies (mainstreaming), bridging knowledge gaps and promoting greater coordination, coherence and information-sharing.
- By 2017, the former Mayors Adapt signatories and the integrated Covenant of Mayors for Climate and Energy brings together almost 900 cities committed to adaptation planning and action. It is expected that by the end of 2017 around 100 European cities will have submitted a climate risk and vulnerability assessment as well as indicative adaptation actions.
- An evaluation of the adaptation strategy is currently underway and will be completed in 2018. It examines the implementation of the strategy action and the achievements of its objectives.

6.1. Introduction

Both public and political recognition of the need to take urgent action on climate change has continued to build momentum since the 6NC. The European Commission is a global climate change leader and is committed to maintaining this role. The European Union has a binding target to jointly reduce greenhouse gas emissions by at least 40 % in 2030 compared to 1990⁷⁰, and to stabilise global mean temperatures below 2°C above pre-industrial levels. This commitment was reflected in the Union’s Nationally Determined Contribution (NDC)⁷¹.

Increasing temperatures, rising sea levels, melting of glaciers and ice sheets, as well as more intense and frequent extreme weather events are among the challenges for Europe already triggered by climate change (see Section 6.2). Significant changes in climate and its impacts are already visible in Europe today. Further climate change impacts are projected and are likely to increase existing vulnerabilities, in addition to deepening socio-economic imbalances in Europe.⁷²

In view of the wide-ranging nature of climate change impacts across the EU’s territory, the European Union has recognised the need to develop an EU-wide framework for adaptation that supplements national adaptation efforts. The European Commission has recognised that planning for adaptation requires a strategic approach to ensure timely, efficient and effective adaptation actions coherently across different sectors and levels of governance.

The EU Adaptation Strategy defines the EU’s main role as supporting the public and private sector at the national, regional and local levels by providing comprehensive information on adaptation. Information is mainly provided through the European information platform,

70 More information about the EU 2030 Climate & Energy Framework can be found at: https://ec.europa.eu/clima/policies/strategies/2030_en#tab-0-1

71 <http://www4.unfccc.int/ndcregistry/PublishedDocuments/European%20Union%20First/LV-03-06-EU%20INDC.pdf>

72 http://ec.europa.eu/clima/policies/adaptation/what/docs/com_2013_216_en.pdf

Climate-ADAPT⁷³, as well as the Covenant of Mayors for Climate and Energy⁷⁴, which now includes adaptation. The EU also provides guidance on coherent adaptation approaches (e.g. through guidelines), in addition to concretely allocating funding (e.g. through the LIFE programme) to adaptation actions. In addition, the EU is supporting its Member States in the case of transboundary issues. It is further strengthening and mainstreaming adaptation into those sectors that are closely integrated at the EU level through the single market and common policies.

Emerging policy fields such as climate change adaptation are particularly dependent on new and increasingly precise research results for decision making. Thus, since the 6th NC, research on the impacts of climate change, vulnerability and adaptation options has become a high priority for Europe. Of particular note are outputs from the EU's Seventh Framework Programme for Research and Technological Development (FP7) and its successor, Horizon 2020, together with many other programmes at the transnational and national levels. Disaster Risk Reduction (DRR) and new insurance products are two adaptation-related research areas that have been prioritised since the 6th NC, to address the impacts of more frequent extreme weather events.

The following sections outline observed and projected changes to the climate across the EU as well as anticipated impacts. The current and planned EU adaptation actions to reduce climate change vulnerability that have been developed since the 6th NC are described.

6.2. Observed patterns of climate change across the EU and projections for the future

Significant changes in climate and its impacts (such as increase in mean temperature, changes in precipitation, sea level rise, among others) are already being felt globally and in Europe. Observed impacts of climate change are projected to increase due to further climate change. In 2017 the European Environment Agency (EEA) published a report⁷⁵ providing an updated compilation of observed and projected climate change impacts across Europe's regions. Its findings are summarised in this section.

6.2.1. *Observed and projected change in temperature*

Observed changes

The average annual temperature for the European land area for the last decade (2006–2015) was around 1.5 °C above pre-industrial levels, making it the warmest decade on record. 2014 and 2015 were the warmest years in Europe since instrumental records began. 500-year-old temperature records were broken in over 65 % of Europe in the period 2003–2010. Climate reconstructions show that summer temperatures in Europe in the last three decades (1986–2015) have been the warmest for at least 2 000 years, and were outside the range of natural variability. The strongest warming has been observed over the Iberian Peninsula, particularly in summer, and across central and north-eastern Europe. Winter warming has been strongest over Scandinavia.

73 <http://climate-adapt.eea.europa.eu/>

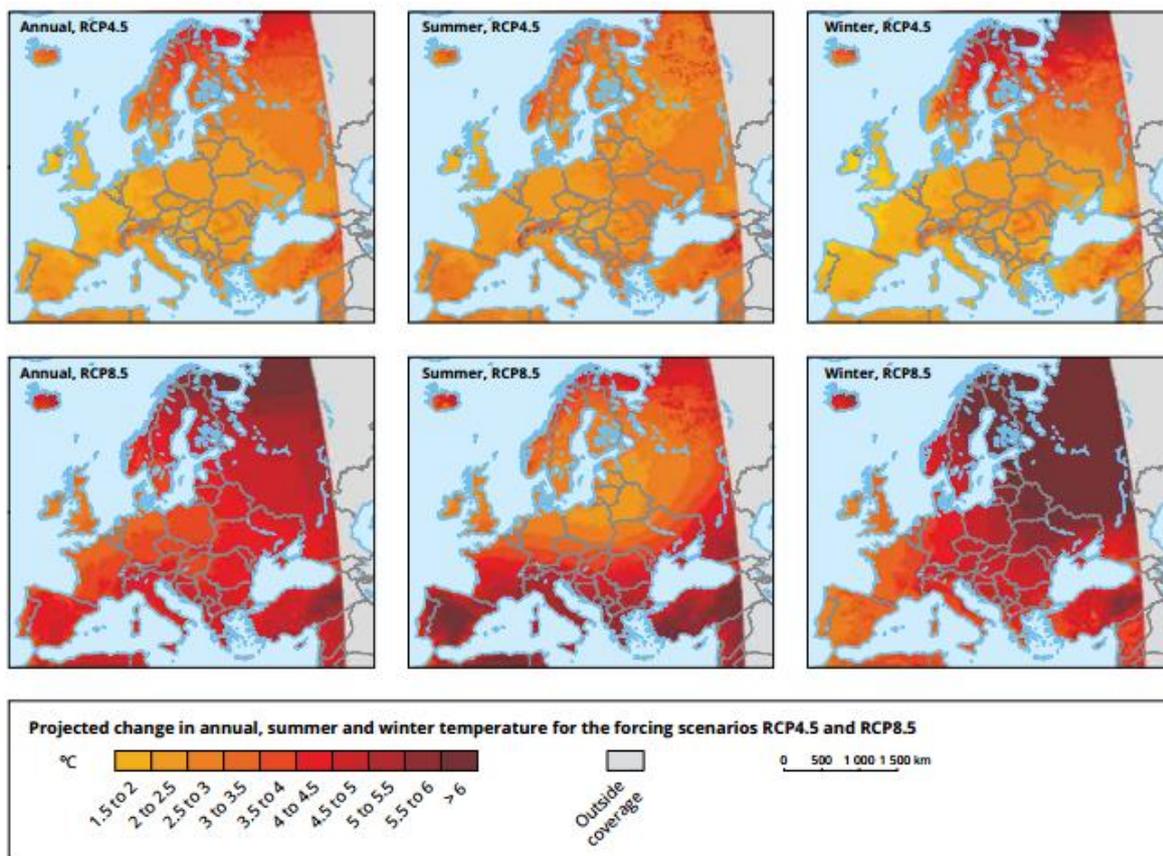
74 http://www.covenantofmayors.eu/about/covenant-of-mayors_en.html

75 EEA (2017) Climate change impacts and vulnerability in Europe 2016, European Environment Agency. <https://www.eea.europa.eu/publications/climate-change-impacts-and-vulnerability-2016>

Projected changes

Temperatures across Europe are projected to continue increasing throughout this century. Annual average land temperature over Europe is likely to increase in the range of 1 to 4.5 °C under a medium emissions scenario (RCP4.5), and 2.5 to 5.5 °C under a high emissions scenario (RCP8.5) (Figure 6-1) by the end of this century (2071–2100 relative to 1971–2000) - more than the projected global average increase. The strongest warming is projected across north-eastern Europe and Scandinavia in winter and southern Europe in summer, and the projected increase in the frequency of heat waves is greatest in southern and south-eastern Europe.

Figure 6-1 Projected changes in mean annual, summer, and winter temperature for the forcing scenarios RCP4.5 and RCP8.5⁷⁶



Note: This map shows projected changes in mean annual (left), summer (middle) and winter (right) near-surface air temperature (°C) in the period 2071–2100 compared with the baseline period 1971–2000 for the forcing scenarios RCP4.5 (top) and RCP8.5 (bottom). Model simulations are based on the multi-model ensemble average of many different combined GCM-RCM simulations from the EURO-CORDEX initiative.

Source: EURO-CORDEX (Jacob et al., 2014).

76 EEA (2016), Climate impacts, vulnerability and adaptation in Europe 2016. Map 3.4, pg. 76. <http://www.eea.europa.eu/publications/climate-change-impacts-and-vulnerability-2016>

6.2.2. *Observed and projected change in precipitation*

Observed changes

Average annual precipitation for all of Europe has not changed significantly since 1960, but significant changes have been observed at sub-continental scales. North-eastern and north-western Europe show an increasing trend of up to 70 mm per decade (in Western Norway) since 1960, whereas some parts of southern Europe show a decrease of up to 90 mm per decade, in central Portugal. At mid-latitudes, no significant changes in annual precipitation have been observed. Mean summer (June to August) precipitation has decreased by up to 20 mm per decade in most of southern Europe, while increases of up to 18 mm per decade have been recorded in parts of northern Europe.

Projected changes

Projected changes in precipitation vary substantially across regions and seasons. Annual precipitation is projected to decrease in southern Europe and to increase in northern Europe. For a high emissions scenario, the models project a statistically significant increase in annual precipitation in large parts of central and northern Europe (of up to about 30 %) and a decrease in southern Europe (of up to 40 %) from 1971–2000 to 2071–2100 (Figure 6-2, left hand map); in summer, the precipitation decrease extends northwards (Figure 6-2, right hand map). Future projections are regionally and seasonally different in Southern Europe, but the projected decrease in southern Europe is strongest in the summer. Precipitation is projected to decrease in the summer months up to southern Sweden, and increase in winter with more rain than snow in mountainous regions⁷⁷.

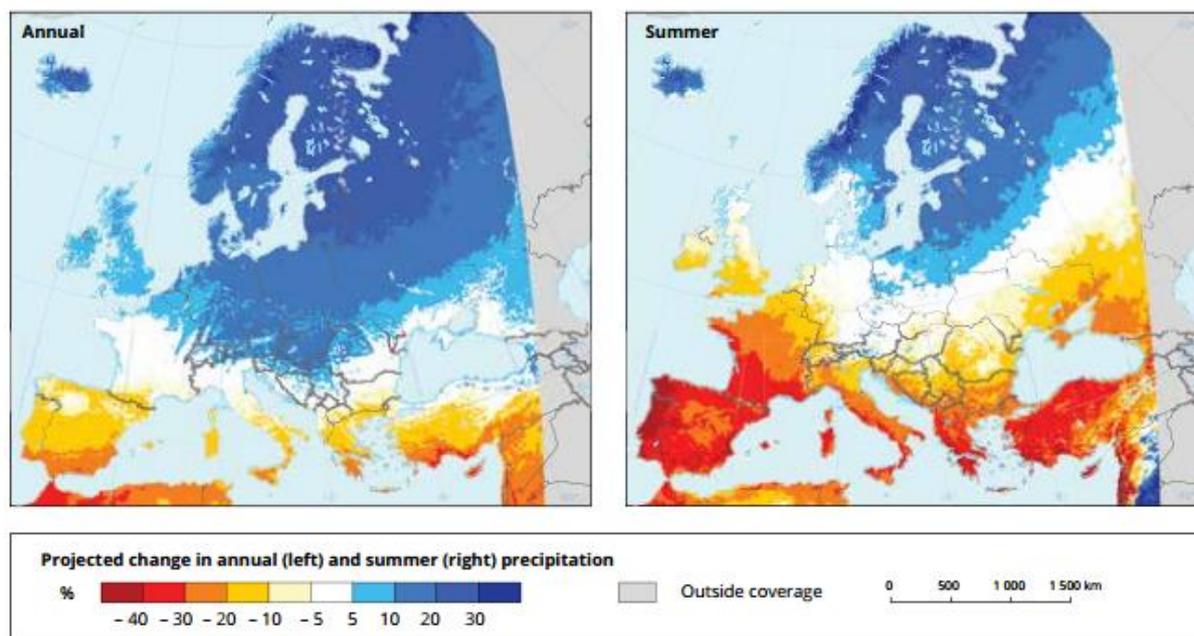
Climate projections in the IPCC AR5 indicate high confidence of increased extreme precipitation in Northern Europe (all seasons) and continental Europe (except summer)⁷⁸. Even in regions where summer precipitation is expected to increase, soil moisture and hydrological droughts may become more severe as a result of increasing evapotranspiration⁷⁹.

77 https://www.ipcc.ch/pdf/assessment-report/ar5/wg2/WGIIAR5-Chap23_FINAL.pdf

78 https://www.ipcc.ch/pdf/assessment-report/ar5/wg2/WGIIAR5-Chap23_FINAL.pdf

79 https://www.ipcc.ch/pdf/assessment-report/ar5/wg2/WGIIAR5-Chap23_FINAL.pdf

Figure 6-2 Projected changes in annual and summer precipitation⁸⁰



Note: This map shows projected changes in annual (left) and summer (right) precipitation (%) in the period 2071–2100 compared with the baseline period 1971–2000 for the forcing scenario RCP8.5. Model simulations are based on the multi-model ensemble average of many different RCM simulations from the EURO-CORDEX initiative.

Source: EURO-CORDEX (Jacob et al., 2014).

6.2.3. Observed and projected change in freshwater

Observed changes

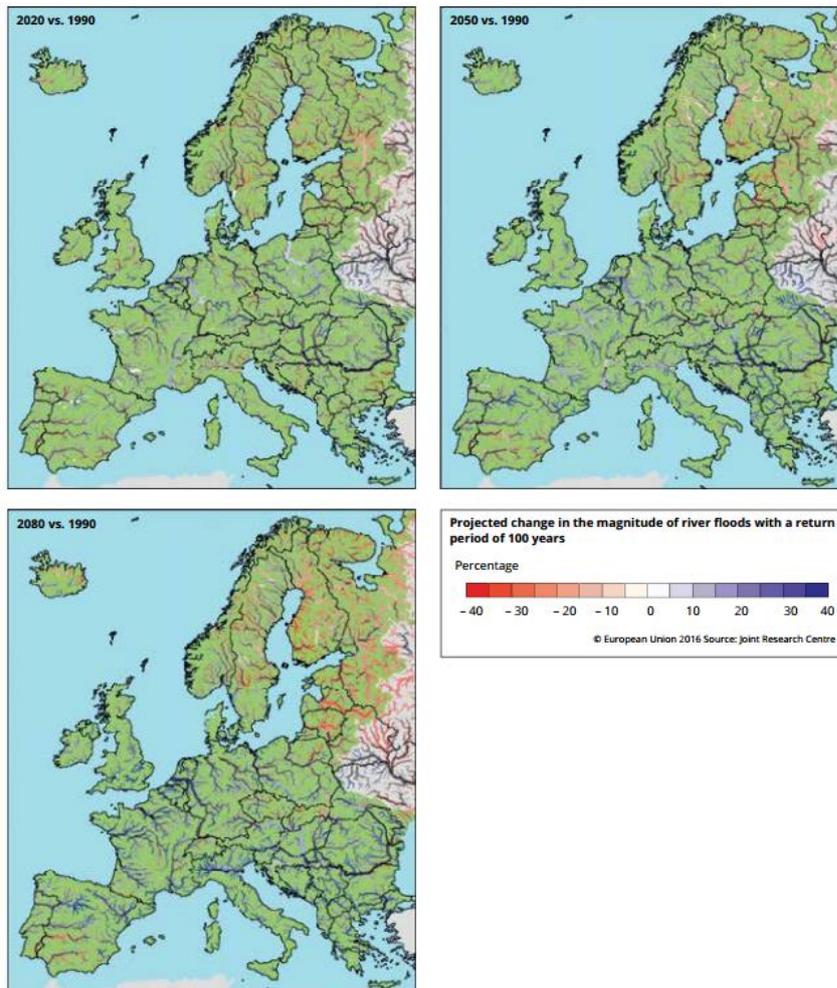
In general, river flows in Europe have increased in winter and decreased in summer since the 1960s, but with substantial regional and seasonal variation. Water flows have generally increased in western and northern Europe, while decreasing in southern and parts of Eastern Europe, particularly in summer. These trends have led to an increase in the number of floods since 2000, and an increase in the severity and frequency of droughts in south-western and central Europe in particular, impacting water quality and freshwater ecosystems. Note that river engineering and other factors also influence these observations.

Projected changes

Detecting long-term trends in hydrological variables is difficult owing to substantial inter-annual and decadal variability. Projections nonetheless suggest an intensifying hydrological cycle and increased seasonality of river flows, resulting in more frequent and intense flood events and droughts. Reduced snow accumulation during winter is projected to reduce the risk of early spring flooding. Figure 6-3 highlights the projected changes in river floods.

⁸⁰ EEA (2017), Climate impacts, vulnerability and adaptation in Europe 2016. Map 3.8, pg. 81. <http://www.eea.europa.eu/publications/climate-change-impacts-and-vulnerability-2016>

Figure 6-3 Projected changes in river floods with a return period of 100 years⁸¹



Note: This map shows the projected change in the level of one-in-a-century river floods (Q100). The relative changes for the time slices 2006–2035 (2020), 2036–2065 (2050) and 2066–2095 (2080) are compared with the ensemble mean of the baseline (1976–2005), based on an ensemble of seven EURO-CORDEX simulations forced by the RCP8.5 scenario and the LISFLOOD hydrological model. The consistency of the model projections is evaluated through the use of the coefficient of variation (CV) of the relative change. Smaller CVs indicate better model agreement of the projected mean change. Data points with CV > 1 are greyed out.

Source: Adapted from Alfieri, Burek et al., 2015.

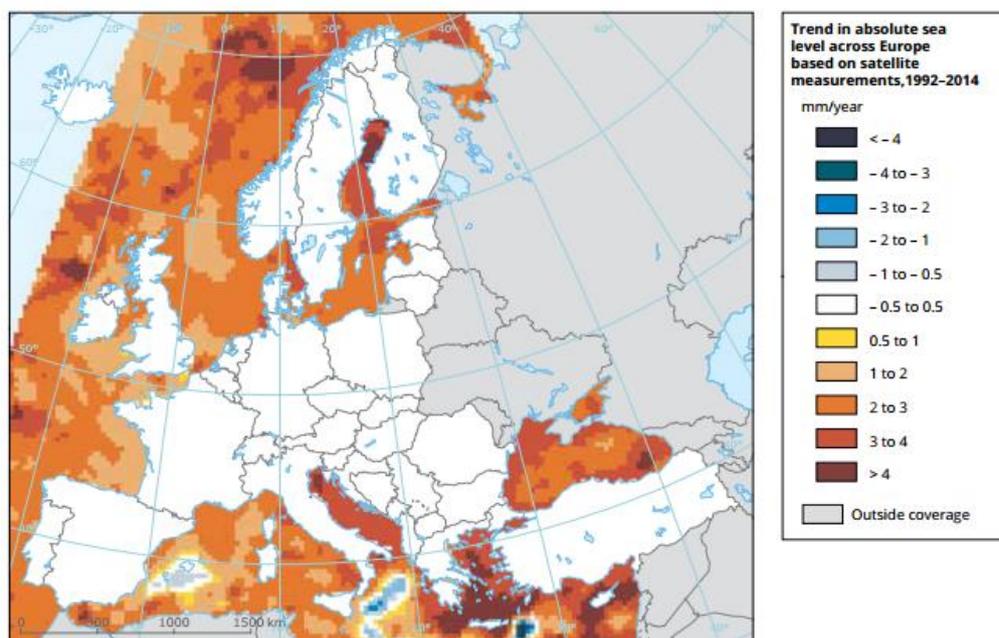
6.2.4. Observed and projected change in oceans including sea level rise

Observed changes

Sea level measurements for the European region are available from satellite altimeter observations (Figure 6-4) and from tide gauges. All coastal regions in Europe have experienced an increase in absolute sea level, and most of them have experienced an increase in sea level relative to land but with significant regional variation.

81 EEA (2017), Climate impacts, vulnerability and adaptation in Europe 2016. Map 4.8, pg. 143. <http://www.eea.europa.eu/publications/climate-change-impacts-and-vulnerability-2016>

Figure 6-4 Trend in absolute sea level across Europe based on satellite measurements⁸²



Note: The map shows the linear trend in sea level change over the period 1992–2014. Data uncertainty is higher along coastal zones than in areas further away from the coast. In some regions of the Mediterranean Sea, the depicted trends reflect long-term variability in gyres (i.e. rotating ocean currents) rather than the effects of climate change.

Source: Data supplied by CLS/CNES/LEGOS group (also available through CMEMS).

As well as SLR (sea level rise), other primary climate change impacts observed in European seas are acidification, increased ocean heat content and increased sea surface temperature. For example, in the North-east Atlantic Ocean, sea surface temperatures and ocean heat content are increasing, at different rates across all regions.

Projected changes

Relative sea level change along most of the European coastline is expected to be similar to the global average, except for the northern Baltic Sea and the northern Atlantic coast, which are rising as a consequence of post-glacial rebound. In these regions, relative sea levels are rising slower and may even decrease.

A recent study found that by the end of this century, the 100-year extreme sea levels (ESL) along Europe’s coastlines is on average projected to increase by 57 cm for Representative Concentration Pathways (RCP) 4.5 and 81 cm for RCP8.5. The North Sea region is projected to face the highest increase in ESLs, amounting to nearly 1m under RCP8.5 by 2100, followed by the Baltic Sea and Atlantic coasts of the UK and Ireland. Relative sea level rise (RSLR) is shown to be the main driver of the projected rise in ESL, with increasing dominance toward the end of the century and for the high-concentration pathway. Changes in storm surges and waves enhance the effects of RSLR along the majority of northern European coasts, locally with contributions up to 40 %. In southern Europe, episodic extreme events tend to stay stable, except along the Portuguese coast and the Gulf of Cadiz where reductions in surge and wave extremes offset RSLR by 20–30 %. By the end of this century, 5 million

82 EEA (2017), Climate impacts, vulnerability and adaptation in Europe 2016. Map 4.3, pg. 127. <http://www.eea.europa.eu/publications/climate-change-impacts-and-vulnerability-2016>

Europeans currently under threat of a 100-year ESL could be annually at risk from coastal flooding under high-end warming.⁸³

Other projected changes in oceans are projected to have predominantly negative effects on oceans and their ecosystems in Europe. Future climate change is projected to warm the Baltic Sea, to decrease its salinity, to decrease sea ice extent by 50–80 % during the 21st century, and to further expand oxygen depleted 'dead zones'.

In the Mediterranean, temperature is projected to increase, and run-off is projected to decrease, thereby increasing salinity. Stratification is projected to remain largely constant because of the compensating effects of increasing temperature and increasing salinity on the density of sea water. The observed invasion and survival of alien species has been correlated with the warming trend in sea surface temperature.

6.2.5. *Observed and projected change in the cryosphere*

Observed changes

A general loss of glacier mass since the beginning of the measurements has occurred in all glacier regions in the EU. The Alps have lost roughly 50 % of their ice mass since 1900 (Zemp et al., 2008, 2015; Huss, 2012).

Projected changes

Projections of Baltic Sea ice extent under different emissions scenarios suggest that the maximal ice cover and ice thickness will continue to shrink significantly over the 21st century. The best estimate of the decrease in maximum ice extent from a model ensemble is 6 400 km²/decade for a medium emissions scenario (RCP4.5) and 10 900 km²/decade for a high emissions scenario (RCP8.5). For the latter scenario, largely ice-free conditions are projected by the end of the century (Luomaranta et al., 2014).

The retreat of European glaciers is projected to continue throughout the 21st century. One study estimates that their volume for all European regions combined will decline between 22 and 84 % relative to 2006 under a moderate greenhouse gas forcing scenario (RCP4.5), and between 38 and 89 % under a high forcing scenario (RCP8.5) (Radić et al., 2014).

6.2.6. *Extreme weather and disaster prevention*

Observed changes in extremes

Attribution of the observed changes in the number of disaster events and the associated losses to specific causes is hampered by large inter-annual variability, changes in reporting, and the implementation of measures to reduce impacts. Observations from the EEA report (2017) indicate that several weather patterns are becoming more extreme with more intense and frequent events. Large parts of Europe have experienced intense and long heat waves since the 1950s, most of which occurred since 2000 (2003, 2006, 2007, 2010, 2014 and 2015) with notable impacts on society. Heavy precipitation events have increased in northern and north-eastern Europe since the 1960s. Observations for south-western and southern Europe are

⁸³ Vousdoukas, M.I., Mentaschi, L., Voukouvalas, E., Verlaan, M., Feyen, L. Extreme sea levels on the rise along Europe's coasts (2017) *Earth's Future*, 5 (3), pp. 304-323.

inconclusive. Frequency and intensity of observed wind storms have shown considerable decadal variability across Europe and as such are also inconclusive. However, hail storms have increased in frequency since 1951, in particular across mountainous and Alpine regions, including southern France and Austria.

An analysis of the timing of river floods in Europe over the past 50 years found clear patterns of changes in flood timing that can be ascribed to climate effects⁸⁴. These variations include earlier spring snowmelt floods in northeastern Europe, later winter floods around the North Sea and parts of the Mediterranean coast owing to delayed winter storms, and earlier winter floods in western Europe caused by earlier soil moisture maxima. The number of very severe flood events, in terms of socio-economic impact, in Europe increased over the period 1980–2010, but with large inter-annual variability. This increase has been attributed to better reporting, land-use changes and increased heavy precipitation in parts of Europe, but it is not currently possible to quantify the importance of these factors.

A recent review of extreme sea levels during major storms along European coasts observed that storm surge heights along the Estonian coast of the Baltic Sea have increased significantly during the 20th century. The trend is associated with increasing mean sea levels.

Projected changes

Future climate change is projected to increase the frequency and intensity of climate-related extremes and the associated losses. Heat waves are expected to increase across Europe and droughts to increase across southern Europe. Under a high emissions scenario (RCP8.5), very extreme heat waves as strong as those already felt or even stronger are projected to occur as often as every two years in the second half of the 21st century. The impacts will be particularly strong in southern Europe. Projections are inconclusive for short-term meteorological extremes such as wind and hailstorms. Recent studies on changes in winter storm tracks generally project an extension eastwards of the North Atlantic storm track towards central Europe and the British Isles. Model projections show a likely increase in overall flood risk, i.e. coastal and inland floods (Figure 6-3).

Projected increases in extreme high coastal water levels are likely to result from increases in local relative mean sea level in most locations. However, recent studies suggest that increases in the meteorologically driven surge component can also play a substantial role, in particular along the northern European coastline. Extreme sea level events will increase (high confidence; WGIAR5 Section 13.7; SREX Section 3.5.3), mainly dominated by the global mean sea level increase. Storm surges are expected to vary along the European coasts. Significant increases are projected in the eastern North Sea⁸⁵.

6.3. Expected impacts and vulnerabilities of climate change in the EU

Climate change is already occurring globally and across Europe.⁸⁶ While it is clear that all regions of Europe are vulnerable to climate change, certain hotspots, in particular the southern and south-eastern regions, are expected to experience the most acute adverse impacts.

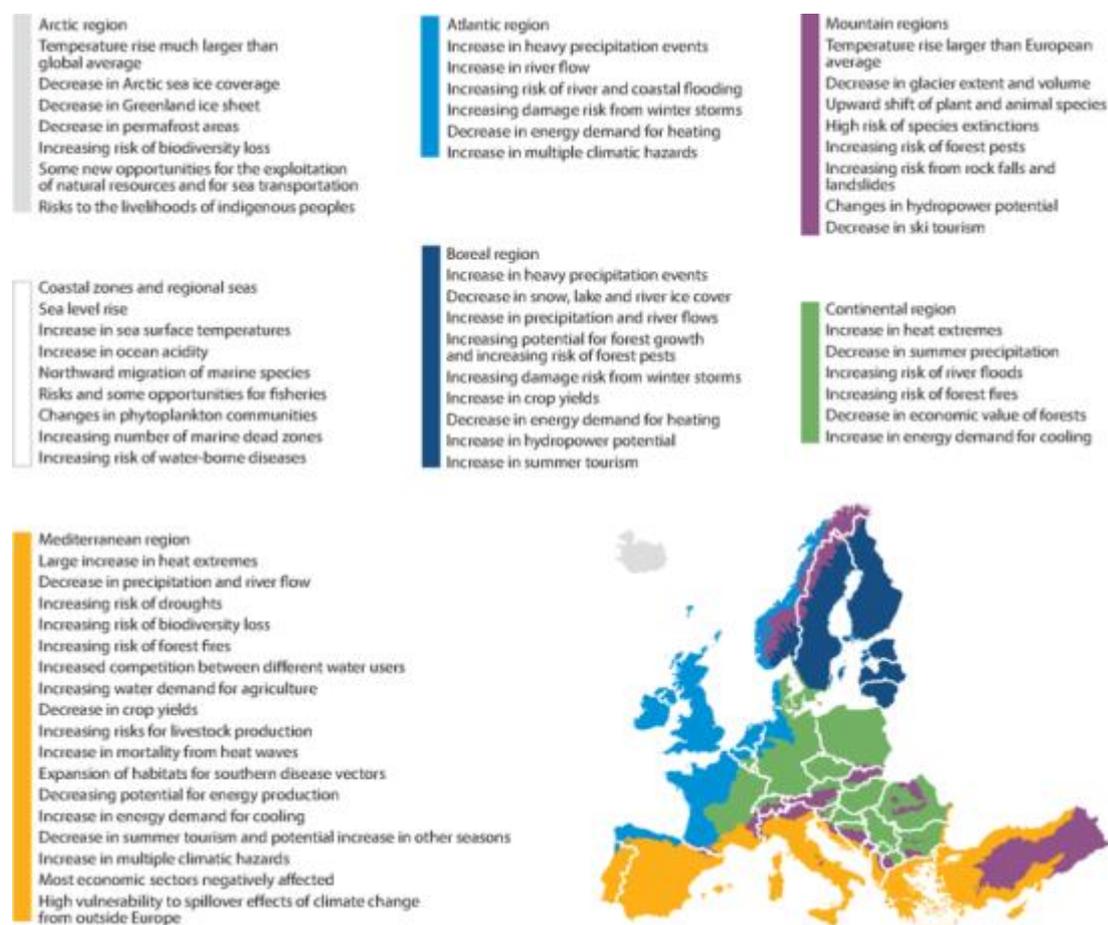
84 Blöschl et al., Changing climate shifts timing of European floods (2017) *Science*, 357 (6351), pp. 588-590.

85 https://www.ipcc.ch/pdf/assessment-report/ar5/wg2/WGIAR5-Chap23_FINAL.pdf

86 Kovats, R.S., R. Valentini, L.M. Bouwer, E. Georgopoulou, D. Jacob, E. Martin, M. Rounsevell, and J.-F. Soussana, 2014: Europe. In: *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate*

The recent report ‘Climate change impacts and vulnerability in Europe 2016’⁸⁷ provides a detailed, indicator-based assessment of past and projected climate change impacts, together with the associated vulnerabilities of and risks to ecosystems, human health and society in Europe, based on a wide range of observations and model simulations. The main findings from this recent research are summarised in the sections below. An overview is provided for the main regions in Europe in the overview map (Figure 6-5).

Figure 6-5 Key observed and projected climate change impacts for the main biogeographical regions in Europe



Source: EEA (2016)

Change [Barros, V.R., C.B. Field, D.J. Dokken, M.D. Mastrandrea, K.J. Mach, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L.White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1267-1326.

87 EEA (2017) Climate impacts, vulnerability and adaptation in Europe 2016., European Environment Agency, <http://www.eea.europa.eu/publications/climate-change-impacts-and-vulnerability-2016>

6.3.1. *Food production and supply*

Agriculture still plays a dominant economic role in many regions in Europe, and at the same time continues to be the predominant user of land and water resources. As highlighted in Section 6.3.1 of the 6NC, the stress imposed by climate change on agriculture is likely to intensify the regional disparities between European countries, with some regions experiencing positive impacts, and others experiencing only negative impacts.

Observed changes in crop phenology include the advancement of flowering and harvest dates in cereals. Projected temperature rise will lead to increased evapotranspiration rates, thereby increasing crop water demand across Europe. Water demand is expected to increase most in southern and central Europe, where crop deficit and irrigation needs are projected to increase.

Expansion of a range of agricultural pests not previously found in Europe can be expected due to increased temperatures allowing them to survive wintertime and to have multiple generation cycles per year, and by increasing the susceptibility of crops and trees to new dangerous pests of plants from other continents.

As discussed in Section 6.3.9 of the 6NC, the expected main effect of climate change in the coming decades will be to shift food production from southern to northern Europe without significantly curtailing overall production.

Europe is already susceptible to spill over effects from climate change impacts occurring outside the European territory through various pathways, including agricultural commodities. Europe in fact relies increasingly on imports to meet demand for food and feed supply. Climate impacts on agriculture experienced outside Europe are having an effect on the supply of agricultural commodities within Europe. The Mediterranean area has been identified as the most vulnerable to shocks in the flow of agricultural commodities, primarily due to its high dependence on food imports from outside the EU as well as the prominent role food plays in its economy.

The FOOD 2030 SWD (European Research and Innovation for Food and Nutrition Security) initiated in 2016 is a first step in the further development of a more coherent approach to research and innovation in response to recent international political drivers, including the Sustainable Development Goals and the Paris Agreement. FOOD 2030 is calling for a systemic approach to future-proofing our nutrition and food systems towards becoming sustainable, resilient, diverse, responsible, inclusive and competitive in the longer term. FOOD 2030 builds on four priorities: Nutrition for sustainable and healthy diets; Climate-smart and environmentally sustainable food systems; Circular and resource efficient food systems; Innovation and empowerment of communities.

6.3.2. *Forestry*

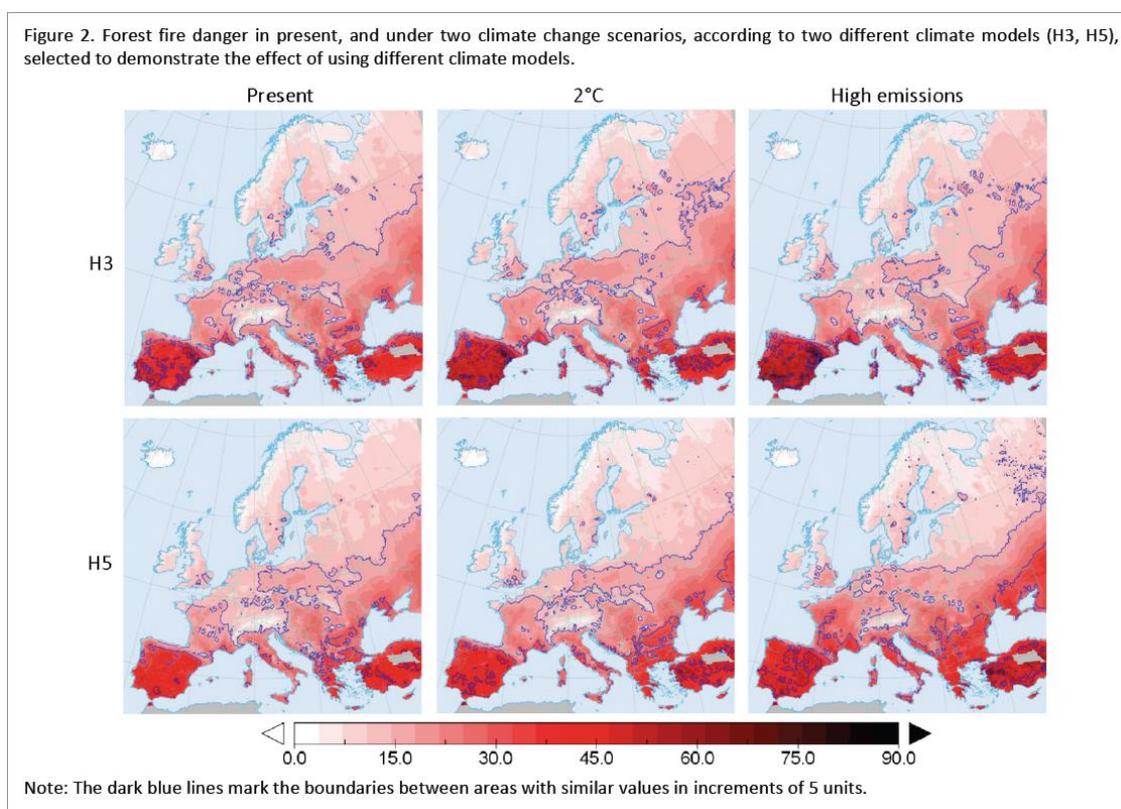
Climate change impacts on forests and on the ecosystem services they provide include shifts of tree species towards higher altitudes and latitudes, an increased risk of forest fires - particularly in southern Europe - as well as an increased incidence of forest pest insects.

Forests cover around 215 million hectares across Europe, which is around 33 % of the total land area. In recent years, large forest fires have repeatedly affected Europe, in particular

Mediterranean countries. The danger of forest fires will increase with unmitigated climate change (preliminary results of the JRC PESETA III project). See Figure 6.6 below.

Cold-adapted coniferous tree species are expected to lose large areas of their ranges to broadleaf species, and forest growth is projected to decrease in southern Europe but increase in Northern Europe. Furthermore, projected changes to forest ecosystems will have an impact on the goods and services that forests provide. For example, the value of forestland in Europe is forecast to decrease between 14 % and 50 % during the 21st century.

Figure 6-6 Forest fire danger in present, and under two climate change scenarios, according to two different climate models (H3 and H5), selected to demonstrate the effect of using different climate models.⁸⁸



6.3.3. *Freshwater resources*

Vulnerability to climate change is intimately linked to the impact on water resources through floods and droughts, but also through the impact on fisheries and low river flows on aquatic ecosystems.

The Mediterranean region is expected to be increasingly affected by severe impacts on its water resources, due to extreme high temperatures and droughts. There is high certainty that the water resources of mountain regions will be negatively affected in the future. This will have impacts on hydropower production, winter tourism and ecosystems. Physical risk to

⁸⁸ JRC (2017) PESETA III Science for Policy Summary Series: Climate Change and Forest Fires

infrastructure and settlements from slope instability may also increase.

According to the preliminary results of the droughts and water sectors of the JRC PESETA III project, under a 2°C climate future the Southwest Mediterranean is a region of concern, with extreme droughts projected for much of Southern Europe. Regarding river floods, around 216 000 people across the EU are already exposed to river flooding annually, with flood damage amounting to € 5.3 billion each year. Under 3 °C global warming and assuming present socio-economic conditions prevail into the future, and that there is no adaptation, flood risk could almost triple (preliminary findings of the JRC PESETA III study). Over 600 000 people could be exposed to floods each year, amounting to € 14.5 billion of annual losses.

With respect to coastal systems, the study's preliminary results also show that if no adaptation measures are taken, climate and socio-economic change could increase annual flood damages by around € 960 billion. From around 100 000 people currently, coastal floods could affect 3.6 million people annually across Europe by the end of the century, an increase by a factor of 35.

6.3.4. *Marine resources and fisheries*

Increased water temperature and reduced oxygen can result in marked changes in species composition, nutritional value and size, and on the functioning of aquatic ecosystems. Climate change has negatively impacted the resilience of marine ecosystems, making them more vulnerable to other high intensity ecological stressors such as overfishing, pollution and introduction of non-indigenous species. Of the commonly observed demersal fish species (fish living and feeding on or near the bottom of seas or lakes), 72 % have experienced changes in abundance and/or distribution in response to warming waters. This change has already had important impacts on fisheries in the Atlantic region.

Elevated sea temperatures have triggered a major northwards retreat of colder water plankton in the North-east Atlantic, estimated at 1 100 km over the last 40 years. This trend has accelerated since 2000 and is expected to shift the distribution of fisheries. Sub-arctic species are receding northwards as a result, and more sub-tropical species are appearing in European fisheries. Continued changes in fisheries distribution will affect the livelihoods of fishing communities and impact current international agreements on the exploitation of straddling and highly migratory stocks.

6.3.5. *Energy*

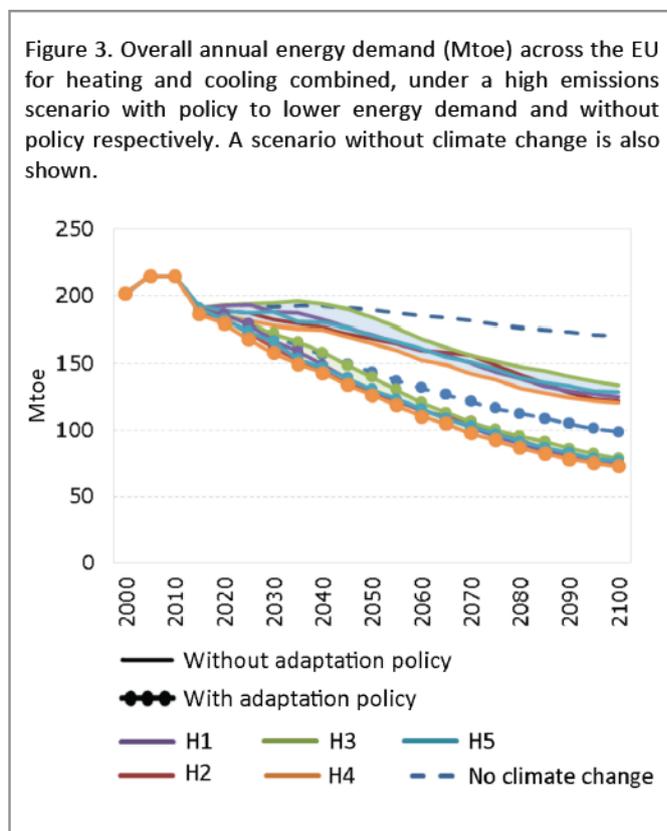
The energy sector faces multiple threats from climate change, from changing patterns of demand, increasing stress on water resources and extreme weather events.

The number of heating degree-days has decreased and the number of cooling degree-days has increased, leading to a decrease in energy demand for heating (particularly in northern and north-western Europe) but an increase in energy demand for cooling (particularly in central and southern Europe). Recent information from the preliminary JRC PESETA III⁸⁹ indicates that the net effect on energy demand would be a decrease of around 25 % by 2100. In

89 PESETA III: findings expected in 2017

addition, the introduction of better building insulation would further reduce demand by up to 40 %. See Figure 6.7 below.

Figure 6-7 Overall annual energy demand (Mtoe) across the EU for heating and cooling combined, under a high emissions scenario with a policy to lower energy demand and without policy respectively. A scenario without climate change is also shown.⁹⁰



These long-term changes in average energy demand are expected to be accompanied by more acute stress on energy infrastructure as a result of extreme events. Increasingly common incidence of drought and hot weather may mean that cooling water is unavailable and thermal generating capacity is forced offline. Changing patterns of precipitation will continue to impact upon the output of hydropower plants.

6.3.6. *Infrastructure and Urban Settlements*

6.3.6.1. *Cities and urban areas*

Climate change will have a direct impact on cities, including increasing health problems due to heat, or flooding damage to buildings and infrastructure⁹¹. With a higher proportion of elderly people, cities will also be more sensitive to heat waves and other climatic hazards.

⁹⁰ JRC (2017) PESETA III Science for Policy Summary Series: Climate change and residential energy demand.

⁹¹ EEA (2016) Urban adaptation to climate change in Europe 2016 — Transforming cities in a changing climate, European Environment Agency

Increased incidences of heavy rainfall can cause flooding along coastlines, within river catchments and also from poor urban drainage. This has an indirect impact on homes, business and critical infrastructure.

The urban heat island (UHI) effect is exacerbating the impacts of heat waves, which is increasingly affecting also cities in central and north-western Europe. High soil sealing⁹² and urban sprawl, in combination with more extreme precipitation events and sea level rise increase the risk of urban flooding. Many cities have experienced significant urban sprawl, noticeably expanding into areas such as floodplains, therefore increasing their exposure to floods. Furthermore, low-density housing built on previously untouched land has increased the risk of forest fires in many residential areas over the last decades, in particular around cities in southern Europe.

A recent study indicates that under a business-as-usual greenhouse gasses emissions scenario, potential damage from climate hazards to critical infrastructures in the energy, transport, industrial and social sector could triple by the 2020s, multiply six-fold by mid-century, and amount to more than 10 times today's total of 3.4 billion € /year by the end of the century. Damage from heatwaves, droughts in southern Europe, and coastal floods shows the most dramatic rise, but the risks of inland flooding, windstorms, and forest fires will also increase in Europe, with varying degrees of change across regions. Economic losses are highest for the industry, transport, and energy sectors. Future losses will not be incurred equally across Europe. Southern and south-eastern European countries will be most affected and, as a result, will probably require higher costs of adaptation.⁹³

6.3.6.2. Construction and buildings

As highlighted in Section 6.3.6 in the 6NC, the impact of climate change is particularly pertinent to the construction sector given the long life expectancy of buildings. The vulnerability of buildings and constructions is mainly influenced by the design (e.g. resistance to storms) and location (e.g. in flood-prone areas, landslides, avalanches).

6.3.6.3. Transport

Climate-related impacts on transport are primarily the result of extreme events. Transport systems in mountainous regions, coastal areas and regions prone to more intense rain and snow are generally expected to be most vulnerable to future climate change. Available projections suggest that rail transport will face particularly high risks from extreme weather events, mostly as a result of the projected increase in heavy rain.

The preliminary results of the JRC PESETA III project show that by the end of the century under a high emissions scenario, 196 airports and 852 seaports across the EU could face the risk of inundation due to higher sea levels and extreme weather events. On the other hand, transportation along the rivers Rhine and Danube could face less drought-related disruptions relative to the current situation.

92 The destruction or covering of soils by buildings, constructions and layers of completely or partly impermeable artificial material (asphalt, concrete, etc.).

93 Forzieri, G., A. Bianchi, F. Batista e Silva, M. Marin, A. Leblois, C. Lavalle, J. Aerts, L. Feyen, 2017. Escalating impacts of climate extremes on critical infrastructures in Europe. *Global Environmental Change* (forthcoming).

A recent EEA report on ‘Urban adaptation to climate change in Europe 2016’ summarised the key direct and indirect impacts that society will experience living, working and moving around cities (see Figure 6-8 below).

Figure 6-8 How climate impacts affect urban living, working, and moving⁹⁴

	 LIVING	 WORKING	 MOVING
HEAT 	Decreased comfort Health risks Increased energy use for cooling, decreased for heating	Reduced labour productivity Increased energy use for cooling, decreased for heating	Discomfort on public transport Rail buckling Increased energy use for cooling, decreased for heating
FLOODS 	Nuisance/health risks Damage to houses Power and water failures	Reduced accessibility Economic asset damage Power and water failures	Blocked roads and rail
WATER SCARCITY 	Discomfort Health and safety risks	Reduced productivity Power and water failures	Shipping constraints
WILD FIRES 	Health and safety risks Damage to houses	Damage to economic assets	Transport route blockage
STORMS 	Nuisance/health risks Damage to houses Power and water failures	Economic asset damage Reduced accessibility Power and water failures	Blocked roads and rail

Note: The examples are not exhaustive and they may not be relevant for all cities.

Source: EEA, 2016

6.3.7. Biodiversity, Ecosystems and Ecosystem Services

Biodiversity and ecosystems are under threat from several drivers, including socio-economic drivers, development and industry, agricultural practices as well as observed climate change. The relative importance of climate change as a major driver of biodiversity and ecosystem change is projected to increase in the future. Human efforts to mitigate and adapt to climate change can both positively and negatively affect ecosystems, biodiversity and other ecosystem services. The relative importance of climate change compared with other pressures depends on the type of environment (terrestrial, freshwater, marine) and geographical region. Europe's marine and alpine ecosystems are currently the most sensitive to climate change.

Current observed climate change impacts on terrestrial ecosystems include changes in soil conditions, phenological changes, and altitudinal and latitudinal migration of plant and animal species (the general trend is northwards and upwards), as well as changes in species interactions and composition within communities. In Europe, 14 % of habitats and 13 % of species of interest have been assessed to already be under pressure because of climate change. The number of habitats threatened by climate change is projected to more than double in the near future. Many species in the Natura 2000 network are projected to lose suitable climate niches. It is expected in the future, in particular in the Mediterranean region, that changes in soil moisture will have a direct effect on terrestrial ecosystems. Climate

94 EEA (2016) Urban adaptation to climate change in Europe 2016 — Transforming cities in a changing climate, European Environment Agency

change is also anticipated to exacerbate the spread of invasive species, already being experienced across Europe.

Climate change therefore significantly affects the capacity of ecosystems to provide services for human well-being and may have already triggered shifts in ecological regimes from one state to another. While the knowledge base on the combined effects of climate change and other pressures on ecosystems and their capacity to provide services is still limited, it is improving.

The Mediterranean region is home to almost half of the plant and animal species and more than half of the habitats listed in the EU Habitats Directive. However, this reservoir of biodiversity is threatened by climate-driven habitat loss because the Mediterranean climate zone is at risk of becoming smaller, according to the preliminary results of the JRC PESETA III project. See Figure 6.9 below.

Figure 6-9 Existing Natura 2000 sites mapped against natural and semi-natural areas where the Mediterranean zone is preserved under high emissions scenario by the end of the century.⁹⁵



6.3.8. Health

Climate change is already contributing to the burden of disease and premature deaths in Europe. Its main health effects are related to heat waves and other extreme weather events, changes in the distribution of climate-sensitive diseases and changes in environmental and social conditions⁹⁶.

A recent study found that weather-related disasters could affect about two-thirds of the European population annually by the year 2100 (351 million people exposed per year during the period 2071–100) compared with 5 % during the reference period (1981–2010; 25 million

⁹⁵ JRC (2017) PESETA III Science for Policy Summary Series: Climate change and Mediterranean Habitat Loss.

⁹⁶ Paci (2014) Human Health Impacts of Climate Change in Europe, Report for the PESETA II project JRC: url: <http://publications.jrc.ec.europa.eu/repository/bitstream/JRC86970/1fna26494enn.pdf>

people exposed per year). About 50 times the number of fatalities occurring annually during the reference period (3 000 deaths) could occur by the year 2100 (152 000 deaths).⁹⁷

Heat waves were the deadliest extreme weather event in the period 1991–2015 in Europe, causing tens of thousands of premature deaths in Europe. The projected further increase in the length, frequency and intensity of heat waves will lead to greater mortality, which will be most pronounced among vulnerable population groups, unless adaptation measures are taken. Future adaptation will very likely reduce these impacts. The reduction in cold-related deaths is projected to be smaller than the increase in heat-related deaths in most regions. Mortality effects are observed even for small differences from seasonal average temperatures. Because small temperature differences occur much more frequently than large temperature differences, not accounting for the effect of these small differences would lead to underestimating the future impact of climate change

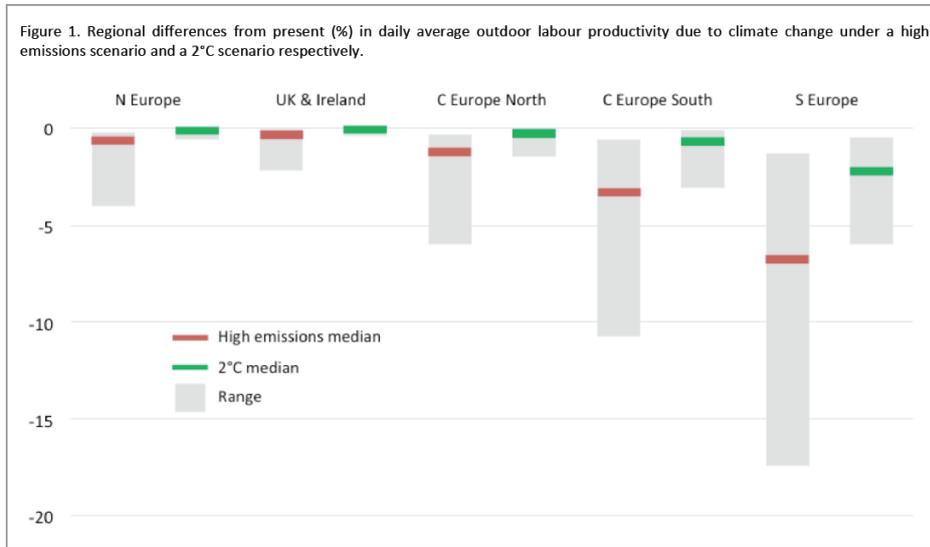
Climate change is expected to alter the geographic and seasonal distributions of existing vectors and vector-borne diseases. Climate change is influencing the transmission cycles of vector-borne diseases, but disease risks are also affected by factors such as land use, vector control, human behaviour, population movements and public health capacities. It is widely suspected that climate change has played (and will continue to play) a role in the expansion of disease vectors such as the spread of the Asian tiger mosquito (*Aedes albopictus*), which can disseminate several diseases including dengue, chikungunya and Zika, and *Phlebotomus* species of sand flies which transmit leishmaniasis.

It is not possible to assess whether past climate change has already affected the overall incidence of water- and food-borne diseases in Europe, but the sensitivity of pathogens to climate factors suggest that climate change could be having effects on these diseases. The unprecedented number of vibriosis infections in 2014 has been attributed to the record 2014 heat wave in the Baltic region. Increased sea surface temperatures enabled the right environmental conditions for *Vibrio* species to bloom in the marine waters. Furthermore, climate change has been found to have an impact on food safety hazards throughout the food chain. Increases in water temperatures due to climate change will alter the seasonal windows of growth and the geographic range of suitable habitat for toxin-producing harmful algae.

Labour productivity in outdoors sectors (like agriculture and construction sectors) can be affected by increasing air temperature. According to the preliminary results of the JRC PESETA III project, under a high emissions scenario and in the absence of adaptation, global warming could result in declines by around 10-15 % from present-day levels in several southern European countries by the end of the century. Countries in northern Europe could also see declines in labour productivity with climate change, at around 2-4 %. See Figure 6.10 below.

97 Forzieri, G., A. Cescatti, F. Batista e Silva, L. Feyen, 2017. Increasing risk over time of weather-related hazards to the European population: a data-driven prognostic study. *The Lancet Planetary Health* 2017; 1: e200-08.

Figure 6-10 Regional differences from present (%) in daily average outdoor labour productivity due to climate change under high emissions scenario and a 2 degree scenario respectively⁹⁸



Animal health (specifically livestock) will be affected by climate change, with more severe impacts expected in some areas of southern Europe. In particular, higher temperatures and the increasing drought risk are expected to reduce livestock production through negative impacts on both grassland productivity, which may be partly alleviated by increased CO₂ levels, and animal health. Rising carbon dioxide concentrations and climate change will alter incidence and distribution of pests, parasites, and microbes, leading to increases in the use of pesticides and veterinary drugs. Equally, the nutritional value of agriculturally important food crops, such as wheat and rice, will decrease as rising levels of atmospheric carbon dioxide continue to reduce the concentrations of protein and essential minerals in most plant species.

Some positive impacts in northern Europe may be seen if the increased growing season for crops and grasslands boost livestock system production, but across Europe changes in the distribution of pathogens and pathogen vectors present further challenges.

Climate change will make it harder for any given regulatory approach to reduce ground-level ozone pollution in the future as meteorological conditions become increasingly conducive to forming ozone over most of the European landmass. Unless offset by additional emissions reductions, these climate-driven increases in ozone will cause premature deaths, hospital visits, lost school days, and acute respiratory symptoms. Changes in climate, specifically rising temperatures, altered precipitation patterns, and increasing concentrations of atmospheric carbon dioxide, are expected to contribute to increasing levels of some airborne allergens and associated increases in asthma episodes and other allergic illnesses.

Ticks capable of carrying the bacteria that cause Lyme disease and other pathogens will show earlier seasonal activity and a generally northward expansion in response to increasing temperatures associated with climate change.

98 JRC (2017) PESETA III Science for Policy Summary Series: Outdoor Labour Productivity and Climate Change

Regarding plant health, invasive species are expected to expand across Europe due to expected increases in temperature.

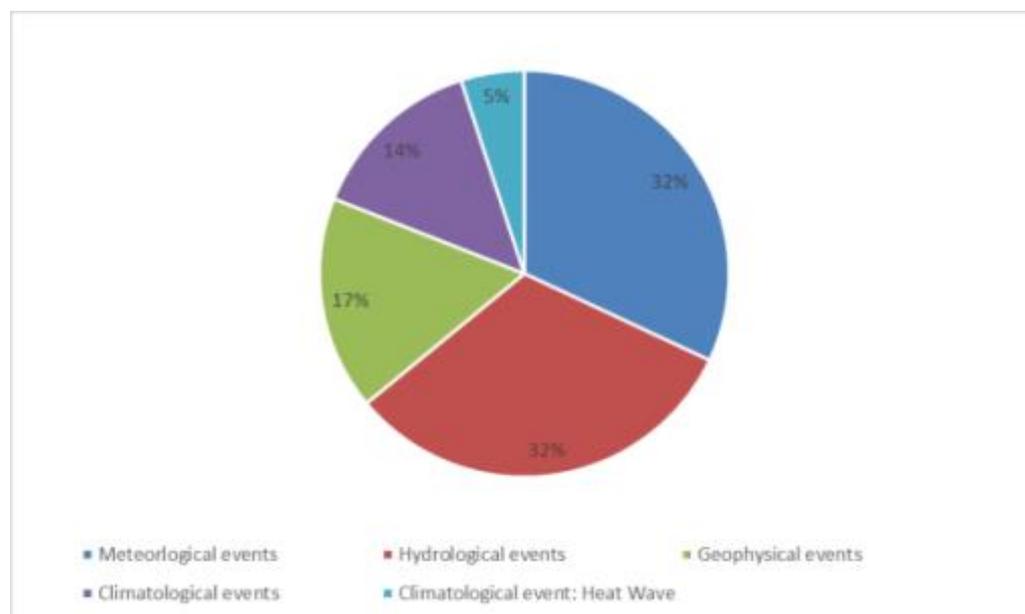
6.3.9. *Economic activity and employment*

The climate change impacts on economic activity and employment are expected to be mixed, with substantial disparities among regions in Europe. The complexity of the interlinkages between the climate and the economy mean that there is little certainty in projections.

Rising temperatures and erratic weather patterns have the potential to reduce agricultural productivity across many European regions. Extreme weather events can severely disrupt economic activity. Sea-level rise will put physical capital assets at increasing risk. On the other hand, climate change may also offer new business opportunities in the form of new products and services to help people to adapt.

Historically, the total reported economic losses caused by weather and climate-related extremes in the EEA member countries over the period 1980-2015 amount to around EUR 433 billion (in 2015 Euro values). The average annual economic losses have varied between EUR 7.5 billion in the period 1980-1989, EUR 13.5 billion in the period 1990-1999, and EUR 14.3 billion in the period 2000-2009. In the period from 2010 to 2015 the average annual loss accounted to around EUR 13.3 billion⁹⁹. The observed variations in reported economic loss over time are difficult to interpret since a large share of the total deflated losses has been caused by a small number of events. Specifically, more than 70 % of the economic losses was caused by only 3 % of all registered events¹⁰⁰. The losses by climate-event are presented in Figure 6-11 below.

Figure 6-11 Losses from Natural Hazards in EEA member countries (EUR 519 628 million)¹⁰¹



99 <http://www.eea.europa.eu/data-and-maps/indicators/direct-losses-from-weather-disasters-3/assessment>

100 <http://www.eea.europa.eu/data-and-maps/indicators/direct-losses-from-weather-disasters-3/assessment>

101 <http://www.eea.europa.eu/data-and-maps/indicators/direct-losses-from-weather-disasters-3/assessment>

Estimates of the projected economic impacts of climate change in Europe are emerging¹⁰², but the coverage of these estimates remains only partial with a considerable degree of uncertainty. Recent studies indicate that the economic costs of climate change will potentially be high, even for modest levels of climate change; these costs rise significantly for scenarios of greater levels of warming. For example, a JRC study (JRC PESETA II) estimates that the annual total damages from climate change in the EU would amount to around EUR 190 billion (with a net welfare loss estimated to be equivalent to 1.8 % of current GDP) under a reference scenario (SRES A1B) by the end of the 21st century.

These impacts would be reduced to EUR 120 billion (equivalent to 1.2 % of current GDP) in a 2 °C warmer world. The projected damage costs from climate change are distributed very heterogeneously across Europe, with notably higher impacts in southern Europe.

The CIRCE project estimated the economic costs of impacts in the Mediterranean region. Estimates suggest that there will be negative economic consequences for major sectors, such as tourism and energy. Furthermore, all Mediterranean countries could lose, on average, 1.2 % of GDP in 2050. The largest economic costs relate to sea level rise and tourism.

A recent modelling study showed that approximately 410 000 jobs would be lost by 2050 due to climate change if no further adaptation takes place.¹⁰³ The most negatively affected sectors are likely to be manufacturing and public utilities, which includes manufacturing, electricity, gas and water supply. Jobs are also likely to be lost in the retail and leisure sector.

In sectors such as agriculture, the impacts on employment are potentially small, but there are likely to be distributional impacts with positive effects in some countries and negative in others. Countries such as Bulgaria, Croatia, Estonia, Latvia, and Lithuania, Greece, and Romania which have high climate change damage costs and a relatively high share of people employed per unit of output, are more likely to experience the negative effects of climate change on their agriculture and tourism sectors.¹⁰⁴ However, the study also shows that increased levels of adaptation expenditure could have a positive impact on job creation.

6.3.10. *Social issues*

As discussed in Section 6.3.11 in the 6NC, climate change impacts are expected to affect people's daily lives in terms of employment, housing, health, water and energy access as well as the furthering of gender equality and human rights efforts. Populations in some European areas are at a higher risk from climate change than others, depending on their exposure to climatic hazards and their vulnerability.

Results from scenarios for adaptive capacity in the CLIMSAVE¹⁰⁵ project show that overall coping capacity is assumed to either improve or deteriorate substantially towards the 2020s and even further towards the 2050s, depending on the scenario. The currently prevailing spatial distribution across Europe of a higher capacity in central and north-western Europe

102 ECONADAPT: The Economics of Climate Change Adaptation; CIRCLE 2

103 Triple E (Trinomics), TNO and Ricardo AEA (2014) Assessing the implications of climate change adaptation on employment in the EU. Final report to the European Commission under contract CLIMA.C.3/ETU/2013/0013.

104 Triple E (Trinomics), TNO and Ricardo AEA (2014) Assessing the implications of climate change adaptation on employment in the EU. Final report to the European Commission under contract CLIMA.C.3/ETU/2013/0013.

105 EEA (2017) Climate impacts, vulnerability and adaptation in Europe 2016. European Environment Agency <http://www.eea.europa.eu/publications/climate-change-impacts-and-vulnerability-2016> For more information on CLIMSAVE see: <http://www.climsave.eu/climsave/index.html>

and a lower capacity in southern and in particular in (some of) Eastern Europe is projected to prevail across all scenarios. The research caveats that such trends and patterns do not provide information on particular threats and specific local contexts, and should therefore be used in conjunction with hazard-, sector- and location-specific information.

6.4. EU-level actions for adaptation to climate change

In recognition of the shared challenges and cross-border nature of climate change, the European Union has led the development of an EU-wide framework for adaptation. The European Commission started in 2007 by adopting a Green Paper “Adapting to climate change in Europe – options for EU action”¹⁰⁶. It was followed by the White Paper “Adapting to climate change: Towards a European framework for action”¹⁰⁷ in 2009. These documents led to the adoption of the ‘EU strategy on adaptation to climate change’¹⁰⁸ on 16 April 2013. The strategy predates but does not conflict with some key objectives and commitments made by the EU at the international level, including most recently the UNFCCC Paris Agreement (Article 7), the Sustainable Development Goals and the Sendai Framework on Disaster Risk Reduction¹⁰⁹ and also the Aichi biodiversity (CBD) targets. It is also in line with the ten priorities of the Juncker Commission.

The following sub-section describes the Strategy in more detail. Progress and outcomes are reported under Section 6.6.

6.4.1. *The EU Strategy on Adaptation to Climate Change*

The ‘EU strategy on adaptation to climate change’ was adopted by the European Commission on 16 April 2013. The overall aim is to contribute to a more climate-resilient Europe. This means enhancing the preparedness and capacity to respond to the impacts of climate change at local, regional, national and EU levels, developing a coherent approach and improving coordination. It sets out eight actions to meet the Strategy’s three specific objectives:

Objective 1 Promoting action by Member States

Action 1: Encourage all Member States to adopt comprehensive adaptation strategies

Action 2: Provide LIFE funding to support capacity building and step up adaptation action in Europe (2013-2020)

106 Green Paper from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions - Adapting to climate change in Europe – options for EU action <http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:52007DC0354>

107 COM(2009) 147 final WHITE PAPER Adapting to climate change: Towards a European framework for action <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2009:0147:FIN:EN:PDF>

108 <http://climate-adapt.eea.europa.eu/eu-adaptation-policy/strategy>

109 The Sendai Framework for Disaster Risk Reduction 2015-2030 (Sendai Framework) is the first major agreement of the post-2015 development agenda, with seven targets and four priorities for action. It was endorsed by the UN General Assembly following the 2015 Third UN World Conference on Disaster Risk Reduction (WCDRR). <http://www.unisdr.org/we/coordinate/sendai-framework>

Action 3: Introduce adaptation in the Covenant of Mayors framework (2013/2014)

Objective 2 Better informed decision-making

Action 4: Bridge the knowledge gap

Action 5: Further develop Climate-ADAPT as the ‘one-stop shop’ for adaptation information in Europe

Objective 3 Climate-proofing EU action: promoting adaptation in key vulnerable sectors

Action 6: Facilitate the climate-proofing of the Common Agricultural Policy (CAP), the Cohesion Policy and the Common Fisheries Policy (CFP)

Action 7: Ensuring more resilient infrastructure

Action 8: Promote insurance and other financial products for resilient investment and business decisions

6.5. Monitoring and evaluation framework

While there is no specific monitoring and evaluation framework for the EU Strategy on climate change adaptation, a number of the Actions within it are evaluated in their own right. Furthermore the Commission is evaluating progress in a cross-sectional dimension across a number of policies (including the Common Agriculture Policy and the Cohesion Policy). This includes the ‘Adaptation Scoreboard’ in relation to Action 1 was proposed in 2013 and is currently being updated in discussion with Member States (See more in Section 6.6 below); the LIFE Programme that has its own M&E framework (including a monitoring team, NEEMO); and the Covenant of Mayors for Climate and Energy, which is in the process of adopting an integrated online monitoring and reporting framework to be used by all signatures to the Covenant.

6.6. Progress and outcomes of adaptation action

Since the publication of the 6th NC in 2014, the EU and its Member States have significantly increased the number of actions for coping with the impacts of climate change at international, national and local levels as well as across sectors. These are presented in detail below, by each Action of the EU Strategy. The ongoing evaluation of the Strategy is expected to be published in early 2018.

Objective 1 Promoting action by Member States

Action 1: Encourage all Member States to adopt comprehensive adaptation strategies

To achieve coordination and coherence at the various levels of planning and management, the Commission in 2013 developed guidelines¹¹⁰ on formulating adaptation strategies and on developing, implementing and reviewing national adaptation policies. In 2014, the Commission developed an ‘adaptation preparedness scoreboard’, identifying key indicators for measuring Member States’ level of readiness¹¹¹. As part of the ongoing evaluation study, this scoreboard is being updated to align with MS reporting needs and offer a more streamlined approach to monitoring national level progress on adaptation planning and action. To date, 23 Member States have adopted national adaptation strategies as opposed to 15 in 2013. As part of an evaluation process to be completed in 2018, the Commission is assessing the general progress on adaptation action in the Member States.

By April 2017, 23 EU Member States had adopted a National Adaptation Strategy (NAS). Most of the existing strategies include very little information on implementation (e.g. monitoring, financing of adaptation action) and therefore, some countries have gone on to set out concrete action plans (NAP). These strategies and action plans are undoubtedly a good starting point for adaptation action but the 2013 EU strategy recommends that all 28 EU Member States should have their own adaptation policies adopted. Figure 6-12 shows an overview of the status of National Adaptation Strategies in EEA member countries.

Figure 6-12 below provides an overview of adaptation activities in all EU Member States.

¹¹⁰ Included practical examples, checklists, and detailed information on the range of support available at European level. See: [European Commission \(2014\) SWD 134 Guidelines on developing adaptation strategies, European Commission, Brussels.](#)

¹¹¹ <http://climate-adapt.eea.europa.eu/eu-adaptation-policy/strategy/index.html?resolveuid/bbc416202fd844b1a09f90a2990553ae>

Figure 6-12 Overview of National Adaptation Strategies in the EU

EEA Member states	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Austria													
Belgium													
Bulgaria													
Croatia													
Cyprus													
Czech Republic													
Denmark													
Estonia													
Finland										*			
France													
Germany													
Greece													
Hungary									*				
Ireland													
Italy													
Latvia													
Lithuania													
Luxembourg													
Malta													
Netherlands												*	
Poland													
Portugal											*		
Romania												*	
Slovakia													
Slovenia													
Spain													
Sweden													
United Kingdom													
Iceland													
Liechtenstein													
Norway													
Switzerland													
Turkey													

	No policy
	National adaptation strategy (NAS) in place
	National adaptation strategy (NAS) and national and/or sectoral adaptation plans (NAP/SAP) in place
	National Adaptation Strategy (NAS) updated

Action 2: Provide LIFE funding to support capacity building and step up adaptation action in Europe (2013-2020)

The EU will provide financial support for adaptation through the proposed EU financial instrument for the Environment (LIFE) with a dedicated sub-programme on Climate Action. Its general objective is to contribute to the implementation, updating and development of EU environmental policy and legislation by co-financing pilot or demonstration projects with European added value. The total LIFE Climate Action envelope for 2014-2017 is EUR 449.6 million that is split between mitigation and adaptation, with adaptation allocated a total of EUR 190.1 million. Demonstration, best-practice or governance and information projects are awarded through annual calls. Since 2014, three calls for proposals have been launched (2014, 2015 and 2016) and a fourth call (2017) is currently ongoing. LIFE also supports “integrated projects” which implement climate change adaptation strategies at regional or MS level¹¹². A new innovative financial instrument, the Natural Capital Financing Facility was introduced to the LIFE programme in 2015 (MAWP 2014 – 2017) and is implemented by the

¹¹² The first two Integrated Projects for the sub-programme on Climate Action came through the 2015 call and includes the [Danish Coast2Coast Climate Challenge project](#) (LIFE15 IPC/DK/000006).

European Investment Bank. The NCFE contributes to meeting the objectives set out by LIFE, in particular “nature and biodiversity” and “climate change adaptation” by providing financial solutions to bankable projects promoting the conservation, restoration, management and enhancement of natural capital for biodiversity and climate adaptation benefits¹¹³. The first operations are expected to be signed in 2017.

Action 3: Introduce adaptation in the Covenant of Mayors framework (2013/2014)

Building on the success of the Covenant of Mayors, created in 2008 to implement the EU 2020 climate and energy targets, the Mayors Adapt initiative invited cities to voluntarily commit to anticipating and preparing for the inevitable impacts of climate change. Signatory cities undertook to contribute to the EU’s Adaptation Strategy by developing comprehensive local adaptation strategies or integrating these into relevant existing plans.

The Covenant of Mayors for Climate & Energy was launched in 2015 with the aim to inform, mobilise and support cities. It integrates the Mayors Adapt initiative that was launched in 2014. More than 800 cities have committed to the new integrated targets since the integrated Covenant was established. Together with the former Mayors Adapt signatories, this brings almost 900 cities committed to adaptation planning and action. It is expected that by the end of 2017 around 100 European cities will have submitted a climate risk and vulnerability assessment as well as indicative adaptation actions. There is a strong potential for thousands of cities to join. Signatories now pledge to:

- Reduce CO₂/GHG emissions by at least 40 % by 2030;
- Adapt to the impacts of climate change;
- Translate their political commitment into local results by developing local action plans and reporting on their implementation.

Objective 2 Better informed decision-making

Action 4: Bridge the knowledge gap

The Strategy, recognizing that substantial knowledge gaps need to be filled, identifies the need for the European Commission to work with Member States and stakeholders in refining these knowledge gaps and identifying the relevant tools and methodologies to address them. These findings are then fed into the EU’ Framework Programme for Research and Innovation 2014-2020 – Horizon 2020, where they will be addressed through specific programmes and by mainstreaming climate action across the full programme.

Research is key for effective adaptation, as practical adaptation actions and measures must be based on sound, scientific, technical and socio-economic information. This has been recognised by the European Commission and the level of spending on impacts and vulnerability assessment and adaptation has increased significantly since the 6th NC.

The key mechanism that the EU uses to support research in Europe is Horizon 2020, which is funding EUR 80 billion over 7 years from 2014 to 2020. Horizon 2020 aims to support smart, sustainable and inclusive economic growth¹¹⁴. Climate action is one of the cross-cutting

113 See: <http://www.eib.org/products/blending/ncff/index.htm>

114 <https://ec.europa.eu/programmes/horizon2020/en/what-horizon-2020>

issues mainstreamed in Horizon 2020. It is estimated that overall climate-related expenditure should exceed 35 % of the total Horizon 2020 budget. The programme aims to further improve understanding of the causes and impacts of climate change and better coordinate efforts to address them¹¹⁵. It also aims to pool resources to develop better tools, methods and standards to help assess the impact of climate change and adaptation responses.

The research projects on impacts, vulnerability and adaptation that have been funded through Horizon 2020 and the preceding research funds (the European Commission 6th and the 7th Framework Programmes) are summarised in Chapter 7.

The Joint Research Centre (JRC) is the scientific and technical arm of the European Commission. It provides scientific advice and technical expertise to support a wide range of EU policies such as climate change adaptation. JRC has presented an overview on research carried out in order to support the EU climate change policy, taking into account support for mitigation and adaptation¹³⁰. These include:

- Studies on the economic impacts of climate change in the EU (JRC PESETA I and PESETA II and PESETA III). The main purpose of the PESETA I study was to make a consistent physical and economic assessment of the impacts of climate change in Europe at the end of the 21st century for various sectors. PESETA II, released in 2014, responds to a need to provide quantitative modelling support to the European Commission services regarding the impacts of climate change in Europe¹¹⁶. JRC PESETA III is expected to be completed later in 2017;
- Support to Climate-ADAPT by providing data and content from in-house sources such as the European Forest Data Centre, European Database of Vulnerabilities, etc.;
- Report on Environment and human health with one chapter on climate change (joint JRC-EEA report)¹³².

The European Environment Agency (EEA) has also had a significant role in advancing the knowledge base on climate change impacts, vulnerability and adaptation in recent years. The EEA produces integrated environmental data and indicator sets, assessments and thematic analyses in order to provide a sound decision basis for environmental and climate change policies in the EU and Member States and for cooperation with candidate and potential candidate countries. Further information on the JRC and EEAs role in research is given in Section 8.2.1.5.

Action 5: Further develop Climate-ADAPT as the ‘one-stop shop’ for adaptation information in Europe

Climate-ADAPT is a European Commission initiative that aims to facilitate access to sound adaptation information in Europe. It is managed by the EEA, and covers EEA member countries (EU MS plus Iceland, Lichtenstein, Norway, Turkey and Switzerland). It is a repository of information submitted by different providers covering sector and national policies, case studies of implemented adaptation actions, projects, knowledge tools, networks

¹¹⁵ <https://ec.europa.eu/programmes/horizon2020/en/h2020-section/fighting-and-adapting-climate-change-1>

¹¹⁶ Ciscar JC, Feyen L, Soria A, Lavalle C, Raes F, *et al.* (2014). Climate Impacts in Europe. The JRC PESETA II Project. JRC Scientific and Policy Reports, EUR 26586EN. http://publications.jrc.ec.europa.eu/repository/bitstream/JRC87011/reqno_jrc87011_final%20report%20ready_final3.pdf

and a database. It also provides information on adaptation strategies at different governance levels in Europe, and access to specifically designed tools to support adaptation planning and implementation. It is one of the most visited EEA thematic sites. Over the past years EEA has updated the platform's content with information from countries (as submitted under the MMR, article 15); EU research and other EU funded projects and many other sources. A bi-monthly newsletter on climate change adaptation in Europe has been in place since early 2015 with increasing numbers of subscribers. Regular webinars have been held with providers and users, as well as expert meetings with managers of national and other knowledge platforms to enhance complementarity with Climate-ADAPT. An evaluation is currently being undertaken to assess the actions related to Climate-ADAPT in sharing knowledge on climate change impacts, vulnerability and adaptation at the European level.

Objective 3 Climate-proofing EU action: promoting adaptation in key vulnerable sectors

Action 6: Facilitate the climate-proofing of the Common Agricultural Policy (CAP), the Cohesion Policy and the Common Fisheries Policy (CFP)

The European Commission remains strongly committed to mainstreaming adaptation into key EU funds, policies and programmes. The Commission intends to ensure improved access to funding as a critical factor in building a climate-resilient Europe and supporting Member States' adaptation activities. The European Structural and Investment Funds (ESIF) is the EU's main investment policy tool (with about 43 % of the EU budget). The ESIF is a family of five EU funds and has a budget of EUR 454 billion for the period 2014-2020. Through investments in climate action, about 25 % of the funds contribute to EU climate policy objectives simultaneously. These funds help deliver the EU Regional and Cohesion Policy, the EU Common Agricultural Policy, the EU Integrated Maritime Policy and the EU Common Fisheries Policy, as well as Social and Employment Policy.

Action 7: Ensuring more resilient infrastructure

Infrastructure projects, which are characterised by a long life span and high costs, need to withstand the current and future impacts of climate change. The European Commission is continuing to explore all the potential ways at its hand to enhance the adaptation capacity of European infrastructures, from mainstreaming to standardisation, to ecosystem-based approaches or providing further guidance to project developers. The European Financing Institutions Working Group on Adaptation to Climate Change (EUFIWACC) developed guidelines for project development and the execution of Mandate M/526 to revise infrastructure standards for energy, transport, buildings and constructions is now at "full speed".

Action 8: Promote insurance and other financial products for resilient investment and business decisions

The European Commission's aim is to improve the market penetration of natural disaster insurance and to unleash the full potential of insurance pricing and other financial products for risk awareness prevention and mitigation and for long-term resilience in investment and business decisions. Floods have resulted in 4 700 fatalities and caused direct economic losses

of more than EUR 150 billion (based on 2013 values), which is almost one-third of the damage caused by all natural hazards. Less than a quarter of these damages were insured.

To address this gap, ongoing work is being undertaken on:

- Taking stock of insurance mechanisms covering weather and climate related disaster risks, applied in (and beyond) the EU;
- Determining cost effectiveness of insurance mechanisms;
- Analysis of which mechanisms incentivise prevention of risk and support damage reduction;
- Definition of next steps in insuring weather and climate related extreme events.

7. FINANCIAL, TECHNOLOGICAL AND CAPACITY-BUILDING SUPPORT

Key developments

- The EU's provision of bilateral financial support has increased during the reporting period, from USD 1 281 million (€ 964 million) in 2013 to USD 3 020 million (€ 2 730 million) in 2016¹¹⁷.
- Total financial support provided by the EU in the years 2015 and 2016 amounted to USD 4 702 million (€ 4 247 million).
- Financial support for climate change adaptation has increased during the reporting period, from USD 878 million (€ 661 million) in 2013 to USD 1 316 million (€ 1 190 million) in 2016.
- Financial support for Least Developed Countries (LDCs) increased during the reporting period, from USD 382 million (€ 288 million) in 2013, to USD 1 062 million (€ 960 million) in 2016.
- The EU has increased targeted support to the poorest and most vulnerable countries, through a variety of policies and measures, but specifically through the European Development Fund (EDF), Development Cooperation Instrument (DCI), and a new phase of the EU Global Climate Change Alliance Plus (GCCA+) Initiative, with respective commitments of USD 33 739 million (€ 30 500 million), USD 21 681 million (€ 19 600 million) and USD 479 million (€ 432 million) during 2014-2020.

7.1. Introduction

This chapter includes information on financial, technological and capacity-building support provided by the EU to developing country Parties to the UNFCCC Convention¹¹⁸, during the years 2015 and 2016. EU support reported here comprises funds committed by EU institutions and the European Investment Bank (EIB). It does not include contributions by individual Member States, which can be found in each Member State's respective National Communication and Biennial Report. In some cases, the qualitative information reported may refer to Member State activities, but where this occurs this will be clearly stated.

The methodology used to track financial support is outlined in [3BR] Section 6.2.3. This includes details on how support has been categorised as 'new and additional', and how the purpose of the support has been defined as either mitigation, adaptation or cross-cutting.

Where the reporting guidelines require similar information to be provided in both the National Communication and the Biennial Report, such information has been provided in the Biennial Report only. In these cases, the reader will be referred to the respective chapter in the Biennial Report.

¹¹⁷ EUR have been converted to USD for all figures using the OECD-DAC annual average exchange rates: <https://data.oecd.org/conversion/exchange-rates.htm>

¹¹⁸ This includes non-Annex I countries as well as Annex-I countries with economies in transition (the Russian Federation, the Baltic States, and several Central and Eastern European States). Specifically, Annex-I countries with economies in transition included in the National Communication and Biennial Report are Belarus, Turkey, and Ukraine.

7.2. Provision of ‘new and additional’ resources

Information on the EU’s approach to the provision of climate finance, including the provision of new and additional resources, can be found in [3BR] Section 6.2.

7.3. Assistance to developing country Parties that are particularly vulnerable to climate change

Information on EU assistance to developing country Parties that are particularly vulnerable to climate change can be found in [3BR] Section 6.2.

7.4. Provision of financial resources through multilateral channels

Information on EU provision of financial resources through multilateral channels can be found in [3BR] Section 6.3.

7.5. Provision of financial resources through bilateral channels

Information on EU provision of financial resources through bilateral channels can be found in [3BR] Section 6.3.

7.6. Activities related to the transfer of technology and capacity building

Information on EU activities related to the transfer of technology and capacity building can be found in [3BR] Sections 6.4 and 6.5.

8. RESEARCH AND SYSTEMATIC OBSERVATIONS

Key Developments

The EU contributes to research and systematic observation (RSO) through the involvement of multiple actors, by means of a suite of instruments, tools and programmes, and across multiple sectoral policies.

Key vehicles include Horizon 2020, the EU's 2014-2020 framework programme for research and innovation, which is investing heavily in climate action, with approximately 35 % of its budget expected to be used for climate-relevant research and innovation.

Other action includes: LIFE (the EU's 2014-2020 funding instrument for the environment and climate); and the 2014-2020 programme for the competitiveness of enterprises and SMEs. In addition international cooperation is enhanced through various platforms and instruments; and contributions are made to and/or financial support provided for major international institutions, research initiatives and programmes, such as the UNFCCC, the Intergovernmental Panel on Climate Change (IPCC) and the global climate observing system (GCOS), and Mission Innovation – launched in the margins of COP 21 to accelerate global clean energy innovation through the doubling of clean energy R&I public investments in the next 5 years.

To facilitate the implementation of the strategy on accelerating clean energy research and innovation, over EUR 2 billion in Horizon 2020's work programme (2018-2020) have been allocated to programmable actions addressing four interconnected research and innovation priorities (decarbonising the EU's building stock by 2050, strengthening EU leadership in renewables, developing affordable and integrated energy storage solutions, and electromobility and a more integrated urban transport system). In addition, further research investments from Member States towards low-carbon energy are planned through the Strategic Energy Technologies (SET) Plan. It promotes research and innovation efforts across Europe by supporting the most impactful technologies in the EU's transformation to a low-carbon energy system. It promotes cooperation amongst EU countries, companies, research institutions, and the EU itself.

8.1. Introduction

Research on climate change processes and impacts on natural resources and humankind helps us to identify and assess key drivers and improves our understanding of their interactions. The EU contributes to Research and Systematic Observation (RSO) through the involvement of multiple actors (see Section 8.2.1.5) and through a suite of instruments, tools and programmes and across multiple sectoral policies (see Section 8.2.1.6).

EU-funded research aims to better understand the climate evolution (past, present, future), identify and quantify its impact on ecosystems and humans (from local to global scales) and facilitate the design and development of highly effective, cost-efficient response strategies and technologies.

The EU Framework Programme for Innovation, Horizon 2020, is the biggest EU Research and Innovation Programme to date with nearly 80 billion euros of funding available between 2014 and 2020 – in addition to the private investment that this money will attract.

Research is a shared competence with the Member States. A strong partnership is being ensured by building on the work of the Strategic Forum for International Science and Technology Cooperation (SFIC). SFIC is a strategic forum and an advisory body to the Council and the Commission with a view to implementing a European Partnership in the field of international scientific and technological cooperation (S&T cooperation). SFIC is composed of the European Commission, all EU MS and several non-EU countries as observers.

As an advisory body, SFIC plays an active role in the implementation of the S&T cooperation agreements with third countries and high level policy dialogues with international partner countries and regions. Country-specific Working Groups have contributed to creating a more coherent strategy for research and innovation (R&I) cooperation with specific partner countries and regions.

In the EU, certain research and innovation policy measures are designed and implemented at national level by EU MS and others are done at EU level. The EU level work forms the scope of this chapter.

The chapter begins by describing in general terms the policy and funding of RSO, the EU's participation in GCOS's activities and finally points to some of most emblematic RSO projects.

8.2. General policy on and funding of research and systematic observations

8.2.1. General policy on RSO

Different countries are developing different scientific and research strengths. By combining research teams from all over the world, access to new data and scientific results and innovative solutions can be enhanced. For Europe, cooperation means accessing new sources of knowledge, attracting fresh scientific talent and investment, agreeing on common procedures for conducting research and developing common standards.

8.2.1.1. European research and support for climate action

Environmental research and innovation for climate action is centred around in Horizon 2020's Societal Challenge on "[Climate action, environment, resource efficiency and raw materials](http://ec.europa.eu/programmes/horizon2020/en/h2020-section/climate-action-environment-resource-efficiency-and-raw-materials)"¹¹⁹. This has the objective of achieving a resource efficient and climate change resilient economy and society, protecting and sustainably managing natural resources and ecosystems and ensuring a sustainable supply and use of raw materials, to meet the needs of a growing global population within the sustainable limits of the planet's natural resources and eco-systems.

Helping to build a green economy in synchronisation with the natural environment, is part of the answer. Therefore Horizon 2020 activities focus on moving towards a "green" society and economy and they seek to address knowledge gaps to understand changes in the environment,

¹¹⁹ European Commission, The EU Framework Programme for Research and Innovation, Climate Action, Environment, Resource Efficiency and Raw Materials, 2017, (Webpage accessed on 13-06-2017) <http://ec.europa.eu/programmes/horizon2020/en/h2020-section/climate-action-environment-resource-efficiency-and-raw-materials>

Other societal challenges such as on "Secure, Clean and Efficient Energy" and on "Smart, Green and Integrated Transport" are also relevant to climate action.

identify the policies, methods and tools that would most effectively tackle the challenges, and support innovators and businesses to bring green solutions to the market.

Through its last work programme covering the period 2018-2020, Horizon 2020 will continue supporting research and innovation relevant for the objectives of the Paris Agreement. Dedicated projects and activities funded under the programme will produce data and scientific knowledge for climate action, design realistic pathways for achieving the global and European mitigation and adaptation goals and develop ground-breaking technological and non-technological solutions, including for the energy, transport and industrial systems. Actions will support a broad range of EU policies and objectives, such as the EU's energy and climate policies, Arctic policy, Adaptation Strategy and climate diplomacy efforts. They will also boost cooperation with strategic partner countries and key regions of the world.

8.2.1.2. Relation to work of IPCC and UNFCCC and other international initiatives

Throughout its implementation period Horizon 2020 contains specific actions designed to provide input to the IPCC¹²⁰ and to deliver commitments made under the Belmont Forum and the Group on Earth Observation (GEO).

EU research projects also have been and are producing significant results for several international activities under different frameworks, such as the United Nations Framework Convention on Climate Change, the 2030 Agenda for Sustainable Development, the Sendai Framework for Disaster Risk Reduction, the Habitat III Conference on Sustainable Urban Development, and a number of environmental agreements. For instance, more than one thousand publications from FP7 projects¹²¹ contributed to the fifth Assessment Report of the IPCC that provided scientific grounds for global, European and national climate action. Similarly, systems and services such as the Knowledge Centre for Disaster Risk Management and the Copernicus services implemented by the EC underpin the realisation of several these commitments.

8.2.1.3. Changes Post-Paris¹²²

Around 35 % of the funding for the Horizon 2020 programme is expected to be invested in climate related-projects. However, by November 2016, budget implementation seemed to be somewhat lagging behind this target. The Paris Agreement provides a strong incentive to address the gap in the upcoming Horizon 2020 work programmes that will cover the 2018-2020 period.

120 EUR-Lex Access to European Union Law, COM2016(0657) (Webpage accessed on 13-06-2017): <http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=COM:2016:0657:FIN>

121 Projects funded under the 7th EU Research and Innovation Framework Programme that ran between 2007 and 2013, or briefly FP7.

122 European Commission DG Climate Action, Implementing the Paris Agreement. Progress of the EU towards the at least -40% target, 2016, https://ec.europa.eu/clima/sites/clima/files/eu_progress_report_2016_en.pdf

8.2.1.4.Space Policy^{123,124}

Article 189 of the Treaty on the Functioning of the European Union (TFEU) confers on the Union a shared space competence which it pursues alongside that of the Member States. The Union thus has a specific mandate to draw up a European space policy, and, "to this end, it may promote joint initiatives, support research and technological development and coordinate the efforts needed for the exploration and exploitation of space". To this end, "...Parliament and the Council shall establish the necessary measures, which may take the form of a European space programme".

Europe — the Member States, the European Space Agency (ESA), the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) and the EU — has achieved many successes in space with breakthrough technologies and exploration missions, such as ESA's Rosetta mission and unique Copernicus' Earth observation and Meteosat's meteorology oriented capabilities. Europe represents today the second largest public space budget in the world with programmes and facilities spanning different European countries. The EU alone will invest over EUR 12 billion in space activities between 2014 and 2020. It owns world class space systems including those associated with the Copernicus programme for Earth observation. The EU currently has 18 satellites in orbit and over 30 planned in the next 10 to 15 years.

Space technologies, data and services can support numerous EU policies and key political priorities, including economic competitiveness, migration, climate change, the Digital Single Market and sustainable management of natural resources.

In 2016, the European Commission proposed a new Space strategy for Europe, focused on four strategic goals: maximising the benefits of space for society and the EU economy; fostering a globally competitive and innovative European space sector; reinforcing Europe's autonomy in accessing and using space in a secure and safe environment; and strengthening Europe's role as a global actor and promoting international cooperation. Three of these goals relate to observation programmes:

- Maximising the benefits - Copernicus is one of the leading providers of Earth observation data. The full exploitation of data, products and information delivered by Copernicus remained a challenging task due to some technical barriers. Therefore, the Commission facilitates access to and exploitation of space data enabling their cross-fertilisation with other sources of data;
- Competitive and innovative European space sector - as part of the New Skills Agenda for Europe, the Commission will launch a dedicated sector skills alliance for space/Earth observation gathering key stakeholders from industry, research, universities and public authorities to tackle new skills requirements in the sector;
- Promoting international cooperation - the Commission has been using EU space programmes to contribute to and benefit from international efforts through initiatives

123 European Commission, Towards a space strategy for the European Union that benefits its citizens, COM(2011) 152, <http://eur-lex.europa.eu/legal-content/en/ALL/?uri=CELEX:52011DC0152> (Webpage accessed on 19-06-2017).

124 European Commission, Space strategy for Europe, COM(2016) 705, <http://www.ipex.eu/IPEXL-WEB/dossier/document/COM20160705.do> (Webpage accessed on 19-06-2017).

such as the Global Earth Observation System of Systems (GEOSS) and the Committee on Earth Observation Satellites (CEOS) through links with Copernicus.

8.2.1.5. Main RSO actors

As already clarified above, in the EU there are two sets of RSO actions that can be distinguished: those that are implemented by Member States and others that are coordinated at the EU level. The latter make up the scope of this chapter and a complex set of institutions contributes to these activities.

A more detailed description of the roles and responsibilities of the main RSO actors at the EU level was provided in the EU's 6NC for the following actors. Updates only have been mentioned here.

*Directorate-General for Research and Innovation (DG RTD)*¹²⁵

The mission of the DG Research and Innovation is to develop and implement the European research and innovation policy with a view to achieving the goals of Europe 2020 and the Innovation Union.

*Joint Research Centre (JRC)*¹²⁶

As the Commission's in-house science service, the JRC's mission is to provide EU policies with independent, evidence-based scientific and technical support throughout the whole policy cycle.

*Directorate-General GROW – Internal Market, Industry, Entrepreneurship and SMEs*¹²⁷

The European Commission's DG GROW is responsible for EU policy on the single market, industry, entrepreneurship and small businesses. DG GROW's responsibilities were previously covered by the DG for Internal Market (DG MARKT) and the DG for Enterprise and Industry (DG ENTR). DG GROW has the mission of helping turn the EU into a smart, sustainable and inclusive economy by implementing the industrial and sectorial policies of the flagship Europe 2020 initiative. Additionally it is responsible for completing the internal market for goods and services, fostering entrepreneurship and growth by reducing the administrative burden on small businesses; facilitating access to funding for small and medium-sized enterprises; supporting access to global markets for EU companies; generating policy on the protection and enforcement of industrial property rights, coordinating the EU position and negotiations in the international intellectual property rights (IPR) system, and assisting innovators on how to effectively use IPR; delivering the EU's space policy via the two large-scale programmes, i.e. Copernicus (the European Earth Observation programme) and Galileo (the European global navigation satellite system), as well as research action to spur technological innovation and economic growth.

125 European Commission, Directorate-General for Research & Innovation – Mission, 2015, <http://ec.europa.eu/research/index.cfm?pg=dg> (Webpage accessed on 19-06-2017).

126 EU Science Hub, the European Commission's science and knowledge service, JRC, 2017, <https://ec.europa.eu/jrc/en> (Webpage accessed on 19-06-2017).

127 European Commission, Directorate-General GROW, Internal Market, Industry, Entrepreneurship and SMEs, 2017 <https://ec.europa.eu/info/departments/internal-market-industry-entrepreneurship-and-smes> (Webpage accessed on 19-06-2017).

*Directorate-General for Climate Action*¹²⁸

DG Climate Action was established in February 2010, climate change being previously included in the remit of DG Environment. It leads international negotiations on climate, helps the EU to deal with the consequences of climate change and to meet its targets for 2020 and develops and implements the EU Emissions Trading System (EU ETS)¹²⁹.

*European Environment Agency (EEA)*¹³⁰ and *European Environment Information and Observation Network (EIONET)*¹³¹

The EEA is an agency of the European Union. The EEA aims to support sustainable development by helping to achieve significant and measurable improvement in Europe's environment, through the provision of timely, targeted, relevant and reliable information to policymaking agents and the public. EIONET is a partnership network of the EEA and its member and cooperating countries. The EEA is responsible for developing the network and coordinating its activities.

*European Space Agency (ESA)*¹³²

ESA is Europe's gateway to space. Its mission is to shape the development of Europe's space capability and ensure that investment in space continues to deliver benefits to the citizens of Europe and the world. ESA's job is to draw up the European space programme and implement it.

*European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT)*¹³³

EUMETSAT purpose is to supply weather and climate-related satellite data, images and products – 24 hours a day, 365 days a year – to the National Meteorological Services of Member and Cooperating States in Europe, and other users worldwide. EUMETSAT has a fully integrated cooperation with the United States, sharing and exploiting a joint polar system with their [National Oceanographic and Atmospheric Administration](#) (NOAA) which includes two satellites - Metop and NPP Suomi – flying on complementary polar orbits, the so called “mid-morning” and “afternoon” orbits. EUMETSAT is also rapidly developing cooperation with satellite operators of China, India, Japan, Korea and Russia to coordinate their respective missions, exchange data and expertise, facilitate distribution of EUMETSAT data world-wide and expand the portfolio of data services available to Member States.

Looking into the longer term future, EUMETSAT has already started to develop, in cooperation with [ESA](#), the future geostationary and low Earth satellite systems required to deliver and further improve observations in the 2020 to 2040 timeframe¹³⁴. In addition,

128 Directorate-General for Climate Action (DG-CLIMA), Data Providers and Partners, 2011, European Environment agency. <https://www.eea.europa.eu/data-and-maps/data-providers-and-partners/directorate-general-for-climate-action> (Webpage accessed on 19-06-2017).

130 The European Environment Agency. who we are/ what we do/how we do it, 2015, <https://www.eea.europa.eu/publications/eea-general-brochure> . Also <https://www.eea.europa.eu/> (Webpage accessed on 19-06-2017)

131 EIONET (website), News from across the EIONET. <http://www.eionet.europa.eu/> (Webpage accessed on 19-06-2017).

132 ESA (website), 2017, United space in Europe. <http://www.esa.int/ESA> (webpage accessed on 19-06-2017).

133 EUMETSAT. 2017. Monitoring weather and climate from space. <http://www.eumetsat.int/website/home/index.html> (Webpage accessed on 19-06-2017).

134 EUMETSAT. 2017. Monitoring weather and climate from space. <http://www.eumetsat.int/website/home/index.html> (Webpage accessed on 19-06-2017).

EUMETSAT provides data, products and support services to the Copernicus information services and user communities, with a focus on marine, atmosphere and climate¹³⁵.

*European Institute of Innovation & Technology (EIT)*¹³⁶

The EIT is a body of the European Union that aims to enhance Europe's ability to innovate by nurturing entrepreneurial talent and supporting new ideas. Its mission is to contribute to the competitiveness of Europe, its sustainable economic growth and job creation by promoting and strengthening synergies and cooperation among businesses, education institutions and research organisations. It also aims to create favourable environments for creative thought, to enable world-class innovation and entrepreneurship to thrive in Europe. EIT integrates higher education, research and business in areas of high societal need through the Knowledge and Innovation Communities (KICs). Climate-KIC¹³⁷ and EIT's InnoEnergy¹³⁸ aim to significantly accelerate the innovation required for a transformation to a low-carbon economy, and to ensure Europe benefits from new technologies, company growth and jobs. Climate KIC has adopted four sectoral approaches to guide climate innovation and tackle climate change including urban transitions, sustainable production systems, decision metrics and finance and sustainable land use¹³⁹. EIT's InnoEnergy tackles all fields related to the transformation of the energy system into a low-carbon one: energy storage, energy efficiency, renewables, chemical fuels, smart grids, among others.

The below are new key RSO actors that were created since the publication of the EU's 6NC.

*European Research Council (ERC)*¹⁴⁰

The aim of the European Research Council (ERC) is to provide attractive and flexible funding to enable talented and creative individual researchers and their teams to pursue ground-breaking, high-gain/high-risk research in any field at the frontier of science. The ERC was set up under the 2007-2013 research framework programme (FP7) and managed the 'Ideas' initiative. Both the Ideas and Horizon 2020 objectives are fully in line with the aims of the Europe 2020 strategy designed to deliver smart, sustainable and inclusive growth through the strengthening of every link in the innovation chain, from 'blue sky' research to commercialization and contribute to the Commission's general objective A new boost for Jobs, Growth and Investment.

For that purpose, the ERC is composed on the one hand of an independent Scientific Council of 22 scientists, scholars and engineers of the highest repute who establish the overall ERC's scientific strategy and have full authority over decisions on the type of research to be funded. On the other hand, a dedicated implementation structure in the form

135 EUMETSAT, 2017, About Copernicus. <http://www.eumetsat.int/website/home/Copernicus/AboutCopernicus/index.html> (Webpage accessed on 19-06-2017).

136 European Institute of Innovation & Technology. 2017. EIT – Making Innovation Happen. <https://eit.europa.eu/> (Webpage accessed on 19-06-2017).

137 Climate-KIC, 2017. About us. www.climate-kic.org (Webpage accessed on 19-06-2017).

138 <http://www.innoenergy.com/>

139 Climate-KIC, 2017, We adopt four sectoral approaches to guide climate innovation and tackle climate change. <http://www.climate-kic.org/themes/> (Webpage accessed on 19-06-2017).

140 ERCEA, Annual work programme 2017, http://ec.europa.eu/info/publications/executive-agencies-2017-annual-work-programmes_en (Webpage accessed on 19-06-2017).

of an executive Agency (ERCEA) is responsible for the administrative implementation and programme execution under the supervision of its parent Directorate-General, DG RTD.

By supporting the best research and making Europe a magnet for world-class talent, the ERC contributes actively to the Commission’s political guidelines, pushing knowledge forward in a variety of fields including energy and climate.

Research Executive Agency (REA)

The REA is a funding institution for research and innovation, which manages EU research grants. Responsibilities of the REA include to help manage parts of Horizon 2020, run research projects supported under Horizon 2020 and FP7 (a predecessor programme to Horizon 2020), provide support to clients (e.g. applicants for funding, beneficiaries and independent experts), keep close contact with beneficiaries of EU funds, manage the EC research enquiry service and support independent experts evaluating project proposals competing for EU research funds.

Executive Agency for SMEs (EASME)

The Executive Agency for SMEs (EASME) replaces the executive agency for competitiveness and innovation that managed Enterprise Europe Network, Intelligent Energy – Europe, Eco-innovation and Marco Polo. The aim of EASME is to create a more competitive and resource-efficient European economy based on knowledge and innovation. EASME provides support to beneficiaries to turn EU policy into action and it manages significant parts of COSME, LIFE and Horizon 2020.

8.2.1.6. Main instruments, policies and programmes

Table 8-1 provides an overview of the relevant main EU programmes on research and systematic observation.

Table 8-1 Main EU programmes on research and systematic observation

Heading	Programme	Short description
1a: Competitiveness for growth and jobs (includes the European Fund for Strategic Investment (EFSI))	Copernicus	The European Earth Observation Programme
	Horizon 2020	The Framework Programme for research and innovation
	CEF	Connecting Europe Facility
	COSME	Programme for the Competitiveness of Enterprises and small and medium-sized enterprises: EU’s programme dedicated to support SMEs
2 Sustainable growth: Natural resources	LIFE	French: L’Instrument Financier pour l’Environnement

Horizon 2020

Horizon 2020 (2014-2020) is the EU's main instrument for funding research and innovation in Europe and beyond from 2014 to 2020.

Horizon 2020 is also the financial instrument implementing the [Innovation Union](#), a [Europe 2020](#) flagship initiative aimed at securing Europe's global competitiveness. It ‘promises more breakthroughs, discoveries and world-firsts by taking great ideas from the lab to the market’¹⁴¹, including in the field of climate action.

Seen as an instrument to drive economic growth and create jobs, Horizon 2020 has the political backing of Europe’s leaders and the Members of the European Parliament. They agreed that research is an investment in the EU’s future and so put it at the heart of the EU’s blueprint for smart, sustainable and inclusive growth and jobs.

By coupling research and innovation, Horizon 2020 is helping to achieve this with its emphasis on excellent science, industrial leadership and tackling societal challenges. The goal is to ensure Europe produces world-class science, removes barriers to innovation and makes it easier for the public and private sectors to work together in delivering innovation.

Horizon 2020 is open to everyone, with a simple structure that aims to reduce red tape and time so participants can focus on what is important.

This multi-annual regional programme relies on contributions from 28 EU Member States and 14 Associated Countries¹⁴². Legal entities from any country are eligible to join as consortium members any project proposals to Horizon 2020 calls. Participation from outside the European Union is explicitly encouraged in many calls for proposals¹⁴³.

Horizon 2020 is structured around three main research areas which are called “pillars”:

- **Excellent Science**, the first pillar, focuses on basic science;
- **Industrial Leadership**, the second pillar, has a budget of 14 billion euro, 18 % of the total Horizon 2020 budget. This is based on Europe 2020 and Innovation Union strategies and is managed by DG Enterprise;
- **Societal Challenges**, the third pillar, funds potential solutions to social and economic problems.

The societal challenge on climate action is particularly relevant for this chapter, as well as some elements of the following societal challenges: health, food security, energy and transport. There are also climate-related projects funded under the first pillar (Excellent Science).

*LIFE*¹⁴⁴

The LIFE Programme (French: L’Instrument Financier pour l’Environnement) is the European Union’s funding instrument for the environment and climate action. The general objective of LIFE is to contribute to the implementation, updating and development of EU environmental and climate policy and legislation by co-financing projects with European added value. LIFE began in 1992 and to date there have been four complete phases of the

141 European Commission, The EU Framework Programme for Research and Innovation, What is Horizon 2020?, 2015. (Webpage accessed on: 13-06-2017) <https://ec.europa.eu/programmes/horizon2020/en/what-horizon-2020>

142 Iceland, Norway, Albania, Bosnia and Herzegovina, the former Yugoslav Republic of Macedonia, Montenegro, Serbia, Turkey, Israel, Moldova, Switzerland, Faroe Islands, Ukraine, Tunisia, Georgia and Armenia (http://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/3cp/h2020-hi-list-ac_en.pdf)

143 http://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/3cp/h2020-hi-3cp_en.pdf

144 European Commission. 2017. LIFE (2014 – 2020). Available from: <http://ec.europa.eu/environment/life/funding/lifeplus.htm> [accessed on 20/07/2017].

programme (LIFE I: 1992-1995, LIFE II: 1996-1999, LIFE III: 2000-2006 and LIFE+: 2007-2013). The current programme LIFE runs from 2014 to 2020 with a budget of 3.4 billion Euro.

European Research Area (ERA)

The European Commission's 2012 policy Communication on the European Research Area¹⁴⁵ led to a significant improvement in Europe's research performance to promote growth and job creation.

With the explicit objective of opening up and connecting EU research systems – important due to the increased cross-national nature of research – the ERA reform agenda focuses on five key priorities:

- More effective national research systems;
- Optimal transnational co-operation and competition on common research agendas, grand challenges and infrastructures;
- An open labour market for researchers facilitating mobility, supporting training and ensuring attractive careers;
- Gender equality and gender mainstreaming in research encouraging gender diversity to foster science excellence and relevance;
- Optimal circulation and transfer of scientific knowledge to guarantee access to and uptake of knowledge by all.

The ERA-NET instrument under Horizon 2020 is designed to support public-public partnerships in their preparation, establishment of networking structures, design, implementation and coordination of joint activities as well as topping up of single joint calls and of actions of a transnational nature.

The ERA-NET under Horizon 2020 merges the former ERA-NET and ERA-NET Plus into a single instrument with the central and compulsory element of implementing one substantial call with top-up funding from the Commission. The focus of ERA-NETs is therefore shifting from the funding of networks to the top-up funding of single joint calls for transnational research and innovation in selected areas with high European added value and relevance for Horizon 2020. This aims at increasing substantially the share of funding that Member States dedicate jointly to challenge driven research and innovation agendas. Financial contributions of Member States can be in cash or in kind to broaden the scope of ERA-NETs towards the coordination institutional funding of governmental research organisations.

The Joint Programming Initiatives (JPI) are also part of the ERA. Particularly relevant in this context are the JPI on Connecting Climate Knowledge for Europe (JPI-Climate) and on Agriculture, Food Security and Climate Change (FACCE-JPI). The concept of Joint Programming was introduced by the European Commission in July 2008.

¹⁴⁵ European Commission. 2017. European Research Area. Available from: http://ec.europa.eu/research/era/index_en.htm [accessed on 25/07/2017].

JPI-Climate¹⁴⁶ is a pan-European intergovernmental initiative gathering European countries to jointly coordinate climate research and fund new transnational research initiatives that provide useful climate knowledge and services for post-COP21 Climate Action.

JPI-Climate connects scientific disciplines, enables cross-border research and increases the science-practice interaction. JPI-Climate contributes to the overall objective of developing a ERA and to underpin the European efforts in tackling the societal challenge of climate change. The JPI-Climate Strategic Research and Innovation Agenda (SRIA) sets out three overarching challenges and one strategic mechanism that together are intended to develop and support excellent, innovative, relevant and informative climate research. The framing – especially the emphasis on connectivity and synergy - reflects the priorities and approaches of researchers, funders and practitioners in the countries participating in JPI-Climate.

The Joint Programming Initiative on Agriculture, Food Security and Climate Change (FACCE-JPI)¹⁴⁷ brings together 22 countries who are committed to building an integrated ERA addressing the interconnected challenges of sustainable agriculture, food security and impacts of climate change.

FACCE-JPI provides and steers research to support sustainable agricultural production and economic growth, to contribute to a European bio-based economy, while maintaining and restoring ecosystem services under current and future climate change. The integrated FACCE-JPI strategic research agenda defines five core research themes:

- Sustainable food security under climate change, based on an integrated food systems perspective: modelling, benchmarking and policy research perspective;
- Environmentally sustainable growth and intensification of agricultural systems under current and future climate and resource availability;
- Assessing and reducing trade-offs between food production, biodiversity and ecosystem services;
- Adaptation to climate change throughout the whole food chain, including market repercussions;
- Greenhouse gas mitigation: nitrous oxide and methane mitigation in the agriculture and forestry sector, carbon sequestration, fossil fuel substitution and mitigating GHG emissions induced by indirect land use change.

An implementation plan was launched in the summer of 2015, setting out short-term and mid-term priority actions to implement the FACCE-JPI strategic research agenda, in coherence with the Work-Programme of Horizon 2020.

In 2016 saw an update to the original Strategic Research Agenda named "FACCE-JPI in brief". This update refreshed the original five core themes, reframing them around new, more impact-driven research priorities.

¹⁴⁶ JPI Climate. 2017. Connecting Climate Knowledge for Europe. Available from: <http://www.jpi-climate.eu/home>. [accessed on 20/07/2017].

¹⁴⁷ Agriculture, Food Security and Climate Change (FACCEJPI). What is FACCE-JPI? Available from: <http://www.facecpi.com/About-Us/What-is-FACCE-JPI> [accessed on 20/07/2017].

The JPI Urban Europe¹⁴⁸ was created in 2010 to address the global urban challenges of today with the ambition to develop a European research and innovation hub on urban matters and create European solutions by means of coordinated research. Research themes for 2014 to 2020 include: sustainable transition pathways; and urban environmental sustainability and resilience.

Article 185¹⁴⁹

Article 185 of the Treaty on the Functioning of the European Union (TFEU) enables the EU to participate in research programmes undertaken jointly by several Member States, including participation in the structures created for the execution of national programmes.

The actions supported may cover subjects not directly linked to the themes of Horizon 2020, as far as they have a sufficient EU added value. They will also be used to enhance the complementarity and synergy between Horizon 2020 and activities carried out under intergovernmental structures such as EUREKA¹⁵⁰ and COST¹⁵¹.

148 Urban Europe. 2017. Introduction JPI Urban Europe. Available from: <http://jpi-urbaneurope.eu/about/intro/> [accessed on 20/07/2017].

149 European Commission. 2017. European Research Area What is Article 185? Available from: http://ec.europa.eu/research/era/what-is-art-185_en.htm [accessed on 20/07/2017].

150 Eureka Network – Innovation Across Borders. 2017. Eureka Cluster Success Story. Available from: <http://www.eurekanetwork.org/> [accessed on 20/07/2017].

151 Cost, European Cooperation in Science and Technology. 2017. About Cost. Available from: <http://www.cost.eu/> [accessed on 20/07/2017].

*Copernicus*¹⁵²

Through satellite and in-situ observations, six Copernicus services deliver near-real-time data, products and information on a global level which can also be used for local and regional needs, to help us better understand our planet and sustainably manage the environment we live in. A detailed description of Copernicus, its users, management and services can be found in section 8.4.1.2. under cross-cutting activities in systematic observations.

Summary information on GCOS activities

GCOS is intended to be a long-term, user-driven operational system capable of providing the comprehensive observations required for:

- Monitoring the climate system;
- Detecting and attributing climate change;
- Assessing impacts of, and supporting adaptation to, climate variability and change
- Application to national economic development; and
- Research to improve understanding, modelling and prediction of the climate system.

As contributing to GCOS, the EU contributes to the collection of Atmospheric, Oceanic and Terrestrial Essential Climate Variables (ECVs) through Copernicus, the European system for monitoring the Earth. GCOS assesses and communicates requirements for climate observations and data products, identifies in particular the ECVs on which data are needed, advises on and promotes implementation and reviews progress and reports to its sponsors and the UNFCCC. In its latest report on implementation needs GCOS also makes the link between climate needs and those serving other international forums such as the UN Convention to Combat Desertification, the Convention to combat desertification, the Convention on Biological Diversity, the Ramsar convention on wetlands, the Sendai framework for disaster risk reduction and the Sustainable Development Goals of Agenda 2030.

The European Commission has undertaken to evaluate the status quo and future plans for the provision of climate data and identify what actions are required to build on existing and planned capacities to secure a dependable and comprehensive information source for climate data. The Copernicus' Climate Change service will in particular contribute to the provision of ECVs, climate analyses and projections at temporal and spatial scales relevant to adaptation and mitigation strategies for the various EU sectoral policies.

8.2.1.7. International Cooperation

Fostering international cooperation in research and innovation is a strategic priority for the EU, as it allows:

- Access to the latest knowledge and the best talent worldwide;
- To tackle global societal challenges more effectively;
- To create business opportunities in new and emerging markets;
- To support external policy through science diplomacy.

¹⁵² Copernicus, Europe's eyes on Earth. 2017. Copernicus in brief. Available from: <http://www.copernicus.eu/main/copernicus-brief> [accessed on 20/07/2017].

Horizon 2020, the EU's framework programme for research and innovation, is open to participants from across the world and with many topics specifically targeting international cooperation. Cooperation takes place in research and innovation projects, networking between projects, joint or coordinated calls and specific joint initiatives.

The European Commission is leading the way in many global research partnerships. Very often research and innovation to tackle societal challenges in areas like health, food, energy and water is best implemented through global multilateral initiatives where solutions can be developed and deployed more effectively. These multilateral initiatives are important to address EU commitments to international objectives like the 2030 Agenda for Sustainable Development; COP21 (also referred to as the Paris Agreement); Mission Innovation (launched in the margins of COP 21, see also Section 9.9.2.4), to accelerate global clean energy innovation through the doubling of clean energy R&I public investments in the next 5 years; or the WHO Resolutions, to reduce the global burden and pool resources for better results and greater impact.

Knowledge and technology should also circulate as freely as possible in a "global research area". To enable researchers to work together smoothly across borders, e.g. on large-scale common challenges, the European Commission is working to address obstacles to efficient international cooperation by ensuring fair and equitable framework conditions. This includes issues such as reciprocal access to programmes, mechanisms for co-funding, mutual access to resources and efficient and fair intellectual property rights systems. To do so, the EU concluded 20 [Science & Technology \(S&T\) agreements](#) and maintains several policy dialogues with countries and regions across the globe.

Established in 1984, the Committee on Earth Observation Satellites (CEOS) coordinates civil space-borne observations of the Earth. Participating agencies strive to enhance international coordination and data exchange and to optimize societal benefit. Currently, 60 members and associate members made up of space agencies, national, and international organizations participate in CEOS planning and activities. It is noteworthy that the European Commission will chair CEOS activities in 2018.

8.2.2. *Funding of RSO*

The EU is among the world leaders in research and innovation and is regarded as an attractive partner for international cooperation. Environmental research is a particularly good example of EU efforts to provide a common reference framework and tackle global societal challenges – whether they relate to climate, disasters, water or pollution – together with international partners.

Considering the crucial role of research and innovation in tackling climate change¹⁵³, funding for climate action has been mainstream in the EU's multiannual financial framework 2014-2020, incl. in main EU research funds, see Table 8-22. In Horizon 2020 'climate action, resource efficiency and raw materials' has been identified as one of the societal challenges that will drive the activities from research to market in Horizon 2020. Low-carbon solutions in the energy system, mobility and transport will be the focus of two other societal challenges. The programme marks a new emphasis on innovation-related solutions

¹⁵³ European Commission. 2017. Research and Innovation – Pushing boundaries and improving quality of life Available from: https://europa.eu/european-union/sites/europaeu/files/research_en.pdf [accessed on 25/07/2017].

and it is expected that around 35 % of the Horizon 2020 budget of around € 80 billion will be climate related expenditure; see Table 8-2.

Table 8-2 Climate Mainstreaming 2014 – 2020 – totals by programme

Climate Mainstreaming 2014 – 2020 – totals by programme ¹⁵⁴		(EUR million, commitment appropriations)							
Heading	Programme	2014	2015	2016	2017	2018	2019	2020	Total
1a	Copernicus	€ 120.4	€ 190.3	€ 200.7	€ 209.7	€ 220.8	€ 299.1	€ 213.5	€ 1 454.4
	Horizon 2020	€ 2 090.9	€ 2 251.1	€ 2 053.5	€ 2 103.5	€ 2 458.1	€ 2 691.9	€ 2 918.8	€ 16 567.8
	CEF	€ 1 115.0	€ 959.0	€ 1 761.0	€ 1 631.0	€ 1 618.0	€ 1 970.0	€ 1 939.0	€ 10 993.0
	COSME	€ 21.2	€ 21.6	€ 21.1	€ 23.9	€ 23.8	€ 24.7	€ 26.9	€ 163.2
2	LIFE	€ 190.9	€ 202.2	€ 216.4	€ 227.5	€ 248.6	€ 266.0	€ 276.6	€ 1 628.1

¹⁵⁴ European Commission – An EU budget focused on results Available from: http://ec.europa.eu/budget/mff/lib/COM-2016-603/SWD-2016-299_en.pdf [accessed on 25/07/2017].

Additionally, the European fund for strategic investments (EFSI) is a € 16 billion guarantee from the EU budget, complemented by a € 5 billion allocation of resources from the European Investment Bank (EIB). This fund supports strategic investment in key areas such as infrastructure, education, research, innovation and risk finance for small businesses. It is capable of leveraging € 315 billion from other public and private sources. The EFSI has already financed renewable energy demonstration projects, including RES-related transport, industry and energy storage. On 16 September 2016, the European Commission proposed an extension of the fund to focus further on innovative, low-carbon projects for the 2018-2020 period. This proposal reinforces the concept of "additionality" to ensure that only projects that would not have happened without the EFSI are chosen. In view of their importance for the single market, cross-border infrastructure projects, including services, have been specifically identified as providing additionality. The proposal should deliver a total of at least half a trillion euro of investment by 2020. The Commission called on the co-legislators to consider its proposal as a matter of priority.

To follow up on the Paris Agreement and support developing and neighbouring countries in implementing their climate action plans, the EU aid budgets also integrate climate.

8.2.2.1. Horizon 2020

As described in 8.2.1.6, Horizon 2020 (2014-2020) is the EU's main instrument for funding research in Europe and beyond from 2014 to 2020. This multi-annual regional programme relies on contributions from 28 EU Member States and 14 Associated Countries¹⁵⁵. Legal entities from any country are eligible to submit project proposals to Horizon 2020 calls in consortium with EU partners.

Funding for the research areas of Horizon 2020 is as follows:

- Excellent Science, the first pillar, focuses on basic science and has a budget of 24 billion euro, 30 % of the total Horizon 2020 budget;
 - The European Research Council (ERC) delivers funding based on scientific excellence of the applications to researchers and teams of researchers (13 billion euro),
 - Future and Emerging Technologies (FET) (2.7 billion euro¹⁵⁶) actions radically new lines of technology through unexplored collaborations between advanced multidisciplinary science and cutting-edge engineering,
 - Marie Skłodowska-Curie Action (MSCA) receives 6.1 billion euro of the first pillars budget. This supports the career development and training of researchers at all stages of their careers,
 - Large European research infrastructure are also funded from the first pillar (2.5 billion euro).
- Industrial Leadership, the second pillar, has a budget of 14 billion euro, 18 % of the total Horizon 2020 budget. This pillar contains special efforts on SME

¹⁵⁵ European Commission. 2017. Associated Countries Available from: http://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/3cpart/h2020-hi-list-ac_en.pdf [accessed on 25/07/2017]

¹⁵⁶ European Commission. 2017. Future and Emerging Technologies Available from: <http://ec.europa.eu/programmes/horizon2020/en/h2020-section/future-and-emerging-technologies> [accessed on 25/07/2017]

- funding and also gives risk financing through loans of the European Investment Bank (2.8 billion euro);
- Societal challenges, the third pillar, funds potential solutions to social and economic problems. It is split into seven sub-programs;
 - Health (7.5 billion euro),
 - Food, water, forestry, bio economy (3.8 billion euro),
 - Energy (5.9 billion euro),
 - Transport (6.3 billion euro),
 - Climate action, environment, resource efficiency, and raw materials (3.1 billion euro),
 - European society (1.3 billion euro),
 - Security (1.7 billion euro).

Progress has been, and continues to be, made in reducing fragmentation across the European Research Area and in strengthening coordination of national and regional research programmes. Horizon 2020 is supporting two main tools to achieve these goals – the ERA-NET scheme and actions under Article 185, as described below.

8.2.2.2.LIFE

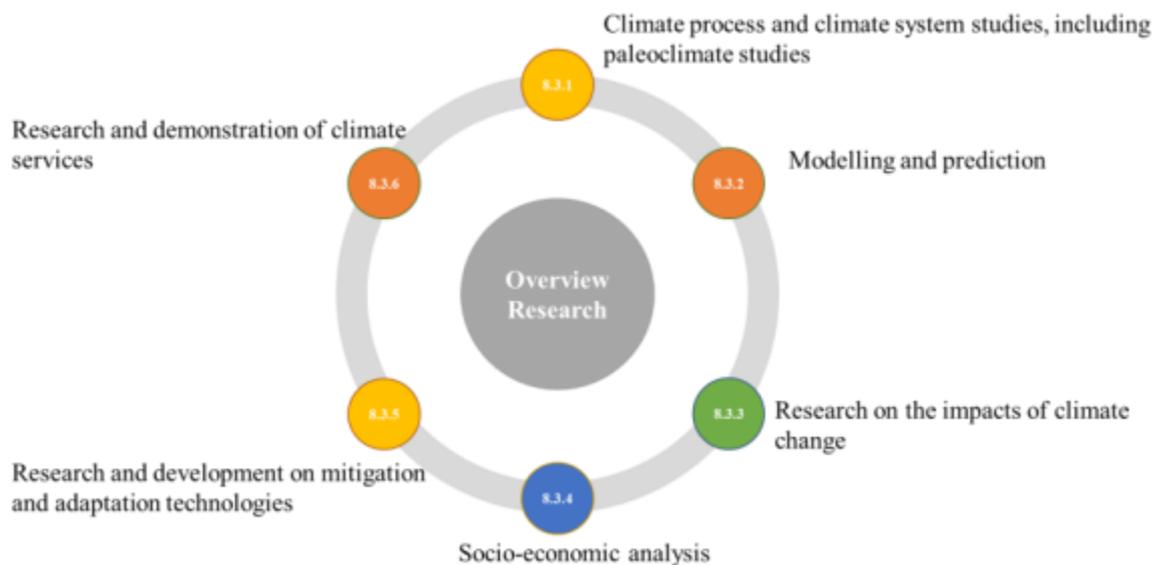
As described under Section 8.2.1.6., the LIFE Programme (French: L'Instrument Financier pour l'Environnement) is the European Union's funding instrument for the environment and climate action. From 1992 LIFE has co-financed some 4 306 projects across the EU.

The LIFE programme for 2014-2020, with a budget of € 3.4 billion, will support public authorities, NGOs and private actors, especially small and medium enterprises, in testing small-scale low carbon and adaptation technologies, new approaches and methodologies to address climate issues. Specific local and regional climate mitigation or adaptation strategies or action plans will also be financed. Moreover, the sub-programme will support capacity building as well as awareness-raising actions involving stakeholders, in order to improve the implementation of the existing climate legislation.

8.3. Research

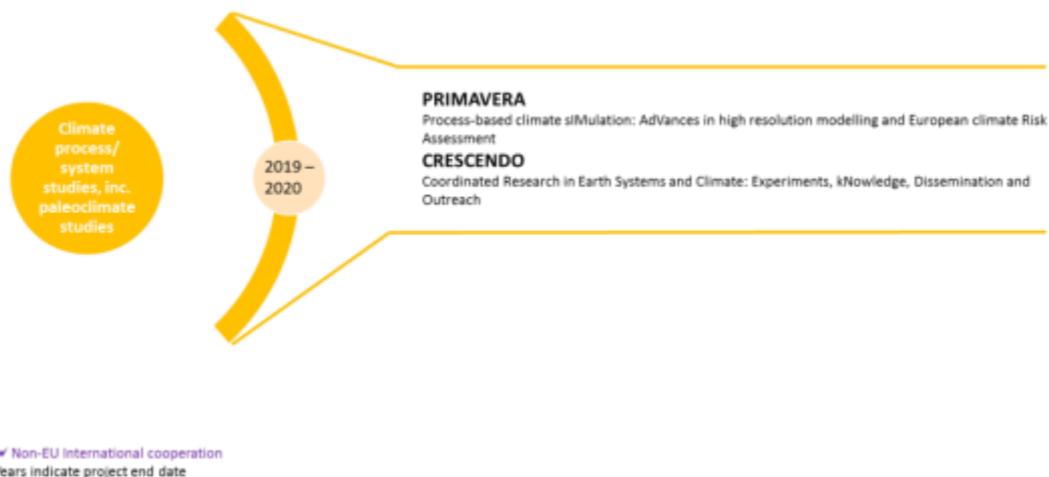
Figure 8-1 gives an overview of the main areas for research projects and the sections where they are discussed in this national communication.

Figure 8-1 Overview of main areas of research projects and section numbers

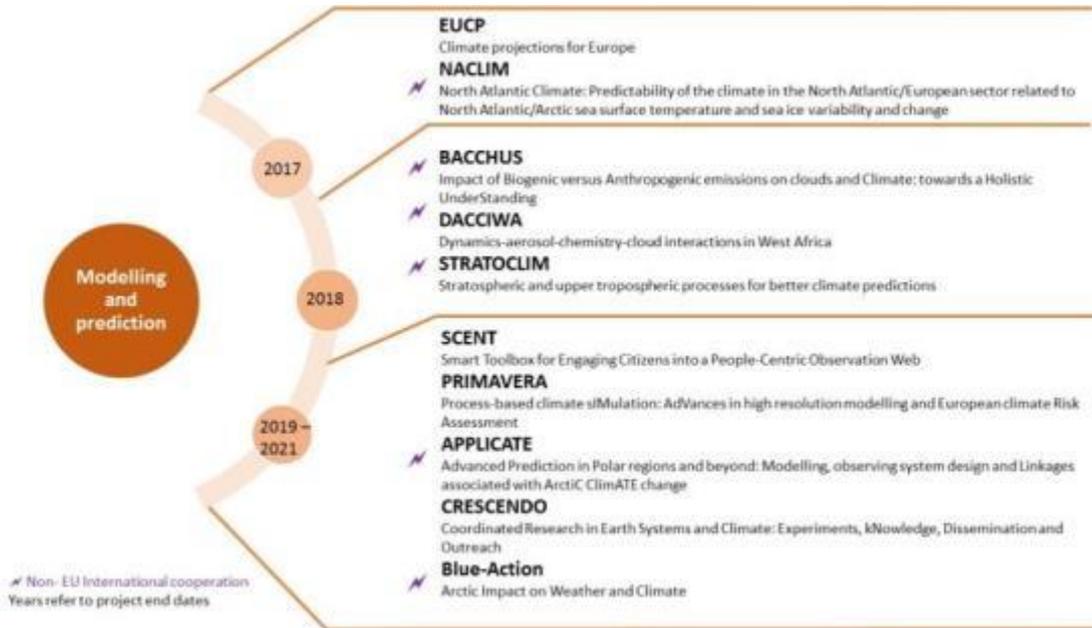


8.3.1. Climate process and climate system studies, including paleoclimate studies

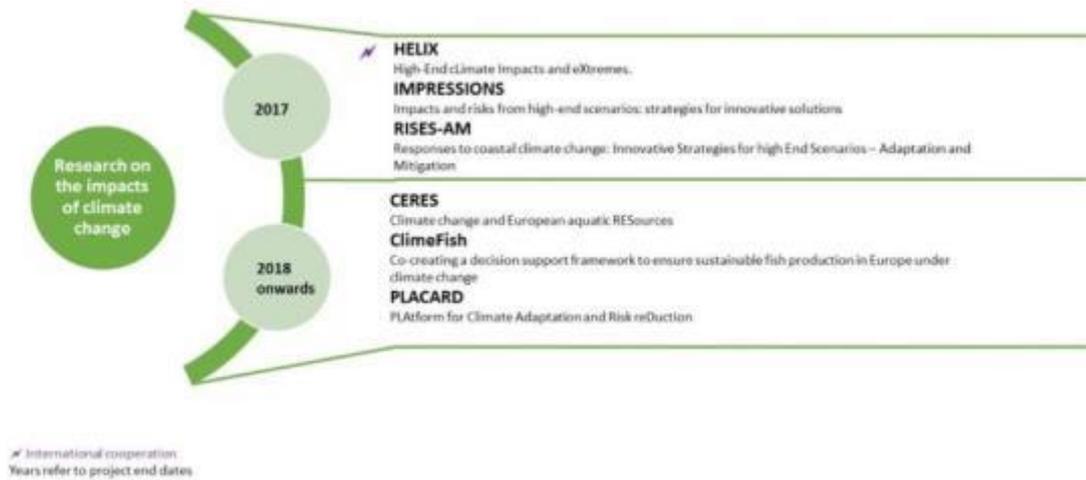
For most of the areas in Sections 8.3, 8.4 and 8.5, a selection of key projects is listed as in the diagram below. This includes some additional information such as the end date of the project and whether it included cooperation with participants from outside the EU. Further information about the projects, including their end date, EU contribution and website is given in Appendix III.



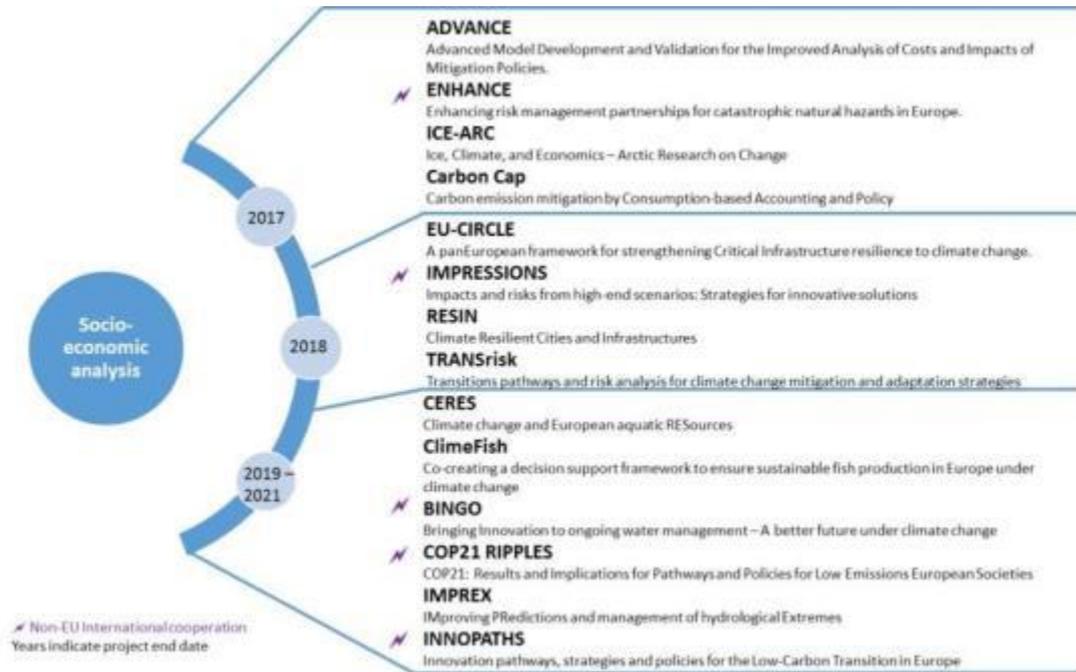
8.3.2. Modelling and prediction, including general circulation models



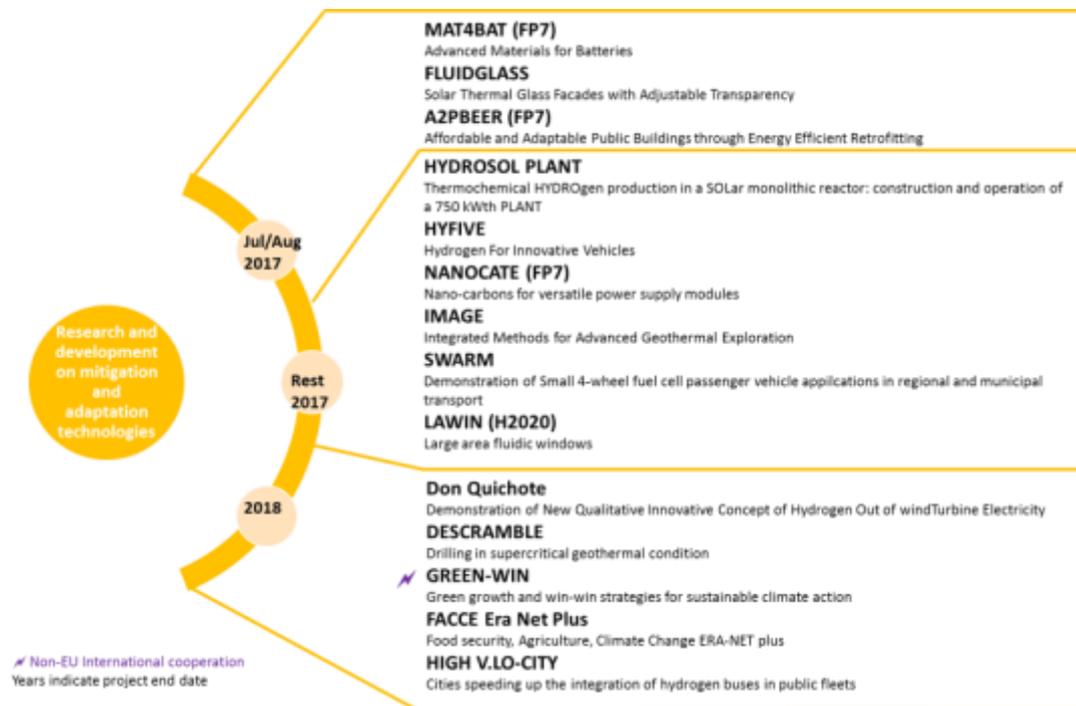
8.3.3. Research on the impacts of climate change

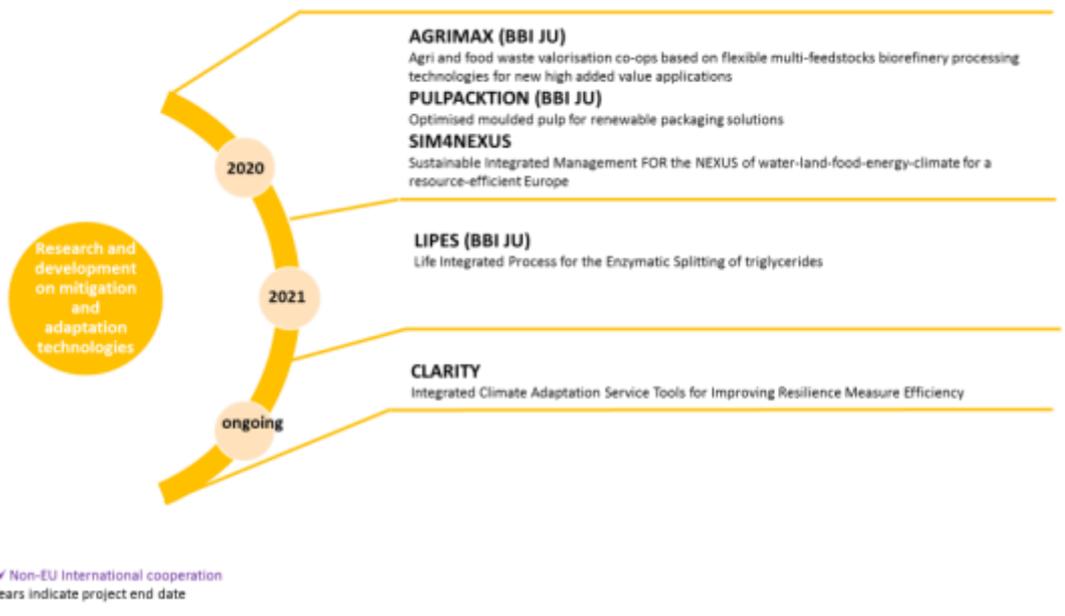
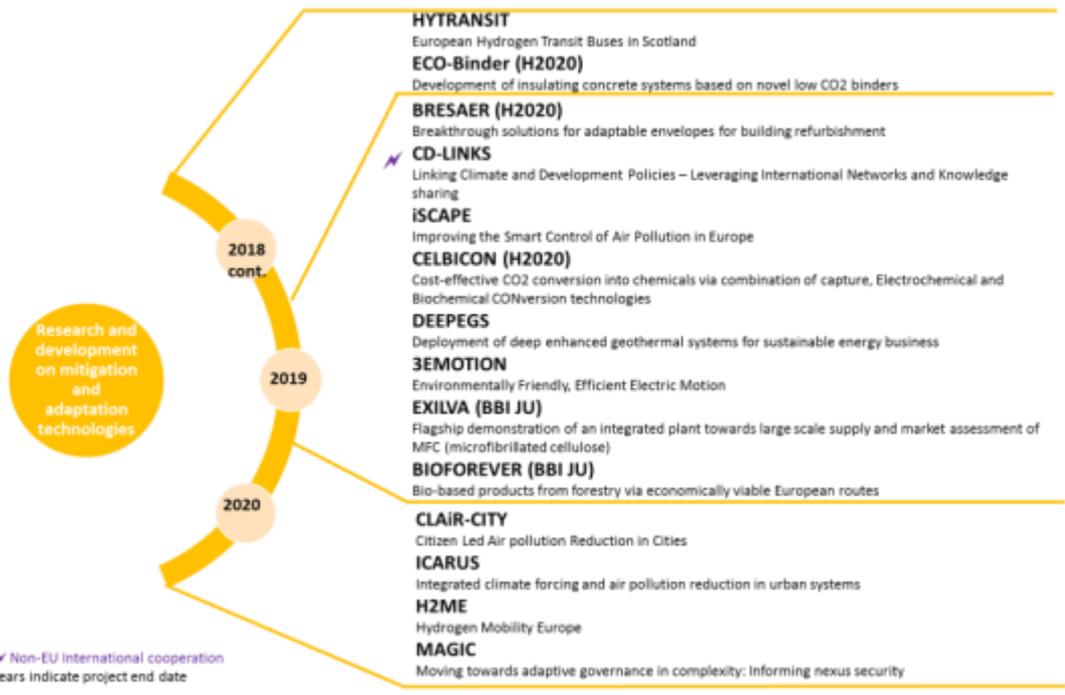


8.3.4. Socio-economic analysis, including analysis of both the impacts of climate change and response options

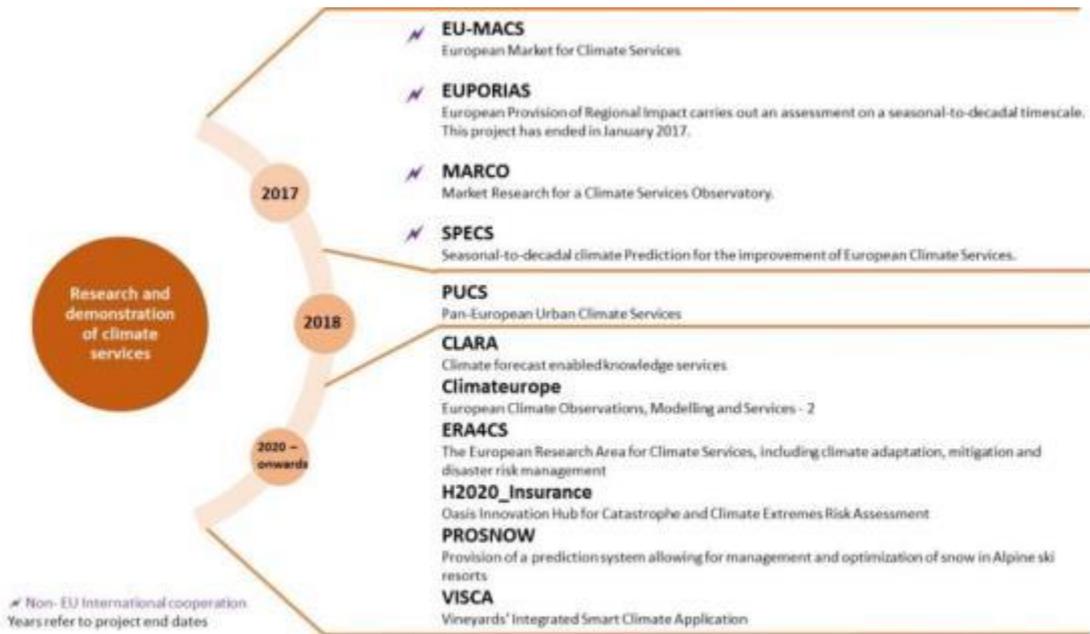


8.3.5. Research and development on mitigation and adaptation technologies





8.3.6. Research and demonstration of climate services



8.4. Systematic observation

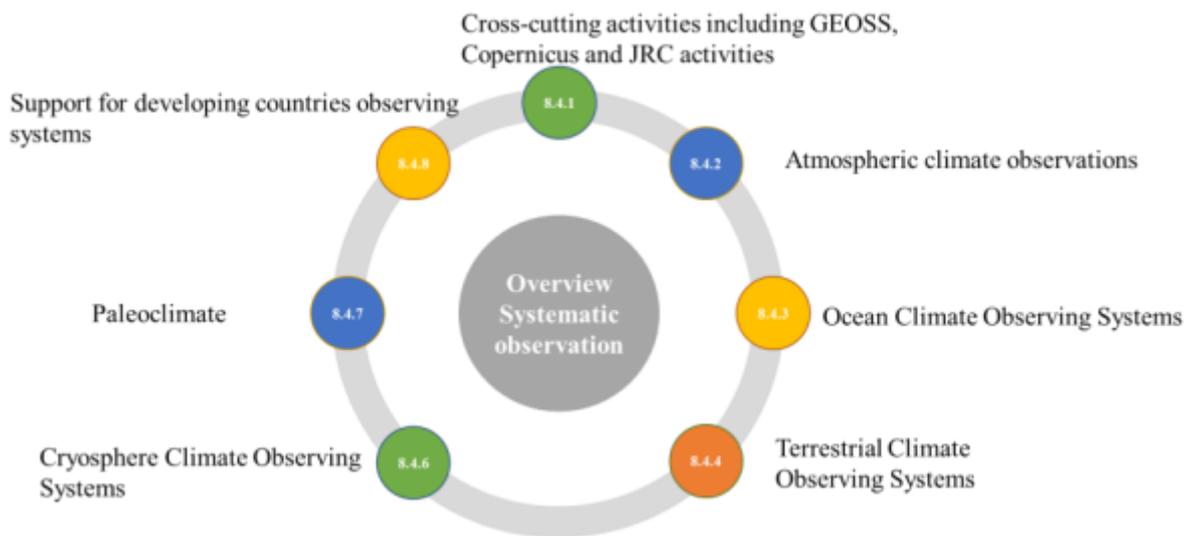
The EU contributes to Systematic Observation through various channels and various programmes and projects. This section will describe both the cross-cutting activities including GCOS, (see 8.2.3), GEOSS (see 8.4.1.1), Copernicus (see 8.4.1.2), JRC activities (see 8.4.1.3) and other key projects and programmes on systematic observation.

The following topics include the description of the most emblematic projects and programmes on systematic observation covering:

- Atmospheric climate observing systems, including those measuring atmospheric constituents;
- Ocean climate observing systems;
- Terrestrial climate observing systems;
- Cryosphere climate observing systems;
- Paleoclimate;
- Support for developing countries to establish and maintain observing systems, related data and monitoring systems.

Figure 8-2 gives an overview of the main areas for systematic observation projects and the sections where they are discussed in this national communication.

Figure 8-2 Overview of main areas of systematic observation projects and section numbers



8.4.1. Cross-cutting activities

8.4.1.1. Global Earth Observation System of Systems (GEOSS)

The Earth’s atmosphere, oceans and landscapes are changing rapidly, with human activities being a major driver. Monitoring and modelling these changes are critical for governments, private sector and citizens to make informed decisions on the global challenges our society is facing. Vital information is being gathered by land, sea, air and space-based Earth observation systems.

The Group on Earth Observations (GEO) brings together 103 partner countries from around the world, including the European Commission and 109 participating organizations to connect the demand for sound and timely environmental information with the supply of data and information about the Earth. Together, the GEO community is creating a Global Earth Observation System of Systems (GEOSS) to better integrate observing systems and share data by connecting existing infrastructures using common standards. There are more than 200 million open data resources in GEOSS.

Advocacy for broad, open data policies helps ensure that the data collected through national, regional and global observing systems is both made available and applied to decision-making for global priorities including The Sustainable Development Goals, The Paris Agreement on climate change, The Sendai Framework for Disaster Risk Reduction and Aichi Targets of The Convention on Biodiversity. GEOSS provides open and unrestricted access to millions of observation data, items of information and products. These can be used to tackle issues including protecting people against natural disasters, responding to climate change, managing energy resources or promoting sustainable agriculture, among other societal challenges.

In January 2014, government ministers from the GEO member countries resolved to renew GEO's mandate for a further decade. This second phase of GEO (2016-2025) will be crucial in terms of stepping up the use of a more robust GEOSS.

The GEO Workplan 2017-2025 brings together experts to ensure global collaboration, identify gaps and reduce duplication in the areas of Biodiversity and Ecosystem Sustainability; Disaster Resilience; Energy and Mineral Resources Management; Food Security; Infrastructure & Transportation Management; Public Health Surveillance; Sustainable Urban Development; and Water Resources Management.

The EU is a driving force within GEO. The European Commission, as a founding member and one of the four co-chairs of this initiative, and the EU Member States are contributing actively to this international effort. This has resulted in strengthened transnational collaboration in Earth observation activities within and outside the EU.

The EU Research and Innovation programmes have been pivotal in building the GEOSS, with more than € 200 M invested over the period 2007-2013 and with ongoing support by Horizon 2020 activities. Copernicus, the European Earth observation programme, also provides a crucial framework for the achievement of a strong and visible European contribution.

The current transition period in GEO is a unique window of opportunity for Europe to assess and review its position in this global initiative. Therefore, the European Commission has conducted several consultations of experts and society to identify preliminary issues and possible EU-level actions to improve coordination of Earth Observations through GEO and speed up the evolution of the GEOSS into a system with the capacity to contribute to EU policies and benefit EU industry and European society as a whole. The outcomes of these consultations were consolidated in the Commission document "Global Earth Observation System of Systems (GEOSS): achievements to date and challenges to 2025" and in the report which resulted from a public consultation conducted in 2015.

8.4.1.2. Copernicus

Through satellite and in-situ observations, Copernicus services deliver near-real-time data, products and information on a global level which can also be used for local and regional needs, to help us better understand our planet and sustainably manage the environment we live in.

Copernicus is served by a set of dedicated satellites (the Sentinel families) and contributing missions (existing commercial and public satellites). The Sentinel satellites are specifically designed to meet the needs of the Copernicus services and their users. Since the launch of Sentinel-1A in 2014, the European Union set in motion a process to place a constellation of almost 20 more satellites in orbit before 2030.

Copernicus also collects information from In-situ networks, which deliver data acquired by a multitude of sensors on the ground, at sea or in the air.

The Copernicus Services transform this wealth of satellite and in-situ data into value-added information by processing and analysing the data. Datasets stretching back for years and

decades are made comparable and searchable, thus ensuring the monitoring of changes; patterns are examined and used to create better forecasts, for example, of the ocean and the atmosphere. Maps are created from imagery, features and anomalies are identified and statistical information is extracted.

These value-adding activities are streamlined through six thematic streams of Copernicus services:

- Atmosphere (CAMS) (See Section 8.4.2.1);
- Marine (CMEMS) (See Section 8.4.3.1);
- Land (CLMS) (See Section 8.4.4.1);
- Climate Change (C3S) (see Section 8.4.5.1);
- Emergency (EMS);
- Security.

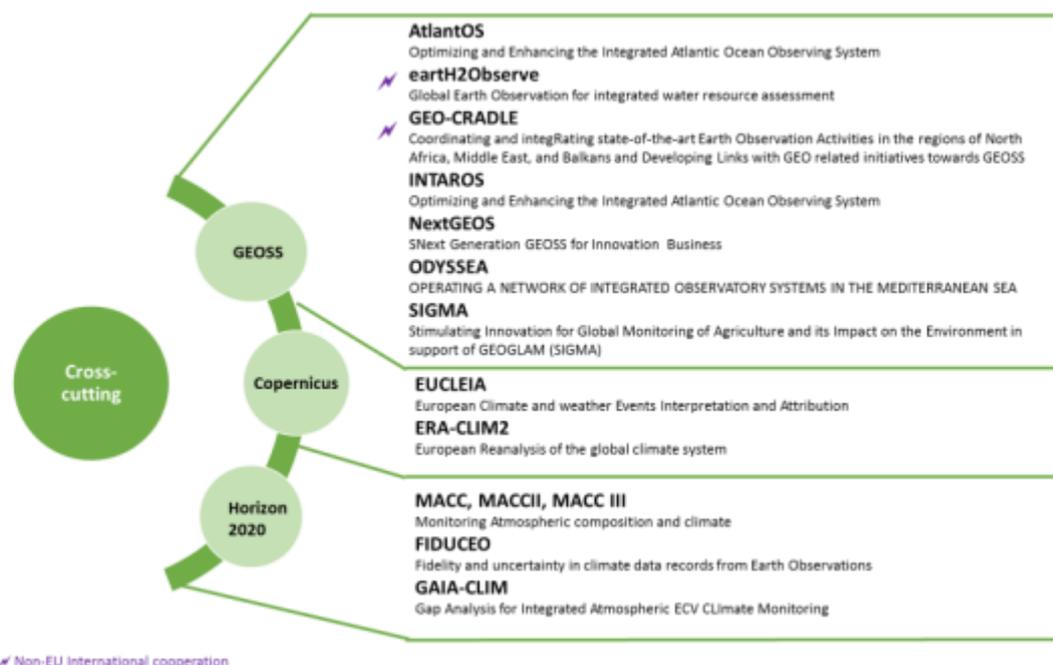
The information provided by the Copernicus services can be used by end users for a wide range of applications in a variety of areas. These include urban area management, sustainable development and nature protection, regional and local planning, agriculture, forestry and fisheries, health, civil protection, infrastructure, transport and mobility, as well as tourism.

The main users of Copernicus services are policymakers and public authorities who need the information to develop environmental legislation and policies or to take critical decisions in the event of an emergency, such as a natural disaster or a humanitarian crisis.

Based on the Copernicus services and on the data collected through the Sentinels and the contributing missions, many value-added services can be tailored to specific public or commercial needs, resulting in new business opportunities.

In 2016, the European Commission completed a large-scale study which examined the overall impact of the Copernicus programme on the European economy and its benefits for the Space industry, the downstream sector and end-users. The results of this exercise were published in the first Copernicus Market Report. Moreover, several former economic studies had already demonstrated a huge potential for job creation, innovation and growth.

The Copernicus programme is coordinated and managed by the European Commission. The development of the observation infrastructure is performed under the aegis of the European Space Agency for the space component and of the European Environment Agency and the Member States for the in situ component.



8.4.1.3.JRC activities

A number of JRC activities are related to climate change. Beyond its contribution to legislative proposals, the JRC advised EU negotiators at the Marrakech summit (COP22) and presented its most recent work to inform related debates in the broader scientific and policy arenas.

Some examples of the large number of achievements and impacts of the JRC in climate area are related to:

Achievement	Year	Description and impact
JRC report : Paris pledges insufficient to meet 2°C, (GECO 2016 - Global Energy and Climate Outlook: Road from Paris)	2016	This report looks into the evolution of the world energy system and GHG emissions to 2050 under different energy and climate policy scenarios. Based on the most recent energy and economic data, the report provided a quantified foundation for international discussions and contributed to future global stocktaking exercises.
JRC and the PBL Netherlands Environmental Assessment Agency Report : Global CO ₂ emissions from fossil fuels and industrial processes stall	2016	This report concluded that global CO ₂ emissions from fossil-fuel combustion and industrial processes stalled, confirming the slowing trend observed since 2012.
The JRC co-authored the Copernicus CO ₂ report : Independent Greenhouse Gas Verification	2016	This report describes the greenhouse gas verification system. This report was cited by the New York Times (May 2016) and presented to the UNFCCC SBSTA meeting (Bonn, May 2016) and to the COP22 summit (Marrakech, November 2016).
Methodology for setting forest reference levels (FRLs)	2016	Driving Europe's transition to a Low-Carbon Economy - the JRC developed a methodology for setting forest reference levels (FRLs), which enable different national circumstances to be accommodated. The JRC also contributed to the development of a set of scenarios

		for assessing the impact of different policies to tackle CO ₂ emissions from road transport. The scenarios were simulated with the JRC's newly developed fleet impact model DIONE, to develop projections on the evolution of the vehicle mix, activity, energy consumption and emissions up to 2050.
Modelling tool SHERPA	2016	The SHERPA model (Screening for High Emission Reduction Potential on Air) calculates how changes in emissions affect air quality in urban areas.
Report on biofuels: Biofuels from algae: technology options, energy balance and GHG emissions	2016	This shows that the cost of algal production and its conversion into biofuels remains still too costly for economically viable production.
Report on the Covenant of Mayors (CoMs): Greenhouse Gas Emissions Achievements and Projections	2016	This report revealed that the first 315 implementation reports from more than 6 200 municipalities across the EU and beyond show an overall reduction in GHG emissions of 23 % compared to baseline levels. Building on the CoM, a new, more ambitious Covenant of Mayors for Climate and Energy was announced in October 2015, based on three pillars: mitigation; adaptation; and secure, sustainable and affordable energy. At 4 September 2016, the cut-off date of the JRC analysis, 6 926 local authorities from 54 countries had joined the initiative, representing more than 213 million inhabitants.
Report on how design, construction, operation and maintenance standards of critical infrastructures should be adapted to protect them from climate-related hazards.	2016	According to a new JRC study, the current design, construction, operation and maintenance standards of critical infrastructures, including energy, transport, industrial and social sectors, should be adapted to protect them from climate-related hazards. The study also showed that southern countries are most likely to be affected throughout the 21 st century and thus require substantial investment to protect them from climate hazards.
Study on food safety and nutrition in 2050	2016	JRC contributed to a study on food safety and nutrition in 2050 which employed the methodology of scenario constructed on the basis of different developments of specific drivers that can significantly impact and bring change to the food system, including climate change (Delivering on EU food safety and nutrition in 2050 – future challenges and policy preparedness).
European Atlas of Forest Tree Species	2016	This provides a wealth of information on the many tree species in our forests, including their climatic preferences and singularities and how threats such as climate change may affect them.
European Energy Efficiency Platform (E3P)	2016	JRC has a long history of cooperation in earth observation research and programme planning with other key Copernicus partners across Europe, especially ESA, EUMETSAT, ECMWF, EUSC, EMSA, Frontex and EEA. JRC launched the interactive and collaborative online European Energy Efficiency Platform (E3P) and also contributed to the Accelerating Clean-Energy Innovation Communication with the findings produced by the Strategic Energy Technologies Information System (SETIS). It was also involved in a number of initiatives related to the EU Energy Security Strategy.
Studies on the economic impacts of climate change in the EU	2014 and ongoing	PESETA I, PESETA II (reported in 2014) and PESETA III (expected to be completed in 2017. See also Section 6.6.

Studies in the area of "Associated and Neighbourhood Countries"	-	Air quality in the Danube macroregion and modelling vector-borne infectious disease dynamics under climate change
Studies on Arctic sea ice	2016 and 2017	Recent JRC studies suggest that the ongoing shrinkage of the Arctic sea ice cover is linked to a combination of global temperature rise, the pronounced warming in the Arctic and weather anomalies in the mid-latitudes ¹⁵⁷ . Changes in atmospheric circulation due to polar atmospheric warming and reduced winter sea ice have also significantly impacted the long range transport and deposition of black carbon (BC) in the Arctic ¹⁵⁸ .
Research, technology, technical services and training for nuclear safeguards	-	JRC continues to provide enabling research, technology, instruments, technical services and training for nuclear safeguards including the verification of treaties and agreements, to inspection agencies, States and operators, as planned under the EURATOM treaty. This includes promoting education and training for Nuclear Decommissioning

8.4.2. Atmospheric climate observing systems, including those measuring atmospheric constituents

8.4.2.1. Copernicus Atmosphere Monitoring Service

The Copernicus Atmosphere Monitoring Service (CAMS) is part of the Copernicus Programme and provides continuous data and information on atmospheric composition. The service describes the current situation, forecasts the situation a few days ahead, and analyses consistently retrospective data records for recent years. This service, MACC-III (Monitoring Atmospheric Composition and Climate - Interim Implementation), is the pre-operational Copernicus Atmosphere Service.

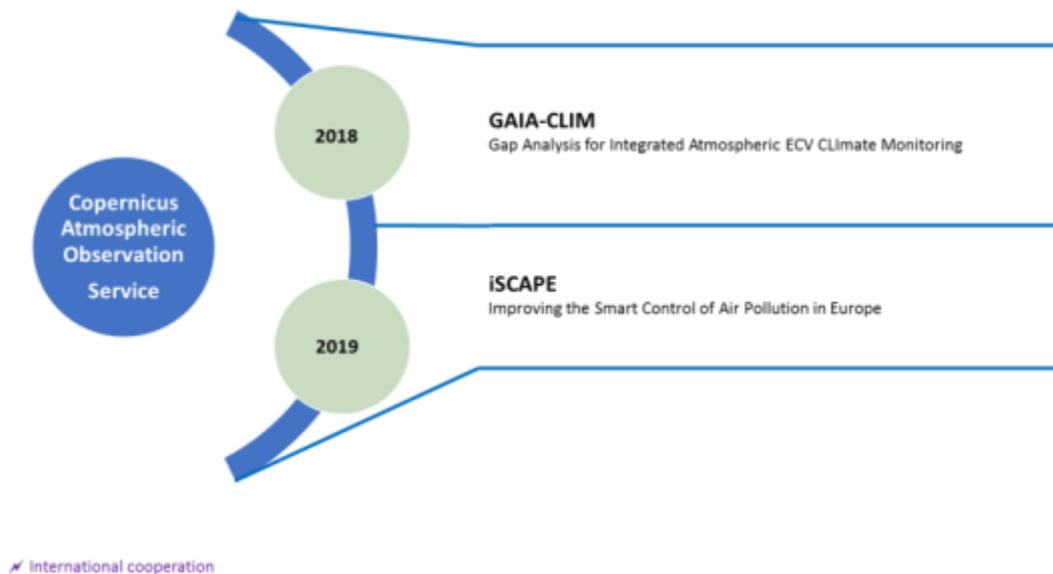
CAMS delivers the following operational services:

- Daily production of near-real-time analyses and forecasts of global atmospheric composition;
- Reanalyses providing consistent multi-annual global datasets of atmospheric composition with a frozen model/assimilation system;
- Daily production of near-real-time European air quality analyses and forecasts with a multi-model ensemble system;
- Reanalyses providing consistent annual datasets of European air quality with a frozen model/assimilation system, supporting in particular policy applications;

157 Dobricic and Vignati (2016), Large-Scale Atmospheric Warming in Winter and the Arctic Sea Ice Retreat, *American Meteorological Society*. Available at: <http://journals.ametsoc.org/doi/pdf/10.1175/JCLI-D-15-0417.1>

158 Pozzoli, et al. (2017) Impacts of large-scale atmospheric circulation changes in winter on black carbon transport and deposition to the Arctic, *Atmospheric Chemistry and Physics*, 17, 11803–11818 Available at: <https://www.atmos-chem-phys.net/17/11803/2017/acp-17-11803-2017.pdf>

- Products to support policy users, adding value to “raw” data products in order to deliver information products in a form adapted to policy applications and policy-relevant work;
- Solar and UV radiation products supporting the planning, monitoring, and efficiency improvements of solar energy production and providing quantitative information on UV irradiance for downstream applications related to health and ecosystems;
- Greenhouse gas surface flux inversions for CO₂, CH₄ and N₂O, allowing the monitoring of the evolution in time of these fluxes;
- Climate forcings from aerosols and long-lived (CO₂, CH₄) and shorter-lived (stratospheric and tropospheric ozone) agents;
- Anthropogenic emissions for the global and European domains and global emissions from wildfires and biomass burning.



8.4.3. Ocean climate observing systems

8.4.3.1. Copernicus Marine Environment Monitoring Service

The Copernicus Marine Environment Monitoring Service (CMEMS) provides regular and systematic reference information on the physical state, variability and dynamics of the ocean and marine ecosystems for the global ocean and the European regional seas.

The observations and forecasts produced by the service support all marine applications.

For instance, the provision of data on currents, winds and sea ice help to improve ship routing services, offshore operations or search and rescue operations, thus contributing to marine safety.

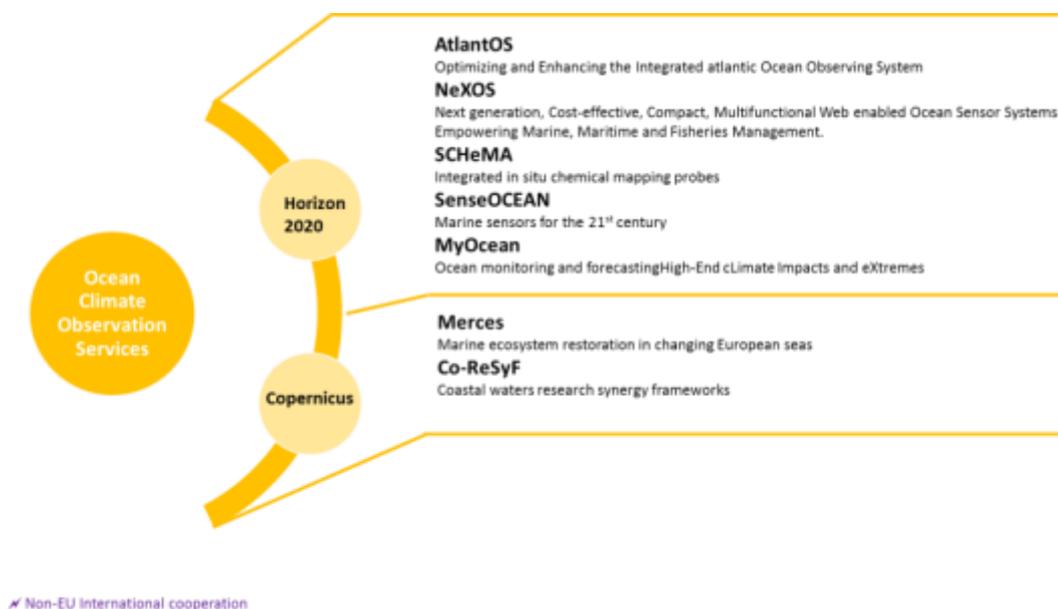
The service also contributes to the protection and the sustainable management of living marine resources in particular for aquaculture, fishery research or regional fishery organisations.

Physical and marine biogeochemical components are useful for water quality monitoring and pollution control. Sea level rise helps to assess coastal erosion. Sea surface temperature is one of the primary physical impacts of climate change and has direct consequences on marine ecosystems. As a result of this, the service supports a wide range of coastal and marine environment applications.

Many of the data delivered by the service (e.g. temperature, salinity, sea level, currents, wind and sea ice) also play a crucial role in the domain of weather, climate and seasonal forecasting.

The service is currently delivered in a pre-operational mode.

The products delivered by the Copernicus marine environment monitoring service today are provided free of charge to registered users through an online catalogue available on the Copernicus marine web portal¹⁵⁹.



8.4.4. Terrestrial climate observing systems

8.4.4.1. Copernicus Land Monitoring Service

The Copernicus land monitoring service provides geographical information on land cover and on variables related, for instance, to the vegetation state or the water cycle. It supports applications in a variety of domains such as spatial planning, forest management, water management, agriculture and food security.

The service became operational in 2012. It consists of three main components: a Pan-European component, a global component and a local component.

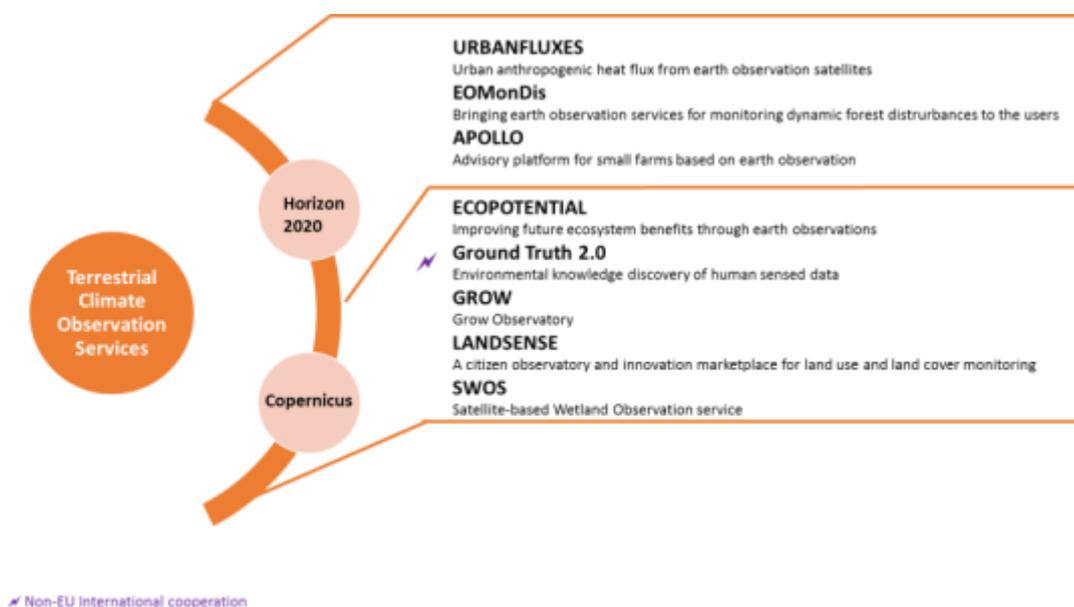
The Pan-European component is coordinated by the EEA and will produce five high resolution data sets describing the main land cover types: artificial surfaces (e.g. roads and

¹⁵⁹ European Commission. Copernicus, Marine Environment Monitoring Service, (webpage accessed 03-10-2017) <http://marine.copernicus.eu/>

paved areas), forest areas, agricultural areas (grasslands), wetlands, and small water bodies. The pan-European component is also updating the Corine Land Cover dataset to the reference year 2012.

The global component is coordinated by the European Commission JRC. It produces data across a wide range of biophysical variables at a global scale (i.e. worldwide), which describe the state of vegetation (e.g. leaf area index), the energy budget (e.g. albedo) and the water cycle (e.g. soil moisture index).

The local component is coordinated by the European Environment Agency and aims to provide specific and more detailed information that is complementary to the information obtained through the Pan-European component. Besides an update of the Urban Atlas, the next local component will address biodiversity in areas around rivers.



8.4.5. Climate change services

The Copernicus Climate Change Service (C3S) will become operational in 2018 and will combine observations of the climate system with the latest science to develop authoritative, quality-assured information about the past, current and future states of the climate in Europe and worldwide.

ECMWF operates the Copernicus Climate Change Service on behalf of the EU and will bring together expertise from across Europe to deliver the service.

C3S will provide key indicators on climate change drivers such as carbon dioxide and impacts, for example, reducing glaciers. The aim of these indicators will be to support European adaptation and mitigation policies in a number of sectors.

The service plans to deliver substantial economic value to Europe by:

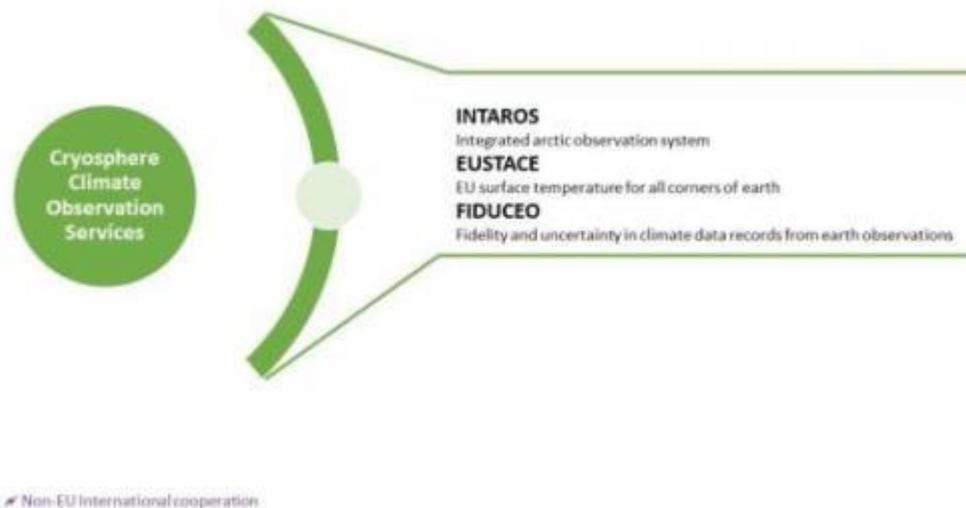
- **Informing** policy development to protect citizens from climate-related hazards such as high-impact weather events;
- **Improving** planning of mitigation and adaptation practices for key human and societal activities;
- **Promoting** the development of new services for the benefit of society.

The service will build upon and complement capabilities existing at national level and being developed through a number of climate-change research initiatives. It will become a major contribution from the EU to the WMO Global Framework for Climate Services and its Climate Monitoring Architecture.

The service will provide comprehensive climate information covering a wide range of components of the Earth-system and timescales spanning decades to centuries. It will maximise the use of past, current and future earth observations (from in-situ and satellite observing systems) in conjunction with modelling, supercomputing and networking capabilities. This will produce a consistent, comprehensive and credible description of the past, current and future climate.

8.4.6. Cryosphere climate observing systems¹⁶⁰

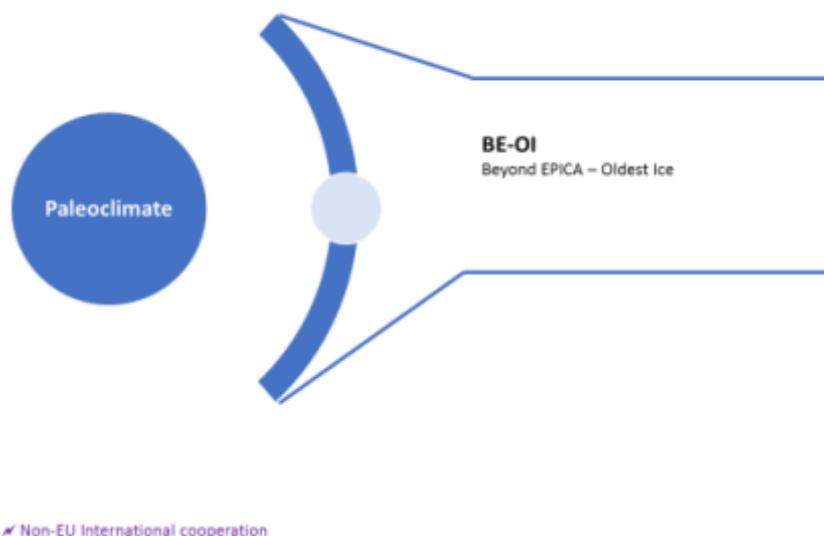
As part of the global land service (see also Section 8.4.4.1) Copernicus is developing a set of cryosphere products – snow extent, snow water equivalent and lake ice extent. In the period from 2016-2020 these operations are being brought online. These build on work in the ESA GlobSnow and EC CryoLand and SEN3App projects.



¹⁶⁰ Copernicus Global Land service. 2016. Services monitoring Earth systems. Available from:

http://workshop.copernicus.eu/sites/default/files/content/attachments/ajax/cryosphere_global_land.pdf [accessed on 20/07/2017].

8.4.7. Paleoclimate



8.4.8. Support for developing countries to establish and maintain observing systems, related data and monitoring systems

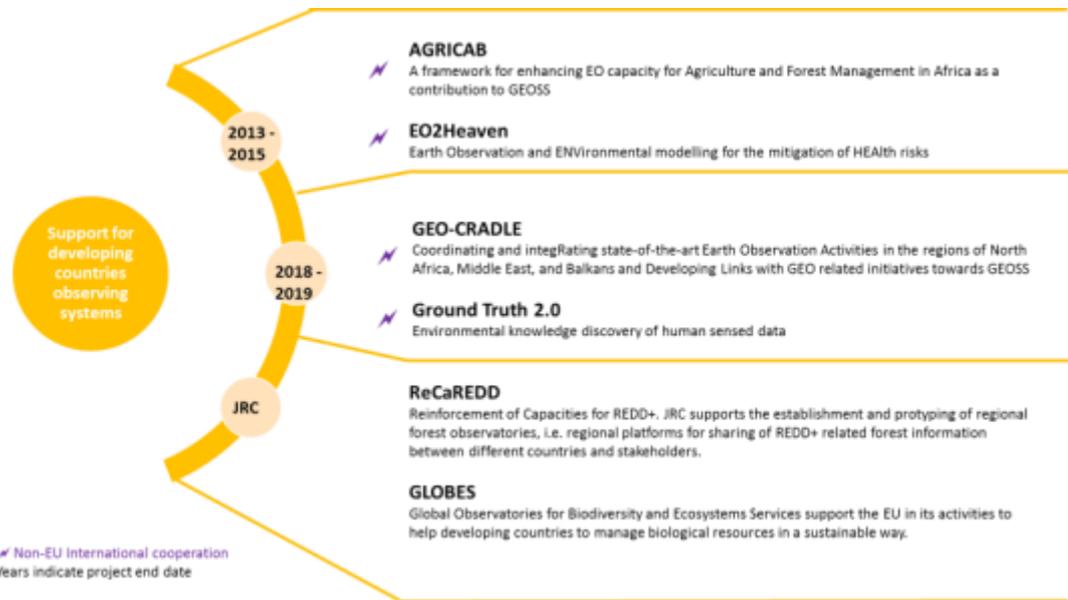
Example projects for support for developing countries to establish and maintain observing systems are depicted below. These include Agricab, EO2 Heaven, Geo-Cradle and Ground Truth 2.0.

Additionally, JRC supports the establishment and prototyping of ‘Regional Forest Observatories’, i.e. regional platforms for sharing of REDD+ related forest information between different countries and stakeholders. The third phase of the ‘Observatory of Central African Forest’ (OFAC) was carried out under the DEVCO-funded **ReCaREDD project** (Reinforcement of Capacities for REDD+) when the fourth phase of OFAC is –from July 2017- funded by the 11th European Development Fund (ED-F11). Moreover, the JRC coordinates the prototyping for ‘Regional Forest Observatories’ in East Africa (OFESA) and Southeast Asia (RFO-SEA). OFESA is hosted at the Regional Centre for Mapping of Resources for Development (RMMRD) in Nairobi, Kenya, and RFO-SEA is initially hosted the Vietnamese Academy of Forest Science (VAFS) in Hanoi, Vietnam.

Through ReCaREDD the JRC supported partner institutions in the tropical countries (forestry departments, government institutions) to access to Copernicus data and develop monitoring approaches for the assessment of forest degradation. JRC gained momentum with partner institutions such as the National Institute for Space Research of Brazil (INPE), the National Forest Inventory services in Republic of Congo (CNIAF) and Cambodia (MoE).

JRC's project **GLOBES**, Global Observatories for Biodiversity and Ecosystems Services, support the EU in its activities to help developing countries to manage biological resources in a sustainable way. The project further develops the knowledge management tools required to assess, monitor and forecast biodiversity and ecosystem services at the global scale (with a focus on protected areas), help the EU ensure maximum aid effectiveness, and underpin indicator development for Sustainable Development Goal 15. Overall project results include

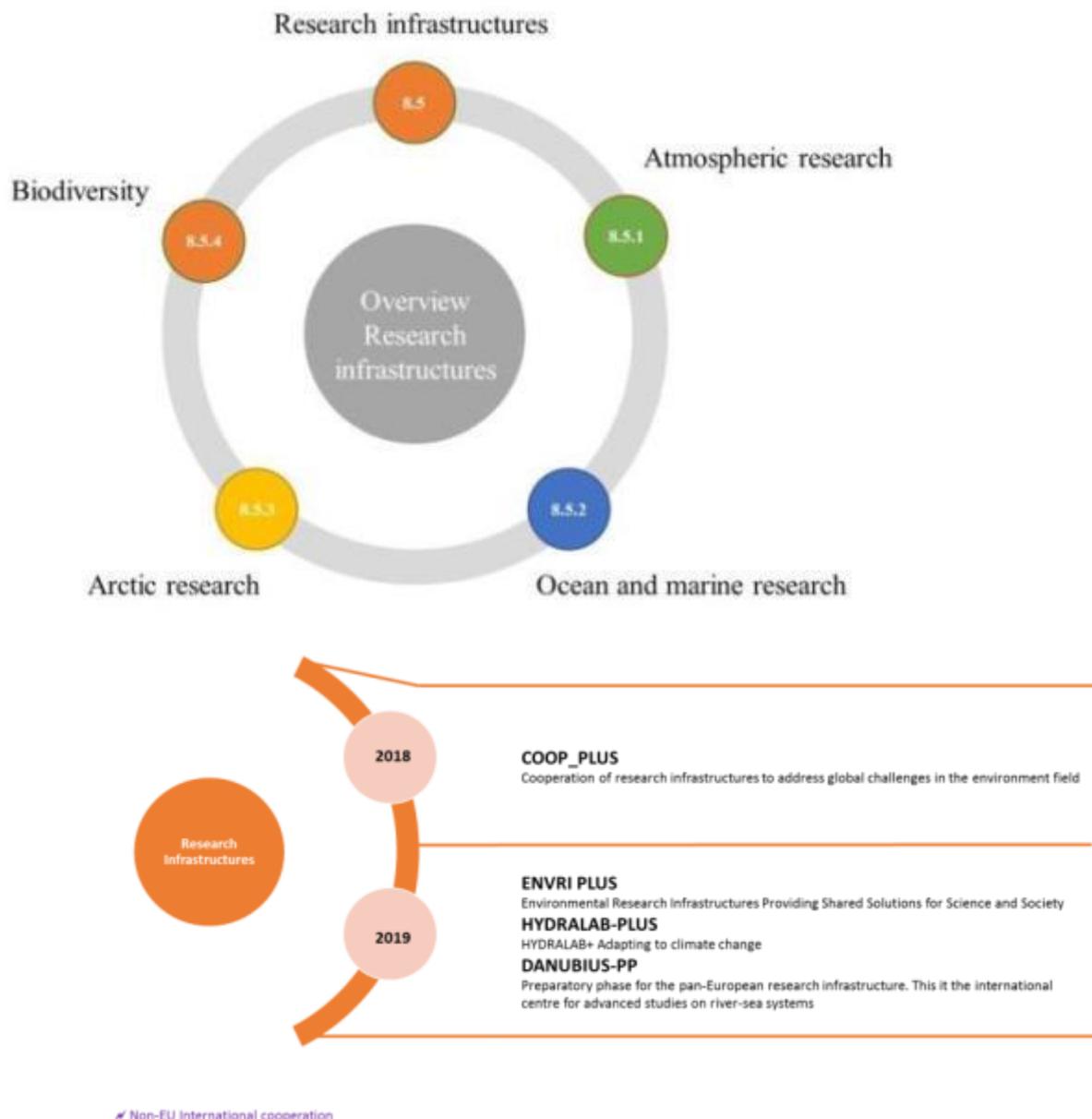
the improvement of the baseline information sought by the EC and the UN Convention on Biological Diversity to assess progress on key targets, and the increased support of JRC to developing countries through capacity building and improved access to essential information.



8.5. Research Infrastructures

Figure 8-3 gives an overview of the main areas for research infrastructure projects and the sections where they are discussed in this national communication.

Figure 8-3 Overview of main areas of research infrastructure projects and section numbers

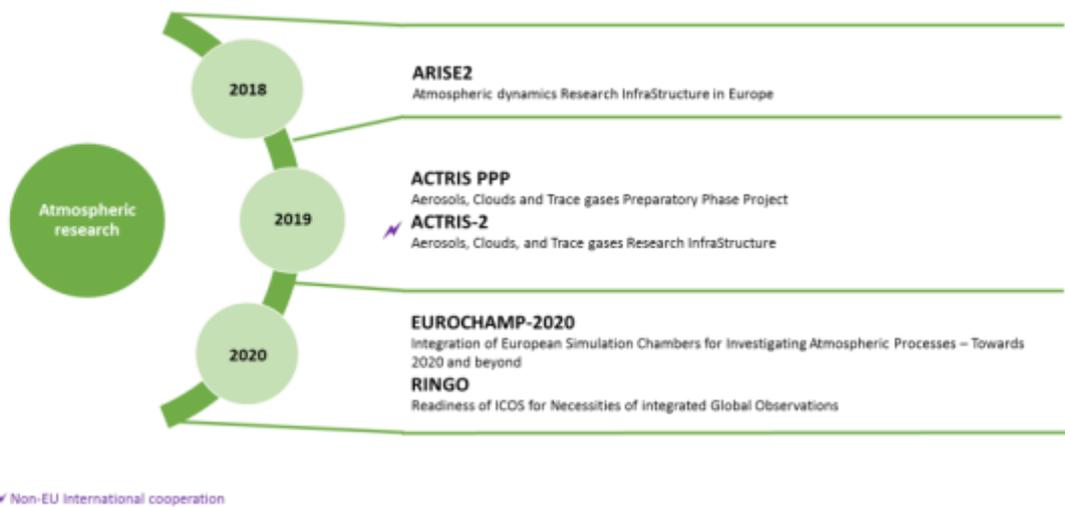


8.5.1. Atmospheric research

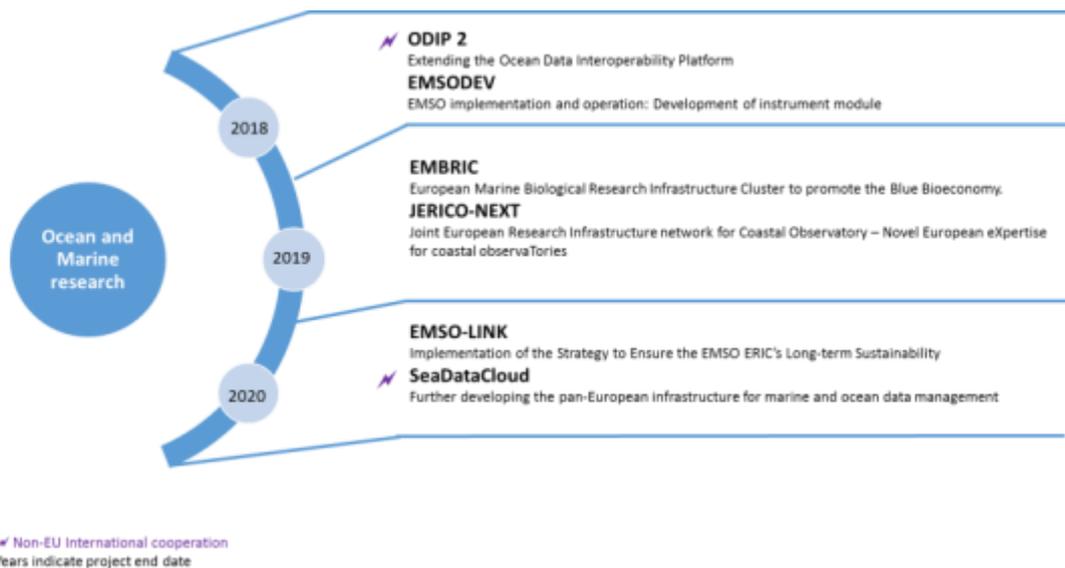
Example project of research infrastructures for atmospheric research are depicted below.

JRC is partner of the project **ACTRIS2**, which aims at coordinating the European ground-based network of stations equipped with advanced in-situ and remote sensing atmospheric instrumentation for measuring aerosols, clouds and short-lived gaseous species. ACTRIS-2 has the essential role to ensure the production of comparable, quality assured and timely open data to provide a robust scientific evidence for air quality and climate policies' impact.

JRC supports smart climate change policymaking in the Commission, by establishing greenhouse gas (GHG) emissions and their trends based on emission inventories, atmospheric flux & concentration measurements and their linkage based on inverse modelling. It relies on the EDGAR database for emission inventories, the ABC-IS station in Ispra and the GHG flux measurement tower in San Rossore - both of the latter aim at being part of the GHG monitoring network of ESFRI's ICOS-Research Infrastructure. Inverse modelling gives estimates of GHG emissions by combining top-down concentration measurements and the bottom-up measurements in the EDGAR database, in order to verify emissions reported to UNFCCC. The reductions in GHG and air pollutant emissions as a result of past, current and future global policies and energy reforms are monitored, and their impact on health and ecosystems is assessed.



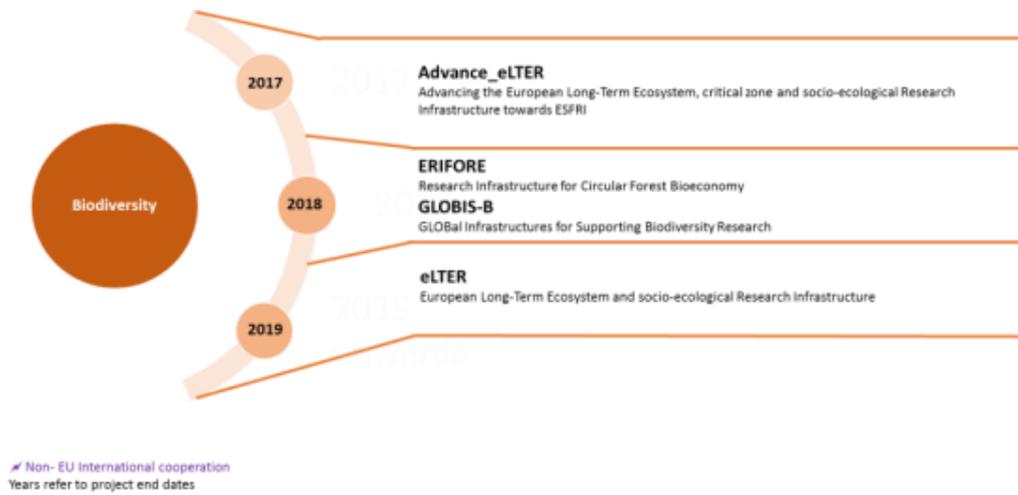
8.5.2. Ocean and Marine research



8.5.3. Arctic research



8.5.4. Biodiversity



9. EDUCATION, TRAINING AND PUBLIC AWARENESS

Key Developments

The EU has been investing significant effort and resources into raising its citizens' awareness of the challenges posed by climate change, but also the opportunities, in particular as regards reducing GHG emissions. Actions in the field of education, public information campaigns, communication activities, training, and awareness raising campaigns, have all played an important role in this context. For instance, Erasmus+ education, Horizon 2020 science education and the Knowledge and Innovation Communities of the European Institute of Innovation and Technology, in particular the Climate (ClimateKIC) and Energy (InnoEnergy) ones, are notable education efforts; and the EU Climate Diplomacy and EU Open Door days, are two key public information campaigns.

In line with the guidelines on preparation of a national communication, the sections on education, training and public awareness are:

- Introduction and general policy toward education, training and public awareness (Section 9.1);
- Primary, secondary and higher education (Section 9.2);
- Public information campaigns (Section 9.3 – 9.5);
- Training programmes (Section 9.6);
- Resource or information centres (Section 9.7);
- Involvement of the public and non-governmental organisations (Section 9.8);
- Participation in international activities (Section 9.9).

9.1. Introduction and general policy toward education, training and public awareness

This chapter on education, training and public awareness has been structured in order to be as consistent as possible with the structure proposed by the UNFCCC reporting guidelines, thus enhancing comparability with reports by other Parties and facilitating the task of the expert review team.

The chapter focuses on key aspects related to education, training, public awareness and support to developing country partners on matters related to Article 6 of the Convention (Action for Climate Empowerment). In order to keep the chapter concise, only a brief description of the most relevant activities is included. In most cases the internet address of the activities is provided, thus facilitating access to additional information.

In the European Union, responsibility for education and training policy lies with Member States. The EU's role is to support the improvement of national systems through complementary EU level tools, mutual learning, exchange of good practice and financial support.

The Member States' seventh National Communications report on education and training activities at the national level. Nevertheless, the EU supports the Member States' activities

under different programmes and actions. Therefore, the EU seventh National Communication reports not only on public awareness activities, but also on education and training activities at the EU level.

9.2. Primary, secondary and higher education

Activities on primary, secondary and higher education comprise:

- Education aspects of Erasmus; and
- The Horizon 2020 programme call on science education.

These are presented in more detail in the following.

9.2.1. *Erasmus+ – Education*¹⁶¹

The Erasmus+ programme merges seven former programmes and has opportunities for education (this section) and training (Section 9.6) for a wide variety of people. Following on from the earlier Erasmus programme, Erasmus+ helps organise student and doctoral exchanges within programme countries and to and from a broad range of partner countries. It is anticipated that there will be opportunities for about 2 million students from 2014 to 2020. Students can study abroad for 3-12 months, with a maximum of 12 months in each study cycle, e.g. Bachelor, Master and Doctoral or equivalents.

9.2.2. *Horizon 2020 – science education*¹⁶²

Making science education and careers attractive for young people is an ambitious goal, since it targets a drastic improvement in science and technology literacy in our society. Within the Horizon 2020 programme, the biggest EU research and innovation programme, a call has been launched with the aim of making science education and careers more attractive for young people.

Expected impacts of the call include developing scientific citizenship by promoting innovative pedagogies in science education, attracting more young people towards science, with a special emphasis on girls, and addressing the challenges faced by young people, in pursuing careers in science, technology, engineering and innovation.

9.2.3. *Climate KIC*¹⁶³ and *InnoEnergy*¹⁶⁴

Education is also provided through the EIT's Knowledge and Innovation Communities: Climate-KIC and InnoEnergy. These provide, for instance, a graduate school, professional education and online courses. (See also section 8.2.1.5)

161 European Commission, Erasmus+, http://ec.europa.eu/programmes/erasmus-plus/node_en (webpage accessed 29-08-2017)

162 European Commission, Science Education, <https://ec.europa.eu/programmes/horizon2020/en/h2020-section/science-education> (webpage accessed 29-08-2017)

163 European Commission, Climate-KIC. <http://www.climate-kic.org/> (webpage accessed 17-10-2017)

164 European Commission, EIT InnoEnergy, <https://eit.europa.eu/eit-community/eit-innoenergy>. (webpage accessed 17-10-2017)

9.3. Public information campaigns

In addition to ongoing communication activities related to climate change and EU action to address it, the European Commission has carried out several EU-wide public information and awareness-raising campaigns that are of direct or indirect relevance to climate change.

Many of the campaigns make considerable use of the internet and social media tools, but all also include opportunities for personal live interaction. The campaigns employ websites, Facebook pages, Twitter feeds, video productions, seminars, workshops and other types of live events.

Examples of activities and events undertaken during the reporting period include:

- EU Climate Diplomacy Days;
- EU Open Doors Day;
- Covenant of Mayors for Climate and Energy;
- EU Sustainable Energy Week;
- Resource Efficiency Campaign;
- EU Green Week;
- European Business Awards for the Environment;
- European Green Capital Award and European Green Leaf;
- Our Planet, Our Future;
- European Mobility Week.

9.3.1. *EU Climate Diplomacy Days*^{165, 166, 167}

The EU Climate Diplomacy Week is an annual event that EU Delegations around the world have been organising since 2015. Through various events and activities, European Embassies around the world highlight the positive action that is being taken around the globe in collaboration with the EU and its Member States.

In June 2015, the first EU Climate Diplomacy Days engaged a range of stakeholders – from the general public to the business community and civil society organisations – in various events taking place in the context of the then upcoming COP21 conference in Paris.

In 2016, the EU Climate Diplomacy Week was held worldwide from 12-18 September and focused on the Paris Agreement.

¹⁶⁵ European External Action Service, European Climate Policy Day, 2015, https://eeas.europa.eu/headquarters/headquarters-homepage_en/2394/European_Climate_Diplomacy_Day (webpage accessed on 29-08-2017)

¹⁶⁶ European Commission, Climate Diplomacy Week: maintaining the political momentum in support of climate action, 2016, https://ec.europa.eu/clima/news/articles/news_2016091201_en (webpage accessed on 29-08-2017)

¹⁶⁷ European External Action Service, EU Climate Diplomacy Week, 2017, https://eeas.europa.eu/delegations/south-africa/28455/eu-climate-diplomacy-week-19-june-2-july-2017_en, (webpage accessed on 29-08-2017)

The latest edition held in June/July 2017 focused on the implementation of the Paris Agreement and the energy–climate nexus.

9.3.2. *EU Open Doors Day*^{168, 169, 170}

Europe Day, held on 9 May every year, celebrates peace and unity in Europe. The date marks the anniversary of the historical 'Schuman declaration'. To celebrate Europe Day, EU institutions open their doors in early May to the public, and local EU offices in Europe and all over the world organise a variety of activities and events for all ages. Each year thousands of people take part in visits, debates, concerts and other events to mark the day and raise awareness about the EU.

In 2015, the interactive activities in the energy and climate area of the exhibition at the European Commission in Brussels focused on the Paris Agreement and the EU's Energy Union strategy.

In 2016, participants could help produce smart and clean energy to run the transport system, heat the houses and light up the streets in a mock-up of a climate-friendly and energy-efficient smart city of the future.

In 2017, the energy and climate stand gave participants the opportunity to turn their own energy into sustainable energy on a power-generating dancefloor. In addition, through a quiz participants could discover how to take climate action in their everyday life.

9.3.3. *Covenant of Mayors for Climate and Energy*¹⁷¹

The Covenant of Mayors initiative encourages local and regional authorities to commit to support the implementation of the EU's target to reduce greenhouse emissions by at least 40 % by 2030 and adopt an integrated approach to tackling mitigation and adaptation to climate change. They do so by voluntarily developing Sustainable Energy Action Plans.

The Covenant was originally launched by the European Commission in 2008, and the new integrated Covenant of Mayors for Climate and Energy was launched by the European Commission in October 2015. By late April 2017, the covenant had been signed by 7 336 local and regional authorities with a combined population of over 229 million people. Of these signatories, 669 are to the new Covenant of Mayors for Climate and Energy.

In 2016, the Covenant of Mayors for Climate and Energy and the Compact of Mayors announced the Global Covenant of Mayors for Climate & Energy¹⁷², a newly merged initiative to bring these two efforts together.

168 European Union, Europe Day, https://europa.eu/european-union/about-eu/symbols/europe-day_en, (webpage accessed on 29-08-2017)

169 European Union, Open Doors Day of the European Commission 2017, http://ec.europa.eu/belgium/events/europe-day_en, (webpage accessed on 29-08-2017)

170 European Commission, Climate and Energy Stand 2017, http://ec.europa.eu/belgium/events/170506_ener_clima_en, (webpage accessed on 29-08-2017)

171 Covenant of Mayors for Climate and Energy, http://www.covenantofmayors.eu/index_en.html, (webpage accessed 29-08-2107)

172 Global Covenant of Mayors for Climate & Energy, [Global Covenant of Mayors for Climate & Energy \(webpage accesses 18-10-2017\)](#)

9.3.4. *EU Sustainable Energy Week*¹⁷³

The EU Sustainable Energy Week (EUSEW) is a month-long series of activities to build a secure energy future for Europe. It brings together public authorities, private companies, NGOs and consumers to promote initiatives to save energy and move towards renewables for clean, secure and efficient power.

Launched in 2006 by the European Commission, the EUSEW is organised by the Executive Agency for Small and Medium-sized Enterprises (EASME) in close cooperation with the European Commission's Directorate-General for Energy.

Events include a conference and associated networking, awards and Energy Days. The awards are in four jury-assessed categories: Consumers, Public Sector, Businesses and, introduced in 2017, Energy Islands. All finalists also compete for the Citizens' prize, with the winner chosen by a public online vote. Energy Days are organised by local public and private organisations to engage citizens and energy stakeholders in building the Energy Union.

9.3.5. *Resource Efficiency Campaign*¹⁷⁴

The European Commission's Generation Awake campaign concluded in 2015 after four years of engaging Europeans with upbeat messages on how to become more sustainable consumers and save natural resources. The campaign won a media industry award for its interactive house website and videos, which were viewed 10 million times. 140 000 people joined the Generation Awake Facebook group and over 2 000 media articles were published about the campaign.

The campaign reached out to 25- to 40-year-olds, with a focus on young urban adults (identified as most open and receptive to environmental behavioural change) and families with small children (the biggest consumers but who are also keen to work towards a better quality of life for their families).

At the end of the campaign, the Commission organised an evaluation by independent consultants, who conducted an online survey, focus groups, expert interviews, including with behavioural scientists, and an online review. According to the report, Generation Awake succeeded in making the topic accessible to a wide audience. The videos were highly appreciated, as were the tone and tools used on the website. The conclusion was that Generation Awake raised awareness about resource efficiency as far as "can be expected for campaigns of this scale". The campaign reached 6 % of the EU population, i.e. approximately 30 million people – an impressive share of the potential target audience.

173 European Commission, Sustainable Energy Week, <http://www.eusew.eu/about-sustainable-energy-week>, (webpage accessed 29-08-2107)

174 European Commission, Waking up to resource efficiency, 2015, https://ec.europa.eu/environment/efe/themes/resource-efficiency/waking-resource-efficiency_en, (webpage accessed 29-08-2107)

9.3.6. *EU Green Week*¹⁷⁵

The European Commission's Green Week is the biggest annual conference on European environment policy. It is open to the public and participation is free of charge.

Green Week offers a unique opportunity for debate and exchanges of experiences and best practice. Over the past decade, the conference has established itself as an unmissable event for anyone involved with protecting the environment.

The themes of Green Week over recent years have been:

2011 – Resource efficiency: using less, living better

2012 – Every drop counts: the water challenge

2013 – Cleaner air for all

2014 – Circular economy – saving resources, creating jobs

2015 – Nature, our health, our wealth

2016 – Investing for a greener future

2017 – Green jobs for a greener future.

9.3.7. *European Business Awards for the Environment*¹⁷⁶

The European Business Awards for the Environment (EBAE) celebrate those companies at the forefront of eco-innovation, or that have a respect for the environment at the very core of their business principles.

The awards are held every second year (currently the 2016-2017 cycle), and winners are recognised in the following five categories: management, product and services, process innovation, and international business cooperation, and business and biodiversity.

9.3.8. *European Green Capital Award and European Green Leaf Award*¹⁷⁷

Europe is an urban society that faces many environmental challenges. The European Commission has long recognised the important role that local authorities play in improving the environment.

The European Green Capital Award has been conceived as an initiative to promote and reward these efforts.

The award aims to provide an incentive for cities to inspire each other and share best practices, while at the same time engaging in friendly competition. In other words, the cities become role models for each other.

¹⁷⁵ European Commission, EU Green Week, 2017, <http://www.eugreenweek.eu/>, (webpage accessed 29-08-2107)

¹⁷⁶ European Commission, European Business Awards for the Environment, <http://ec.europa.eu/environment/awards/index.html>, (webpage accessed 29-08-2107)

¹⁷⁷ European Commission, European Green Capital, http://ec.europa.eu/environment/europeangreencapital/index_en.htm, (webpage accessed 29-08-2107)

Starting in 2010, one European city has been awarded the title of European Green Capital each year. The award is given to a city that:

- Has a consistent record of achieving high environmental standards;
- Is committed to ongoing and ambitious goals for further environmental improvement and sustainable development; and
- Can act as a role model to inspire other cities and promote best practices to all other European cities.

The winners to date are Stockholm (Sweden) 2010, Hamburg (Germany) 2011, Vitoria-Gasteiz (Spain) 2012, Nantes (France) 2013. Copenhagen (Denmark) 2014, Bristol (United Kingdom) 2015, Ljubljana (Slovenia) 2016, Essen (Germany) 2017, and Nijmegen (The Netherlands) for 2018.

Following the success of the European Green Capital Award, the European Green Leaf Award was introduced as a competition aimed at cities and towns across Europe, with between 20,000 and 100,000 inhabitants. This Award recognises commitment to better environmental outcomes, with a particular accent on efforts that generate green growth and new jobs. The objectives of the European Green Leaf Award are:

- To recognise cities that demonstrate a good environmental record and commitment to generating green growth;
- To encourage cities to actively develop citizens' environmental awareness and involvement;
- To identify cities able to act as a 'green ambassador' and to encourage other cities to progress towards better sustainability outcomes.

This is presented in conjunction with the European Green Capital Award. The inaugural winners in 2015 were Mollet del Vallès (Spain) and Torres Vedras (Portugal), followed by Galway (Ireland) in 2017 and Leuven (Belgium) and Växjö (Sweden) for 2018.

9.3.9. *Our planet, our future*¹⁷⁸

[In 2015, in advance of the COP21 discussions in Paris, the European Commission's Directorate-General for Climate Action produced a magazine aimed at 11–16 year olds, entitled “Our planet, our future: Fighting climate change together”. The publication includes information on the science of climate change, how the EU is taking action to reduce greenhouse gas emissions and adapt to climate change, and how everyone can contribute to fighting climate change in their everyday lives. The magazine is available in all EU languages and through a number of websites for educational resources. A new version of the magazine will be available in late 2017.](#)

¹⁷⁸ European Commission, Youth & Climate, 2017, https://ec.europa.eu/clima/citizens/youth_en, (webpage accessed 29-08-2107)

9.3.10. *European Mobility Week*^{179, 180}

European Mobility Week is an annual campaign on sustainable urban mobility organised with the political and financial support of the Directorates-General for the Environment and Transport of the European Commission. The campaign, which runs from 16 to 22 September every year, encourages local authorities to organize activities for citizens based on a focal theme for each year, and to launch and promote permanent measures that support the theme.

Recent themes have included “Choose. Change. Combine” on multimodality in 2015, “Smart and sustainable mobility” in 2016 and “Sharing gets you further” on sharing transport, including through the use of apps and online platforms, in 2017.

Since its introduction in 2002, the impact of European Mobility Week has steadily grown, both across Europe and around the world. In recent years, the campaign has spread to countries outside the EU, including Argentina, Belarus, Japan, Kazakhstan, Mali and Mexico.

In 2016, a record of 2 427 cities from 51 countries in the EU and beyond took part in European Mobility Week. In 2016, 7 386 measures were implemented, these being in 1 229 cities that declared they had implemented at least one measure. These mainly focus on mobility management, such as launching awareness-raising campaigns; accessibility, such as creating wheelchair ramps; and new or improved bicycle facilities.

European Mobility Week is promoted using its website and by social media. All these modes showed increased usage in 2016 compared with 2015. For example, the Facebook account has 11 922 followers, an increase of 36 % on 2015.

9.4. **Monitoring public opinion**

9.4.1. *Eurobarometer results on climate change (2017)*¹⁸¹

Following on from EU-wide surveys of public attitudes to climate change in 2009 and 2011 reported in the 6NC, further surveys have been carried out in 2013¹⁸², 2015¹⁸³ and 2017.

The most recent Eurobarometer survey on climate change was carried out in 2017, with 27 901 EU citizens from different social and demographic groups interviewed face-to-face in their mother tongue.

The results show that climate change remains a key concern for the European public, with around three-quarters of respondents (74 %) seeing it as a very serious problem – up from

179 European Mobility Week, 16-22 September 2017, <http://www.mobilityweek.eu/home/>, (webpage accessed 29-08-2107)

180 European Mobility Week, 16-22 September 2016, Participation Report, http://mobilityweek.eu/fileadmin/user_upload/materials/participation_resources/2016/2016_EMW_Participation_Report.pdf, (webpage accessed 29-08-2107)

181 European Commission, Special Eurobarometer 459 Climate Change, September 2017, https://ec.europa.eu/clima/sites/clima/files/support/docs/report_2017_en.pdf

182 European Commission, Special Eurobarometer 409 Climate Change, March 2014, (Fieldwork in 2013)

<http://ec.europa.eu/commfrontoffice/publicopinion/index.cfm/Survey/getSurveyDetail/search/climate%20change/surveyKy/1084> (webpage accessed 02-10-2017)

183 European Commission, Special Eurobarometer 435 Climate Change, November 2015,

<http://ec.europa.eu/commfrontoffice/publicopinion/index.cfm/Survey/getSurveyDetail/search/climate%20change/surveyKy/2060> (webpage accessed 02-10-2017)

69 % in the previous survey in 2015 – and over nine in ten (92 %) considering it a serious problem.

Climate change is seen by EU citizens as the third single most serious global problem, behind poverty/hunger/lack of drinking water and international terrorism. Nine in ten respondents (90 %) also take personal action to tackle climate change, the most common action being trying to reduce waste and regularly separating it for recycling (71 %).

The results also indicate that nearly four in five Europeans (79 %) believe that fighting climate change and using energy more efficiently can boost the EU economy and jobs, while the same proportion think that more public financial support should be given to the transition to clean energies even if this means reducing fossil fuel subsidies.

Nearly two-thirds of respondents agree that reducing fossil fuel imports from third countries can benefit the EU economically and increase the security of EU energy supplies (65 % and 64 % respectively). Almost nine in ten also believe it is important for their national government to set targets to increase renewable energy use by 2030 and provide support for improving energy efficiency by 2030 (89 % and 88 % respectively).

9.4.2. Eurobarometer results on environment (for 2014) ^{184, 185}

A Eurobarometer survey in the related area of attitudes towards the environment was undertaken in 2014, based on face to face interviews with 27 988 respondents.

When asked how important the environment is to them personally, the view of Europeans is overwhelmingly positive with 95 % of respondents considering it to be important.

Although this survey focussed on issues other than climate change, when asked about actions taken towards protecting the environment, the actions listed also relate to climate change, the top four being: separated most of waste for recycling; cut down energy consumption; cut down on water consumption and chosen a more environmentally way of travelling. Over six out of ten respondents (62 %) feel well informed about environmental issues.

9.5. Communication activities

9.5.1. Web and social media

Table 9-1 below lists examples of climate change related websites and social media many of which are in addition to those identified elsewhere in this chapter.

Table 9-1 Websites and social media

Title	Address
EU Climate Action website and social	https://ec.europa.eu/clima/

¹⁸⁴ There is a lot more in the survey, but most of it is to do with general environmental issues rather than those associated with climate change

¹⁸⁵ European Commission, Attitudes of European Citizens Towards the Environment, 2014, http://ec.europa.eu/public_opinion/archives/ebs/ebs_416_sum_en.pdf, (webpage accessed 29-08-2107)

media channels (European Commission's Directorate-General for Climate Action)	https://www.facebook.com/EUClimateAction https://twitter.com/EUClimateAction https://www.youtube.com/user/EUClimateAction
European Commission's political priorities – Energy Union and climate	https://ec.europa.eu/commission/priorities/energy-union-and-climate_en
Miguel Arias Cañete, European Commissioner for Climate Action and Energy	https://ec.europa.eu/commission/commissioners/2014-2019/arias-canete_en
European Climate Adaptation Platform	http://climate-adapt.eea.europa.eu/
Covenant of Mayors for Climate & Energy	http://www.covenantofmayors.eu/index_en.html
Climate-related webpages of other departments of the European Commission	Agriculture and rural development – Agriculture and climate change Energy Environment Internal market, industry, entrepreneurship and SMEs – Sustainability and circular economy International cooperation and development – Climate change, disaster risk reduction and desertification Mobility and transport – Clean transport Regional policy – Low-carbon economy Research and innovation – Climate action and resource efficiency Trade - Sustainable development Joint Research Centre – Environment and climate change
European Environment Agency	https://www.eea.europa.eu/themes/climate-change-adaptation https://www.eea.europa.eu/themes/climate https://twitter.com/EUEnvironment https://www.facebook.com/European.Environment.Agency/

9.5.2. Publications

The European Commission has published a range of brochures, factsheets, reports and other publications related to climate change and EU action. A list of publications is available online on the EU Climate Action website¹⁸⁶.

The European Environment Agency also publishes regular assessments on climate change mitigation and adaption, including the annual report on trends and projections on greenhouse

¹⁸⁶ European Commission, Climate Action, Publications, https://ec.europa.eu/clima/publications_en (webpage accessed 02-10-2017)

gas emissions, energy efficiency and renewable energy in the EU¹⁸⁷. The EEA has also published a comprehensive assessment on climate change impacts and vulnerability in Europe¹⁸⁸ as well as an EEA briefing on climate finance¹⁸⁹. These publications are complemented by EEA Signals, aimed at raising public awareness environmental and climate issues. To this end, Signals is translated to more than 12 European languages to enhance its outreach. Signals 2015¹⁹⁰ focused mainly on climate change, while 2016¹⁹¹ and 2017¹⁹² focused on mobility and energy, respectively, both of which emphasised the links between these sectors and climate change. The complete list of EEA publications on climate change is available on the EEA website¹⁹³.

9.5.3. Video productions

The European Commission has published a range of multilingual videos related to climate change and EU action. The European Environment Agency also produced short videos and animations on climate change targeting the wider public.

The videos are available online at: <https://www.youtube.com/user/EUClimateAction>

Table 9-2 Examples of videos from the European Commission and European Environment Agency

Title	Address
<i>Videos produced by the European Commission</i>	
Paris Agreement – the world unites to fight climate change	https://www.youtube.com/watch?v=5Tf5Hxa_dKs
Causes and consequences of climate change	https://www.youtube.com/watch?v=oyiNyWQeysI
EU climate action	https://www.youtube.com/watch?v=yFq5p2l0Q2o&t=3s
EU funding for climate action	https://www.youtube.com/watch?v=MIZvHNiduBk
EU adaptation to climate change	https://www.youtube.com/watch?v=PNpQVrwS68w

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

<https://www.eea.europa.eu/publications/trends-and-projections-in-europe> (webpage accessed 02-10-2017)

188 European Environment Agency, Climate change, impacts and vulnerability in Europe 2016, EEA report 1/2017, <https://www.eea.europa.eu/publications/climate-change-impacts-and-vulnerability-2016> (webpage accessed 02-10-2017)

189 European Environment Agency, Financing Europe’s low carbon, climate resilient future, July 2017, <https://www.eea.europa.eu/themes/climate/financing-europe2019s-low-carbon-climate/financing-europes-low-carbon-climate> (webpage accessed 02-10-2017)

190 European Environment Agency, EEA Signals 2015 – Living in a changing climate, June 2015, <https://www.eea.europa.eu/publications/signals-2015> (webpage accessed 02-10-2017)

191 European Environment Agency, Signals 2016 – Towards clean and smart mobility, June 2016, <https://www.eea.europa.eu/publications/signals-2016> (webpage accessed 02-10-2017)

192 European Environment Agency, Signals 2017 – Shaping the future of energy in Europe: Clean, smart and renewable August 2017, <https://www.eea.europa.eu/publications/signals-2017> (webpage accessed 02-10-2017)

193 European Environment Agency, Publications, https://www.eea.europa.eu/publications#%c14=&c12=&c7=en&c11=5&b_start=0 (Select ‘climate change adaptation’ and ‘climate change mitigation’ under available topics. Webpage accessed 02-10-2017)

Title	Address
EU financing climate action in developing countries	https://www.youtube.com/watch?v=L5nKMI8v11A&t=129s
<i>Videos produced by the European Environment Agency</i>	
Climate change impacts in Europe	https://www.youtube.com/watch?v=jS0ZIUtsQHg
Climate change adaptation in cities	https://www.youtube.com/watch?v=nMzpKpY_Kvk
Are we ready for climate change?	https://www.youtube.com/watch?v=yX9UqBGjCkQ

9.5.4. *Side events at international climate conferences*

During the annual UNFCCC climate conferences, the EU Pavilion hosts a series of side-events focused on a range of climate-related themes.

As an example, at COP22 in 2016, 102 official side-events took place at the EU Pavilion, aimed at stimulating the debate on key thematic areas, engaging observers and facilitating dialogue with party delegates and other participants.

9.6. **Training**

The EU programmes that are most relevant to training on climate change are:

- Training aspects of Erasmus+;
- ManagEnergy.

These are presented in more detail in the following.

9.6.1. *Erasmus+ – Training*¹⁹⁴

The Erasmus+ programme offers a broad range of opportunities for training, including training of relevance to climate action:

- For teachers to teach in an educational institute abroad;
- For staff in education – both teaching and non-teaching – to train abroad;
- For a range of students, apprentices and graduates to gain experience in the workplace in traineeships abroad.

Over the period from 2014 to 2020, it is anticipated that the programme will provide opportunities for about 800 000 lecturers, teachers, trainers, education staff and youth workers and for about 650 000 vocational education and training students.

¹⁹⁴ Erasmus Plus, <https://www.erasmusplus.org.uk/>, (webpage accessed 29-08-2017)

9.6.2. *ManagEnergy*¹⁹⁵

Launched in 2002, ManagEnergy is a technical support initiative financed under the Intelligent Energy - Europe programme and managed by the European Commission's Executive Agency for SMEs (EASME). It supports local and regional energy actions in the fields of energy efficiency and renewable energy. Its main target groups include local and regional public authorities, energy agencies and other organisations.

ManagEnergy offers a wide range of tools and facilities, which aim at enabling best practice sharing, ensuring capacity building and improving networking among energy actors across Europe.

Over the past 3 years ManagEnergy organised 45 capacity building workshops in different Member States and 33 networking events, in which stakeholders involved met and interacted at the European level.

A new ManagEnergy initiative is starting in June 2017 and will organise Master classes and peer-to-peer coaching to raise the skills of local and regional energy agencies in energy efficiency, financing and project development.

9.7. **Resource or information centres**

It is the EU's policy to make all relevant information publicly available. For a list of publications and websites, please refer to Sections 9.5.1 and 9.5.2 above.

9.8. **Involvement of the public and non-governmental organisations**

EU law requires extensive engagement and consultation of stakeholders during the policy-making process. The following examples illustrate stakeholder engagement and consultation in the process of formulating EU policies. These policy initiatives were preceded by wide-ranging consultation and benefited from a broad spectrum of scientific and policy expertise.

9.8.1. *Consultation on revision to the EU Emission Trading System Directive*¹⁹⁶

The European Commission presented in July 2015 a legislative proposal to revise the EU emissions trading system (EU ETS) for the period after 2020. Stakeholders were involved at various stages in the development of this proposal.

Extensive consultations were carried out in 2014, including stakeholder events and written consultations. The consultation on the revision of the EU ETS received more than 500 contributions, of which 6 % were from citizens and NGOs. Following these consultations and the analysis of EU climate policy targets for 2030, the Commission carried out an impact assessment.

¹⁹⁵ European Commission, Executive Agency for SMEs, ManagEnergy, <https://ec.europa.eu/easme/en/managenergy>, (webpage accessed on 29-08-2017)

¹⁹⁶ European Commission, Revision for Phase 4 (2021-2030) of the EU ETS, https://ec.europa.eu/clima/policies/ets/revision_en, (webpage accessed on 29-08-2017)

The public also had the possibility to provide feedback on the legislative proposal after it was adopted by the European Commission. Feedback was received from 85 stakeholders and a summary was presented to the European Parliament and the Council.

9.8.2. *Public consultation on the preparation of a legislative proposal on the effort of Member States to reduce their greenhouse gas emissions to meet the European Union's greenhouse gas emission reduction commitment in a 2030 perspective*¹⁹⁷

In July 2016, the European Commission presented a legislative proposal, the "Effort Sharing Regulation", setting out binding annual greenhouse gas emission targets for Member States for the period 2021–2030. These targets cover sectors of the economy that fall outside the scope of the EU ETS.

In advance of presenting the proposal stakeholders were involved at various stages in its development, for example through written consultations on the 2030 climate and energy framework and on the preparation of the legislative proposal (114 responses, of which 22 % were from citizens and NGOs).

9.9. **International cooperation on education, training and public awareness**

9.9.1. *Doha Work Programme on Article 6 of the Convention*

The European Union contributed actively to the intermediate review of the Doha Work Programme on Article 6 of the Convention (education, training and public awareness). This was carried out through written submissions and active EU participation in Article 6 discussions.

The report on progress in implementing the Doha work programme¹⁹⁸ included reference to the EU-wide communications campaign “A world like you, With a climate you like” as an example of an activity on public awareness. The Climate-ADAPT online platform was referred to as an example of providing public access to information.

The EU also provided funding to the UNFCCC Secretariat for Article 6 activities.

9.9.2. *Article 6-related international cooperation activities*

The EU has been actively supporting a number of activities to implement Article 6 in developing countries and other third countries. More specific details about the EU's international cooperation on climate change are provided in the respective sections. Below is a list of examples of EU-supported activities relating to education, training and public awareness in third countries.

¹⁹⁷ European Commission, Proposal for an Effort Sharing Regulation 2021-2030, https://ec.europa.eu/clima/policies/effort/proposal_en, (webpage accessed on 29-08-2017)

¹⁹⁸ UNFCCC, Review of the Doha Work Programme on Article 6 of the Convention, <http://unfccc.int/resource/docs/2016/sbi/eng/06.pdf>, (webpage accessed on 29-08-2017)

9.9.2.1. Global Climate Change Alliance (GCCA)¹⁹⁹

The GCCA was launched by the European Commission in 2007 to strengthen dialogue and cooperation on climate change between the EU and the most vulnerable developing countries, particularly least developed countries and small island developing states (for more information on the GCCA see the chapter on international cooperation on adaptation). It started its work in just four pilot countries. Today it has a budget of more than € 300 million and is one of the most significant climate initiatives in the world. It supports 51 programmes around the world and is active in 38 countries, eight regions and sub-regions and at the global level.

In 2014, a new phase of the GCCA, the GCCA+ flagship initiative, began in line with the European Commission's new Multiannual Financial Framework (2014-2020).

The GCCA+ aim is to boost the efficiency of its response to the needs of vulnerable countries and groups. Using ambitious and innovative approaches, it will achieve its goals by: serving as a platform for dialogue and exchange of experience; and by acting as a source of technical and financial support for the world's most climate-vulnerable countries.

9.9.2.2. World Bank Partnership for Market Readiness (PMR)²⁰⁰ and International Carbon Action Partnership (ICAP)²⁰¹

The PMR is a forum for collective innovation and action and a fund to support capacity building to scale up climate change mitigation using markets and carbon pricing. The PMR links 19 implementing country participants – middle income countries that receive funding and technical support – and 13 contributing participants – that contribute funding and share relevant experience. Following an initial contribution to the PMR, for the 2011-2016 period of € 5 million, an additional contribution of € 10 million has been agreed²⁰², for capacity building in developing countries, including the organisation of training workshops to help countries build expertise in market mechanisms.

The European Commission is a founding member of the International Carbon Action Partnership (ICAP), which brings together countries and regions with mandatory cap-and-trade systems. The ICAP provides a forum for sharing experience and knowledge and organises regular training courses.

9.9.2.3. Group on Earth Observations (GEO) Capacity Building^{203, 204}

The Group on Earth Observations is coordinating efforts to build a Global Earth Observation System of Systems, or GEOSS and aims at, among other objectives, developing capacity-building activities in the domain of earth observation, providing

199 Global Climate Change Alliance, <http://www.gcca.eu/>, (webpage accessed on 29-08-2017)

200 World Bank, The Partnership for Market Readiness, <https://www.thepmr.org/>, (webpage accessed on 29-08-2017)

201 International Carbon Action Partnership, <https://icapcarbonaction.com/en/>, (webpage accessed on 29-08-2017)

202 European Commission, Additional contributions to PMR

[http://www.europarl.europa.eu/RegData/docs_autres_institutions/commission_europeenne/comitologie/ros/2012/D024151-03/COM-AC_DR\(2012\)D024151-03\(ANN7\)_EN.pdf](http://www.europarl.europa.eu/RegData/docs_autres_institutions/commission_europeenne/comitologie/ros/2012/D024151-03/COM-AC_DR(2012)D024151-03(ANN7)_EN.pdf), (webpage accessed on 29-8-2017)

203 Group on Earth Observations, Capacity Building, <http://www.earthobservations.org/cb.php>, (webpage accessed on 29-08-2017)

204 GeoCab, Earth Observation Capacity Building Portal, <http://www.geocab.org/>, (webpage accessed on 29-08-2017)

support to international research initiatives in which Europe would contribute to the development of observing systems.

Several past and on-going projects throughout the GEO Work Plan have collected or are collecting information about capacity building resources²⁰⁵ (i.e. stakeholder contacts, description of initiatives and activities, training material etc.) on different geographical areas and about different topics. The Global Earth Observations Capacity Building (GEOCAB) Portal aims to capture capacity development material and make them easily accessible. Efforts including by the GEO Secretariat and European Union FP7 projects GeoNetCab, EOPOWER and IASON have started to identify capacity development opportunities and materials from outside the GEO community and these are made accessible through the GEOCAB portal.

9.9.2.4. Mission Innovation²⁰⁶

Mission Innovation (MI) is a global initiative of 22 countries and the European Union to dramatically accelerate global clean energy innovation. Participating countries have committed to seek to double their governments' clean energy research and development (R&D) investments over five years, while encouraging greater levels of private sector investment in transformative clean energy technologies.

The Commission, on behalf of the EU has a leading role within the global Mission Innovation initiative. It leads the Converting Sunlight Innovation Challenge to create storable solar fuels and the Affordable Heating and Cooling of Buildings Innovation Challenge, and takes an active part in the remaining innovation challenges. These challenges are aimed at catalyzing our global research efforts in areas that could provide significant benefits in reducing greenhouse gas emissions, increasing energy security, and creating new opportunities for clean economic growth. By doing so, MI members aim to encourage increased engagement from the global research community, industry, and investors, while also providing opportunities for new collaborations between MI members.

²⁰⁵ European Commission, Capacity Building For GEOSS: European Contributions to capacity building activities in GEO, 2014, http://www.earthobservations.org/documents/cb/2014_Capacity_Building_For_GEOSS_by_EC.pdf, (webpage accessed on 29-08-2017)

²⁰⁶ <http://mission-innovation.net/about/>

10. LIST OF ABBREVIATIONS

Abbreviation	Description
1BR	First Biennial Report
2BR	Second Biennial Report
3BR	Third Biennial Report
6NC	6th National Communication
7NC	Seventh National Communication
AAU	Assigned amount unit
AR4	Fourth Assessment Report
AR5	Fifth Assessment Report
BR	Biennial Report
C3S	Copernicus Climate Change Service
CAMS	Copernicus Atmosphere Monitoring Service
CAP	Common Agricultural Policy
CB	Capacity Building
CCS	Carbon Capture and storage
CDM	Clean Development Mechanism
CEOS	Committee on Earth Observation Satellites
CER	Certified emission reduction
CETA	EU-Canada Comprehensive Economic and Trade Agreement
CFP	Common Fisheries Policy
CH ₄	Methane
CMEMS	Copernicus Marine Environment Monitoring Service
CO ₂	Carbon dioxide
CO ₂ e	Carbon dioxide equivalent
CoM	Covenant of Mayors
COP21	21st Conference of the Parties
CP1	First commitment period
CP2	Second commitment period
CRF	Common Reporting Format
CTF	Common tabular format
DCI	Development Cooperation Instrument
DG	Directorate-General
DG RTD	Directorate-General for Research and Innovation
DRR	Disaster Risk Reduction
DRR	Disaster Risk Reduction
E3P	European Energy Efficiency Platform
EAFRD	European Agricultural Fund for Rural Development
EAP	Environmental Action Programme
EASME	Executive Agency for SMEs
ECCP II	The Second European Climate Change Programme
ECMWF	European Centre for Medium range Weather Forecasting
ECU	European Currency Unit

ECVs	Atmospheric, Oceanic and Terrestrial Essential Climate Variables
EDF	European Development Fund
EEA	European Environment Agency
EEEF	European Energy Efficiency Fund
EIB	European Investment Bank
EIONET	European Environment Information and Observation Network
EIT	European Institute of Innovation & Technology
ERA	European Research Area
ERC	European Research Council
ERDF	European Regional Development Fund
ERU	emission reduction unit
ESA	European Space Agency
ESD	Effort Sharing Decision
ESIF	European Structural and Investment Funds
ETC/ACM	European Topic Centre on Air Pollution and Climate Change Mitigation
EU	European union
EU ETS	EU Emission Trading System
EU NIR 2017	EU national inventory report, as submitted to the UNFCCC in 2017
EU-15	Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and United Kingdom
EU-27	EU-15 plus Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia and Slovenia
EU-28	28 Member States of the European Union. EU-27, plus Croatia
EUFIWACC	The European Financing Institutions Working Group on Adaptation to Climate Change
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites
EUR	Euro
EUSEW	EU Sustainable Energy Week
FACCE-JPI	Joint Programming Initiative on Agriculture, Food Security and Climate Change
FET	Future and Emerging Technologies
F-gases	Fluorinated greenhouse gases
FP7	EU's Seventh Framework Programme for Research and Technological Development
FRL	forest reference levels
GAEC	Good agricultural and environmental conditions
GCCA+	Global Climate Change Alliance Plus
GCOS	Global Climate Observing System
GCOS	Global Climate Observing System
GDP	Gross Domestic Product
GEO	Group on Earth Observation
GEOCAB	Global Earth Observations Capacity Building
GEOSS	Global Earth Observation System of Systems
GHG	Greenhouse Gas
GVA	Gross Value Added
GWP	Global Warming Potential
HFCs	Hydrofluorocarbons

ICAP	International Carbon Action Partnership
IED	Industrial Emissions Directive
IPCC	Intergovernmental Panel on Climate Change
ISL	Iceland
ITL	Independent Transaction Log
JPI	Joint Programming Initiatives
JRC	Joint Research Centre
JU	The 'Fuel Cells and Hydrogen Joint Undertaking'
KIC	Knowledge and Innovation Communities
Km	Kilometre
KP	Kyoto Protocol
LCER	Long-term certified emission reduction
LDCs	Least Developed Countries
LECB	Low Emission Capacity Building Programme
LIFE	EU financial instrument for the Environment (French: L'Instrument Financier pour l'Environnement)
LULUCF	Land Use, Land-Use Change and Forestry
M&E	Monitoring and evaluation
MAC	Mobile Air Conditioning Systems
MACC-III	Monitoring Atmospheric Composition and Climate - Interim Implementation
MMR	Monitoring Mechanism Regulation
MRS	Macro-regional strategy
MS	Member State
MSCA	Marie Skłodowska-Curie Action
Mt	Megatonnes
N ₂ O	Nitrous Oxide
NAP	National Adaptation Plan
NAS	National Adaptation Strategy
NC	National Communication
NCFF	Natural Capital Financing Facility
NDC	Nationally Determined Contribution
NGO	Non-Government Organisation
NIR	National Inventory Report
NOAA	National Oceanographic and Atmospheric Administration
PaMs	Policies and measures
PDA	Project Development Assistance
PFCs	Perfluorocarbons
PMR	World Bank Partnership for Market Readiness
PPS	Purchasing power standards
QA/QC	Quality Assurance / Quality Control
R&I	Research and innovation
REA	Research Executive Agency
REFIT	The Regulatory Fitness and Performance programme
RES	Renewable Energy Sources

RMU	Removal unit
RSO	Research and Systematic Observations
S&T	scientific and technological
SAR	Second Assessment Report
SDGs	Sustainable Development Goals
SDS	Sustainable Development Strategy
SETIS	Strategic Energy Technologies Information System
SET Plan	Strategic Energy Technology Plan
SF ₆	Sulphur Hexafluoride
SFIC	Strategic Forum for International Science and Technology Cooperation
SHERPA	Screening for High Emission Reduction Potential on Air
SITC	Standard International Trade Classification
SLR	Sea Level Rise
SMEs	Small-Medium Enterprises
SRIA	Strategic Research and Innovation Agenda
SWD	Staff Working Document
tCER	Temporary certified emission reduction
TFEU	Treaty on the Functioning of the European Union
toe	Tonnes of Oil Equivalent
TWh	Terawatt hour
UAA	Utilised agricultural area
UHI	Urban heat island
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change and the Kyoto Protocol
USD	US Dollars
WAM	With Additional Measures
WEM	With Existing Measures
WOM	Without Measures
WRI	World Resource Institute

APPENDIX I: SUMMARY OF THE REPORTING ON SUPPLEMENTARY INFORMATION UNDER ARTICLE 7.2 OF THE KYOTO PROTOCOL

The table shows a summary of the reporting on supplementary information under Article 7.2 of the Kyoto Protocol, and cross references the reporting requirement to the respective section of this Communication.

Information reported under Article 7 paragraph 2	National Communication section(s)
National systems in accordance with Article 5, paragraph 1	3.3
National registry	3.4
Supplementarity relating to the mechanisms pursuant to Articles 6, 12 and 17	4.5.4.1, 4.5.4.2
Policies and measures in accordance with Article 2	4.5.4.3
Domestic and regional programmes and/or legislative arrangements and enforcement and administrative procedures	4.5.3
Information under Article 10	
Article 10, para. a (efforts to improve emissions inventories)	3.3
Article 10, para. b (policy action on mitigation AND adaptation measures)	4.4, 6.4
Article 10, para. c (Activities related to transfer of technology)	7.6
Article 10, para. d (Activities related to systematic observation)	8.2
Article 10 para. e (Activities related to international education and training, and national level public awareness)	9.3, 9.9
Financial resources	7.2, 7.3, 7.4

APPENDIX II: SUMMARY TABLES OF GHG EMISSIONS IN THE EU-28+ISL

Table 1 – Emissions trends for EU-28+ISL: Summary

GREENHOUSE GAS EMISSIONS	Base year ⁽¹⁾	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Change from base to latest reported year
	CO ₂ equivalent (kt)																									(%)		
CO ₂ emissions without net CO ₂ from LULUCF	4 462 123	4 462 123	4 401 962	4 259 399	4 175 802	4 163 045	4 204 265	4 306 914	4 218 184	4 210 523	4 142 011	4 168 278	4 237 565	4 215 443	4 307 684	4 319 831	4 295 917	4 302 172	4 256 780	4 157 334	3 819 014	3 936 944	3 793 188	3 735 954	3 649 637	3 474 781	3 504 013	- 21
CO ₂ emissions with net CO ₂ from LULUCF	4 218 091	4 218 091	4 131 704	4 020 473	3 934 496	3 904 353	3 928 023	3 999 358	3 912 068	3 885 771	3 797 707	3 854 254	3 902 863	3 901 651	4 014 041	3 990 985	3 967 955	3 958 972	3 949 031	3 816 100	3 477 934	3 605 956	3 472 549	3 412 668	3 321 119	3 154 900	3 188 342	- 24
CH ₄ emissions without CH ₄ from LULUCF	729 474	729 474	709 607	690 539	681 421	664 662	663 786	660 369	647 095	631 911	619 860	607 541	600 394	586 238	577 107	558 988	547 493	536 308	527 301	516 310	503 443	493 238	483 595	477 958	466 055	459 413	456 986	- 37
CH ₄ emissions with CH ₄ from LULUCF	738 704	738 704	718 186	698 871	690 590	675 997	674 563	670 207	656 884	642 013	628 517	617 197	608 924	594 281	586 457	567 027	555 964	544 083	536 717	523 798	511 206	500 906	491 187	486 491	473 242	466 522	464 269	- 37
N ₂ O emissions without N ₂ O from LULUCF	385 532	385 532	366 915	352 716	342 927	345 162	348 133	353 363	350 368	328 368	307 798	305 736	302 151	291 178	288 316	293 058	285 372	275 115	275 682	265 194	249 971	239 679	235 490	232 699	233 121	235 509	236 432	- 39
N ₂ O emissions with N ₂ O from LULUCF	398 687	398 687	380 227	365 922	356 613	358 986	361 576	366 729	363 636	341 883	321 019	319 367	315 342	304 235	301 690	306 096	298 580	288 240	289 090	278 370	263 401	253 109	249 051	246 542	246 454	249 202	250 246	- 37
HFCs	29 126	29 126	29 149	31 575	34 500	39 145	43 752	50 963	58 839	60 510	52 183	53 306	52 622	56 395	63 177	67 070	73 423	77 827	84 014	91 265	94 442	102 494	104 938	108 233	110 512	112 997	107 937	271
PFCs	26 365	26 365	23 907	19 366	18 347	17 660	17 347	16 634	15 500	14 778	14 390	12 338	10 948	12 645	10 354	8 780	7 384	6 951	6 424	5 631	3 533	4 050	4 320	3 794	4 047	3 601	3 680	- 86
Unspecified mix of HFCs and PFCs	5 841	5 841	5 369	5 350	5 340	5 327	5 609	4 128	3 983	3 853	3 651	1 796	1 698	1 835	1 042	887	952	803	727	933	1 229	489	262	278	285	220	242	- 96
SF ₆	11 004	11 004	11 459	12 283	12 968	14 143	15 194	15 065	13 582	12 846	10 546	10 587	9 733	8 596	8 107	8 114	7 924	7 493	7 085	6 711	6 309	6 436	6 219	6 277	6 191	6 138	6 415	- 42
NF ₃	24	24	25	27	29	32	100	94	102	77	75	103	82	134	147	132	156	141	163	149	77	119	127	93	68	74	69	191
Total (without LULUCF)	5 649 488	5 649 488	5 548 393	5 371 255	5 271 335	5 249 176	5 298 185	5 407 530	5 307 652	5 262 867	5 150 514	5 159 686	5 215 192	5 172 465	5 255 933	5 256 860	5 218 621	5 206 810	5 158 175	5 043 526	4 678 018	4 783 450	4 628 140	4 565 286	4 469 917	4 292 735	4 315 773	- 24
Total (with LULUCF)	5 427 841	5 427 841	5 300 026	5 153 866	5 052 884	5 015 644	5 046 163	5 123 179	5 024 594	4 961 733	4 828 089	4 868 948	4 902 210	4 879 773	4 985 014	4 949 092	4 912 338	4 884 510	4 873 251	4 722 957	4 358 132	4 473 561	4 328 654	4 264 376	4 161 920	3 993 656	4 021 200	- 26
Total (without LULUCF, with indirect)	5 653 883	5 653 883	5 552 662	5 375 425	5 275 379	5 252 968	5 301 900	5 411 165	5 311 168	5 266 157	5 153 561	5 162 393	5 217 754	5 174 905	5 258 306	5 259 152	5 220 972	5 209 119	5 160 403	5 045 674	4 680 002	4 785 462	4 630 054	4 567 125	4 471 634	4 294 382	4 317 435	- 24
Total (with LULUCF, with indirect)	5 432 236	5 432 236	5 304 295	5 158 037	5 056 928	5 019 437	5 049 878	5 126 813	5 028 109	4 965 024	4 831 135	4 871 656	4 904 772	4 882 213	4 987 387	4 951 384	4 914 690	4 886 818	4 875 479	4 725 104	4 360 116	4 475 574	4 330 568	4 266 215	4 163 637	3 995 302	4 022 862	- 26

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year ⁽¹⁾	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Change from base to latest reported year
	CO ₂ equivalent (kt)																									(%)		
1. Energy	4 340 923	4 340 923	4 299 374	4 165 174	4 086 573	4 044 229	4 075 463	4 183 512	4 082 224	4 068 403	4 002 966	4 009 464	4 090 639	4 062 256	4 142 204	4 137 071	4 113 416	4 112 432	4 057 147	3 977 883	3 696 027	3 794 716	3 647 849	3 605 087	3 517 587	3 333 029	3 362 266	- 23
2. Industrial processes and product use	517 841	517 841	483 684	464 324	455 579	483 022	497 785	498 533	504 877	480 932	441 623	453 533	438 183	433 892	447 516	462 509	460 996	458 124	468 989	444 771	373 173	392 081	388 632	376 249	373 646	380 091	376 078	- 27
3. Agriculture	549 329	549 329	519 375	497 304	484 658	477 588	479 117	479 766	478 239	474 321	471 858	465 466	458 849	452 239	447 966	447 713	440 735	437 836	440 083	437 392	432 105	426 457	427 168	424 649	427 557	434 772	437 652	- 20
4. Land use, land-use change and forestry ⁽⁵⁾	- 221 647	- 221 647	- 248 367	- 217 388	- 218 451	- 233 532	- 252 022	- 284 351	- 283 058	- 301 134	- 322 425	- 290 737	- 312 982	- 292 692	- 270 919	- 307 768	- 306 283	- 322 301	- 284 924	- 320 570	- 319 886	- 309 888	- 299 486	- 300 910	- 307 997	- 299 079	- 294 573	33
5. Waste	241 396	241 396	245 960	244 454	244 525	244 337	245 821	245 719	242 313	239 211	234 067	231 222	227 521	224 077	218 246	209 567	203 473	198 418	191 957	183 480	176 713	170 196	164 490	159 301	151 126	144 843	139 777	- 42
6. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0
Total (including LULUCF)⁽⁵⁾	5 427 841	5 427 841	5 300 026	5 153 866	5 052 884	5 015 644	5 046 163	5 123 179	5 024 594	4 961 733	4 828 089	4 868 948	4 902 210	4 879 773	4 985 014	4 949 092	4 912 338	4 884 510	4 873 251	4 722 957	4 358 132	4 473 561	4 328 654	4 264 376	4 161 920	3 993 656	4 021 200	- 26

⁽¹⁾ The column "Base year" should be filled in only by those Parties with economies in transition that use a base year different from 1990 in accordance with the relevant decisions of the COP. For these Parties, this different base year is used to calculate the percentage change in the final column of this table.

⁽²⁾ Fill in net emissions/removals as reported in table Summary 1.A. For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

⁽³⁾ In accordance with the UNFCCC reporting guidelines, for Parties that decide to report indirect CO₂ the national totals shall be provided with and without indirect CO₂.

⁽⁴⁾ In accordance with the UNFCCC reporting guidelines, HFC and PFC emissions should be reported for each relevant chemical. However, if it is not possible to report values for each chemical (i.e. mixtures, confidential data, lack of disaggregation), this row could be used for reporting aggregate figures for HFCs and PFCs, respectively. Note that the unit used for this row is kt of CO₂ equivalent and that appropriate notation keys should be entered in the cells for the individual chemicals.

⁽⁵⁾ Includes net CO₂, CH₄ and N₂O from LULUCF.

Emission trends for EU-28+ISL: CO₂

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year ⁽¹⁾	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Change from base to latest reported year	
	(kt)																									%			
1. Energy	4 115 916	4 115 916	4 085 016	3 959 116	3 882 592	3 852 767	3 883 662	3 993 757	3 899 260	3 894 992	3 835 564	3 849 468	3 930 525	3 909 378	3 991 238	3 992 778	3 973 100	3 977 044	3 925 759	3 846 484	3 571 220	3 668 020	3 524 821	3 480 985	3 396 810	3 216 999	3 245 433	- 21	
A. Fuel combustion (sectoral approach)	4 086 387	4 086 387	4 056 971	3 930 685	3 854 104	3 824 573	3 853 948	3 963 866	3 869 664	3 867 581	3 808 897	3 822 084	3 904 218	3 882 634	3 963 774	3 966 532	3 945 539	3 948 451	3 897 333	3 819 020	3 545 494	3 641 788	3 498 861	3 455 785	3 369 845	3 190 807	3 218 865	- 21	
1. Energy industries	1 670 961	1 670 961	1 633 843	1 574 261	1 507 368	1 516 855	1 512 714	1 542 179	1 495 508	1 513 073	1 470 595	1 501 080	1 541 855	1 558 690	1 608 592	1 595 291	1 588 525	1 599 286	1 613 458	1 537 529	1 411 673	1 435 112	1 412 109	1 405 830	1 331 741	1 244 171	1 231 598	- 26	
2. Manufacturing industries and construction	829 225	829 225	782 508	746 157	717 738	721 082	736 845	725 709	717 702	685 833	665 095	672 742	649 224	633 688	641 659	639 004	627 502	620 385	622 142	593 337	497 353	530 983	517 133	493 251	483 268	475 553	477 216	- 42	
3. Transport	769 024	769 024	776 664	800 819	805 297	809 995	822 327	848 694	859 951	887 458	907 218	904 494	918 781	930 336	940 195	960 283	960 828	969 016	979 149	954 904	928 355	922 788	910 756	882 208	875 369	882 890	896 960	17	
4. Other sectors	794 352	794 352	844 979	793 018	809 284	762 567	768 648	835 376	784 500	769 790	755 691	734 217	785 595	751 158	763 948	761 594	758 211	749 437	671 929	723 436	699 463	744 565	650 775	667 223	672 348	581 391	606 225	- 24	
5. Other	22 825	22 825	18 976	16 431	14 416	14 075	13 414	11 909	12 004	11 427	10 298	9 550	8 764	8 762	9 380	10 360	10 472	10 328	10 654	9 814	8 650	8 340	8 088	7 273	7 119	6 802	6 866	- 70	
B. Fugitive emissions from fuels	29 530	29 530	28 046	28 431	28 487	28 194	29 715	29 891	29 596	27 410	26 667	27 385	26 307	26 743	27 464	26 246	27 561	28 594	28 427	27 464	25 726	26 231	25 959	25 199	26 965	26 191	26 568	- 10	
1. Solid fuels	7 099	7 099	5 492	5 308	4 779	5 329	4 106	3 767	4 864	2 985	3 815	4 556	3 875	4 103	4 628	3 997	3 555	4 085	3 788	3 640	2 602	3 650	3 465	3 261	3 949	3 931	4 004	- 44	
2. Oil and natural gas and other emissions from energy production	22 431	22 431	22 554	23 123	23 708	24 665	25 609	26 124	24 731	24 426	22 852	22 828	22 432	22 641	22 837	22 249	24 007	24 508	24 639	23 824	23 124	22 582	22 495	21 939	23 015	22 260	22 564	1	
C. CO₂ transport and storage	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	0
2. Industrial processes	325 708	325 708	298 770	283 690	277 392	295 218	304 647	297 452	303 388	300 707	292 299	304 923	293 346	292 149	302 308	313 509	309 642	312 194	317 885	298 089	234 836	256 173	255 329	241 958	239 214	244 148	245 056	- 25	
A. Mineral industry	145 052	145 052	132 803	128 449	122 877	130 772	135 189	131 193	134 204	136 945	137 536	140 047	137 280	136 929	138 664	144 655	144 674	148 545	153 815	143 562	115 372	116 876	117 435	110 378	106 079	109 161	108 443	- 25	
B. Chemical industry	56 941	56 941	54 190	52 534	50 238	56 683	58 122	58 729	57 694	56 683	56 400	59 565	56 825	54 074	56 844	58 562	60 131	57 361	60 301	56 705	48 735	53 749	55 273	53 602	52 348	51 399	51 275	- 10	
C. Metal industry	109 632	109 632	98 703	88 939	90 773	97 504	98 143	93 665	98 165	93 889	85 756	92 601	87 217	88 828	94 711	97 185	93 056	94 635	92 134	86 468	60 744	74 224	71 768	67 477	70 372	73 018	75 195	- 31	
D. Non-energy products from fuels and solvent use	13 853	13 853	13 156	13 545	13 303	12 767	13 000	13 655	13 125	13 022	12 425	12 514	11 849	12 158	11 909	12 921	11 598	11 475	11 452	11 147	9 791	11 115	10 657	10 306	10 220	10 385	9 951	- 28	
E. Electronic industry																													
F. Product uses as ODS substitutes																													
G. Other product manufacture and use	135	135	138	136	121	154	141	140	133	114	118	129	114	114	114	117	117	122	128	130	126	134	128	127	131	131	131	- 3	
H. Other	96	96	80	87	80	54	53	70	66	53	64	66	59	45	66	69	65	56	54	77	69	75	69	70	65	55	61	- 37	
3. Agriculture	15 230	15 230	12 920	11 318	10 687	10 161	11 339	11 214	11 598	11 039	10 708	10 454	10 199	10 163	10 106	9 810	9 372	9 087	9 359	9 041	9 351	9 057	9 466	9 417	10 119	10 115	10 282	- 32	
A. Enteric fermentation																													
B. Manure management																													
C. Rice cultivation																													
D. Agricultural soils																													
E. Prescribed burning of savannas																													
F. Field burning of agricultural residues																													
G. Liming	11 477	11 477	9 609	8 164	7 500	7 075	8 334	8 131	8 420	7 751	7 308	7 071	6 641	6 632	6 602	6 166	5 979	5 508	5 556	5 492	5 564	5 421	5 619	5 448	6 194	6 017	5 735	- 50	
H. Urea application	3 689	3 689	3 264	3 101	3 143	3 048	2 969	3 056	3 158	3 272	3 381	3 360	3 535	3 508	3 482	3 614	3 367	3 551	3 768	3 516	3 742	3 586	3 787	3 896	3 844	4 021	4 454	21	
I. Other carbon-containing fertilizers	61	61	44	50	42	35	33	25	16	14	16	21	20	20	19	28	23	25	32	30	42	48	57	71	79	75	91	48	
J. Other	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	- 10	
4. Land use, land-use change and forestry⁽²⁾	- 244 032	- 244 032	- 270 257	- 238 926	- 241 306	- 258 691	- 276 242	- 307 555	- 306 116	- 324 752	- 344 304	- 314 025	- 334 702	- 313 792	- 293 643	- 328 845	- 327 962	- 343 200	- 307 748	- 341 234	- 341 079	- 330 987	- 320 640	- 323 286	- 328 517	- 319 881	- 315 670	29	
A. Forest land	- 382 782	- 382 782	- 415 384	- 390 173	- 393 136	- 393 811	- 407 311	- 430 339	- 426 764	- 442 739	- 463 542	- 422 931	- 444 295	- 421 536	- 398 818	- 425 602	- 424 342	- 434 492	- 402 991	- 454 223	- 466 856	- 441 423	- 438 386	- 446 467	- 451 741	- 438 194	- 424 313	11	
B. Cropland	77 016	77 016	75 042	77 424	78 116	74 896	80 176	74 807	75 969	75 303	76 496	76 088	70 540	72 634	72 645	68 459	67 485	68 387	68 772	69 812	65 555	63 157	69 960	67 586	69 410	68 618	62 053	- 19	
C. Grassland	32 029	32 029	28 372	27 521	29 802	26 913	21 083	21 173	23 072	23 221	21 278	19 968	17 754	16 796	18 786	18 221	18 086	17 339	23 717	16 499	17 485	14 498	12 599	15 346	10 041	10 576	9 754	- 9	
D. Wetlands	17 258	17 258	17 342	16 739	16 103	17 478	17 073	17 006	17 041	15 453	18 123	16 772	17 816	18 885	18 855	18 264	19 255	19 902	18 692	18 361	18 704	18 595	18 919	18 160	19 170	18 646	18 862	70	
E. Settlements	36 120	36 120	38 390	37 276	40 648	38 632	39 766	37 650	38 840	39 063	40 594	39 588	39 572	40 205	41 126	43 106	43 776	45 855	47 661	48 706	49 703	48 819	48 706	48 188	48 014	48 777	47 005	30	
F. Other land	2 551	2 551	2 135	1 861	1 550	1 379	- 3	- 35	- 68	- 112	- 122	898	756	578	487	405	322	1 769	- 170	- 297	- 103	- 39	176	504	- 28	- 74	20	- 99	
G. Harvested wood products	- 26 224	- 26 224	- 16 155	- 9 574	- 14 388	- 25 213	- 28 243	- 28 880	- 35 132	- 35 749	- 37 835	- 45 022	- 37 380	- 41 823	- 47 132	- 52 053	- 52 854	- 62 231	- 63 665	- 40 298	- 25 747	- 34 751	- 32 751	- 2					

Emission trends for EU-28+ISL: CH₄

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year ⁽¹⁾	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Change from base to latest reported year	
		(kt)																									%		
1. Energy	7 758	7 758	7 346	7 028	6 932	6 398	6 355	6 218	5 929	5 531	5 327	5 107	5 118	4 854	4 754	4 488	4 353	4 156	3 987	4 001	3 809	3 859	3 741	3 777	3 657	3 493	3 496	- 55	
A. Fuel combustion (sectoral approach)	1 301	1 301	1 315	1 211	1 240	1 129	1 121	1 176	1 107	1 042	1 016	953	948	890	930	913	931	935	952	1 006	997	1 073	981	1 041	1 048	963	986	- 24	
1. Energy industries	50	50	51	51	52	56	64	70	70	73	74	71	71	73	86	86	90	99	106	112	115	131	133	140	150	154	157	212	
2. Manufacturing industries and construction	60	60	57	57	56	58	64	65	67	69	71	76	78	80	87	95	97	84	88	86	74	81	82	85	91	84	85	43	
3. Transport	263	263	252	250	250	224	214	208	197	188	177	161	151	140	130	121	111	102	93	85	76	71	65	59	56	54	53	- 80	
4. Other sectors	916	916	945	849	877	788	777	830	771	711	692	644	645	594	625	609	630	647	662	721	730	788	699	756	749	670	690	- 25	
5. Other	12	12	10	6	4	3	2	2	2	2	2	1	3	3	3	2	3	3	2	2	2	2	1	1	1	1	2	- 85	
B. Fugitive emissions from fuels	6 457	6 457	6 031	5 817	5 692	5 269	5 234	5 042	4 821	4 489	4 312	4 154	4 170	3 963	3 824	3 575	3 422	3 221	3 035	2 994	2 811	2 785	2 761	2 736	2 609	2 530	2 510	- 61	
1. Solid fuels	3 822	3 822	3 565	3 442	3 308	2 925	2 961	2 824	2 741	2 475	2 377	2 292	2 344	2 140	2 018	1 819	1 679	1 567	1 434	1 416	1 301	1 260	1 255	1 275	1 165	1 126	1 153	- 70	
2. Oil and natural gas and other emissions from energy production	2 635	2 635	2 466	2 374	2 384	2 344	2 273	2 219	2 080	2 014	1 935	1 862	1 826	1 823	1 806	1 756	1 743	1 653	1 600	1 578	1 510	1 525	1 506	1 461	1 443	1 404	1 357	- 48	
C. CO ₂ transport and storage																													
2. Industrial processes	73	73	70	71	71	77	75	73	74	72	73	75	75	75	80	79	81	82	82	74	66	71	68	67	65	68	66	- 9	
A. Mineral industry																													
B. Chemical industry	57	57	56	58	59	63	61	60	61	59	61	63	62	62	67	66	67	66	66	61	56	61	57	56	55	58	56	- 3	
C. Metal industry	11	11	10	9	9	10	10	9	10	9	9	9	9	8	9	9	11	12	11	10	6	6	7	7	6	7	6	- 44	
D. Non-energy products from fuels and solvent use	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	- 56	
E. Electronic industry																													
F. Product uses as ODS substitutes																													
G. Other product manufacture and use	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	45	
H. Other	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	- 63	
3. Agriculture	12 265	12 265	11 696	11 307	11 027	10 883	10 824	10 829	10 701	10 621	10 540	10 389	10 247	10 102	10 079	9 952	9 881	9 837	9 905	9 797	9 753	9 565	9 521	9 471	9 439	9 594	9 689	- 21	
A. Enteric fermentation	9 881	9 881	9 468	9 094	8 846	8 723	8 663	8 664	8 536	8 455	8 389	8 240	8 133	7 981	7 935	7 838	7 799	7 755	7 796	7 764	7 694	7 601	7 524	7 510	7 545	7 627	7 701	- 22	
B. Manure management	2 174	2 174	2 035	2 002	1 980	1 964	1 968	1 957	1 971	1 968	1 965	1 968	1 965	1 965	1 983	1 960	1 927	1 925	1 926	1 875	1 881	1 784	1 810	1 763	1 706	1 780	1 796	- 17	
C. Rice cultivation	111	111	106	105	104	109	108	114	115	110	105	102	102	104	107	112	108	105	107	100	112	114	114	111	104	101	104	- 6	
D. Agricultural soils	IE,N,E,NO	IE,N,E,NO	IE,N,E,NO	IE,N,E,NO	IE,N,E,NO	IE,N,E,NO	IE,N,E,NO	IE,N,E,NO	IE,N,E,NO	IE,N,E,NO	IE,N,E,NO	IE,N,E,NO	IE,N,E,NO	IE,N,E,NO	IE,N,E,NO	IE,N,E,NO	IE,N,E,NO	IE,N,E,NO	IE,N,E,NO	IE,N,E,NO	IE,N,E,NO	IE,N,E,NO	IE,N,E,NO	IE,N,E,NO	IE,N,E,NO	IE,N,E,NO	IE,N,E,NO	IE,N,E,NO	0
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0
F. Field burning of agricultural residues	87	87	76	94	86	76	74	82	68	76	68	66	36	40	42	30	29	29	48	28	30	25	25	38	26	25	28	- 68	
G. Liming																													
H. Urea application																													
I. Other carbon-containing fertilizers																													
J. Other	11	11	11	11	11	11	11	11	11	12	12	12	12	13	11	12	18	23	28	30	35	41	48	50	58	60	60	438	
4. Land use, land-use change and forestry	369	369	343	333	367	453	431	394	392	404	346	386	341	322	374	322	339	311	377	300	311	307	304	341	288	284	291	- 21	
A. Forest land	155	155	138	138	160	146	127	120	137	148	123	151	122	117	148	113	128	112	151	101	105	102	99	124	93	94	100	- 35	
B. Cropland	31	31	31	31	31	31	30	30	30	30	30	30	30	30	31	30	30	30	30	31	31	31	31	31	31	31	31	0	
C. Grassland	91	91	80	77	89	90	71	71	78	86	70	85	75	68	81	75	74	72	101	75	81	75	80	93	66	70	69	- 24	
D. Wetlands	82	82	81	81	82	82	83	84	82	81	80	81	83	80	84	81	79	78	78	77	76	79	77	75	76	76	75	- 8	
E. Settlements	3	3	3	3	3	3	3	3	3	3	4	3	3	3	3	4	4	4	4	5	4	4	4	4	4	4	4	36	
F. Other land	7	7	9	3	3	4	9	6	2	10	4	9	6	5	11	6	12	4	1	1	4	6	4	5	7	1	3	- 59	
G. Harvested wood products																													
H. Other	IE,N,E,NO	IE,N,E,NO	IE,N,E,NO	IE,N,E,NO	IE,N,E,NO	98	108	80	60	45	35	27	22	18	16	14	12	11	11	10	10	9	9	9	9	9	9	100	
5. Waste	9 083	9 083	9 272	9 215	9 227	9 228	9 297	9 295	9 180	9 053	8 854	8 731	8 576	8 420	8 171	7 841	7 584	7 378	7 118	6 780	6 511	6 235	6 013	5 803	5 481	5 222	5 028	- 45	
A. Solid waste disposal	7 680	7 680	7 908	7 876	7 912	7 959	8 016	8 029	7 941	7 831	7 662	7 550	7 475	7 325	7 066	6 741	6 518	6 322	6 088	5 788	5 543	5 248	5 027	4 829	4 500	4 235	4 037	- 47	
B. Biological treatment of solid waste	15	15	16	18	21	26	31	35	38	42	47	54	58	66	73	78	88	94	102	105	112	124	133	145	155	166	174	1 084	
C. Incineration and open burning of waste	22	22	23	22	21	20	20	19	16	16	16	16	16	17	17	17	17	17	16	16	16	16	16	16	16	16	16	- 27	
D. Waste water treatment and discharge	1 365	1 365	1 324	1 297	1 271	1 222	1 230	1 211	1 184	1 163	1 128	1 110	1 026	1 011	1 014	1 003	961	944	911	869	838	846	836	812	809	804	800	- 41	
E. Other	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	- 37	
6. Other (as specified in summary I.A)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0	
Total CH₄ emissions without CH₄ from LULUCF	29 179	29 179	28 384	27 622	27 257	26 586	26 551	26 415	25 884	25 276	24 794	24 302	24 016	23 450	23 084	22 360	21 900	21 452	21 092	20 652	20 138	19 730	19 344	19 118	18 642	18 37			

Emission trends for EU-28+ISL: N₂O

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year ⁽¹⁾	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Change from base to latest reported year
	(kt)																										%	
1. Energy	104	104	103	102	103	106	110	115	117	118	115	108	108	106	108	108	106	106	106	105	99	101	99	100	98	96	99	- 5
A. Fuel combustion (sectoral approach)	104	104	102	101	102	105	110	114	116	117	114	108	107	105	107	107	105	105	106	105	99	101	99	99	98	96	98	- 5
1. Energy industries	28	28	28	27	26	26	26	26	25	25	24	25	26	27	28	28	28	28	28	28	26	27	28	28	27	26	26	- 9
2. Manufacturing industries and construction	20	20	19	19	18	17	18	18	18	18	18	18	18	18	19	19	18	19	19	18	15	15	15	14	14	14	14	- 29
3. Transport	26	26	27	28	30	34	38	42	44	46	44	37	36	34	33	33	31	31	31	30	29	29	29	29	30	30	31	19
4. Other sectors	28	28	28	27	28	27	27	28	28	27	27	27	27	26	27	27	28	27	27	29	28	29	27	27	28	26	27	- 5
5. Other	1	1	1	1	1	1	1	0	1	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	- 63
B. Fugitive emissions from fuels	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	- 23
1. Solid fuels	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	- 4
2. Oil and natural gas and other emissions from energy production	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	- 23
C. CO ₂ transport and storage																												
2. Industrial processes	396	396	380	370	353	368	367	377	361	290	224	230	228	202	203	208	200	170	170	135	104	69	53	47	39	38	37	- 91
A. Mineral industry																												
B. Chemical industry	376	376	361	350	334	348	347	358	342	271	205	212	210	185	186	192	183	153	154	119	89	54	38	33	26	25	25	- 93
C. Metal industry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	- 40
D. Non-energy products from fuels and solvent use	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	- 2
E. Electronic industry																												
F. Product uses as ODS substitutes																												
G. Other product manufacture and use	19	19	19	19	19	19	19	19	19	19	18	18	17	17	16	16	16	16	16	16	15	14	14	14	13	12	11	- 41
H. Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29
3. Agriculture	763	763	718	682	665	656	662	664	668	664	663	655	646	636	624	635	619	614	614	616	600	598	603	599	609	620	621	- 19
A. Enteric fermentation																												
B. Manure management	99	99	95	91	88	84	84	83	82	82	81	79	79	78	77	76	76	75	75	74	73	72	71	70	69	70	70	- 29
C. Rice cultivation																												
D. Agricultural soils	661	661	621	588	575	569	576	578	583	579	580	574	566	557	545	557	541	537	537	540	526	525	530	527	538	549	549	- 17
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0
F. Field burning of agricultural residues	2	2	2	3	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	- 65
G. Liming																												
H. Urea application																												
I. Other carbon containing fertilizers																												
J. Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	151
4. Land use, land-use change and forestry	44	44	45	44	46	46	45	45	45	45	44	46	44	44	45	44	44	44	45	44	45	45	46	46	45	46	46	5
A. Forest land	14	14	14	14	14	15	14	15	14	14	14	15	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	- 2
B. Cropland	15	15	15	15	15	15	15	15	15	15	15	14	14	14	13	13	13	13	13	13	13	13	13	13	13	13	13	- 17
C. Grassland	3	3	3	2	3	3	2	2	3	2	3	2	2	2	2	2	2	2	2	3	2	2	2	3	1	2	2	- 45
D. Wetlands	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21
E. Settlements	6	6	7	7	8	7	7	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	9	10	10	11	11	83
F. Other land	2	2	2	2	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	85
G. Harvested wood products																												
H. Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	42
5. Waste	30	30	30	30	29	29	29	30	30	31	31	32	32	33	33	33	34	34	34	34	35	36	36	36	36	36	36	20
A. Solid waste disposal																												
B. Biological treatment of solid waste	1	1	1	1	1	2	2	2	3	3	4	4	5	5	6	6	6	7	7	7	8	9	9	9	9	10	10	784
C. Incineration and open burning of waste	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	- 2
D. Waste water treatment and discharge	27	27	27	26	26	26	25	25	25	25	25	26	26	25	25	25	25	25	25	25	25	25	25	24	24	25	25	- 11
E. Other	NO	NO	NO	NO	NO	NO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100
6. Other (as specified in summary 1.A)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0
Total direct N₂O emissions without N₂O from LULUCF	1 294	1 294	1 231	1 184	1 151	1 158	1 168	1 186	1 176	1 102	1 033	1 026	1 014	977	968	983	958	923	925	890	839	804	790	781	782	790	793	- 39
Total direct N₂O emissions with N₂O from LULUCF	1 338	1 338	1 276	1 228	1 197	1 205	1 213	1 231	1 220	1 147	1 077	1 072	1 058	1 021	1 012	1 027	1 002	967	970	934	884	849	836	827	827	836	840	- 37
Memo items:																												
International bunkers	5	5	5	6	6	6	6	6	7	7	7	8	8	7	8	8	8	8	9	9	9	8	8	8	8	8	8	46
Aviation	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	4	4	4	4	106
Navigation	3	3	3	3	4	4	4	4	4	4	4	4	4	4	4	4	4	5	5	5	4	4	4	4	4	4	4	9
Multilateral operations	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	66 630
CO₂ emissions from biomass																												
CO₂ captured																												
Long-term storage of C in waste disposal sites																												
Indirect N₂O	72	72	67	64	61	58	56	53	52	50	48	45	45	44	43	44	43	42	41	41	38	38	37	36	36	35	36	- 49
Indirect CO₂⁽³⁾																												

Emission trends for EU-28+ISL: HFCs, PFCs, SF₆, and NF₃

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year ⁽¹⁾	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Change from base to latest reported year	
	(kt)																									%			
Emissions of HFCs and PFCs - (kt CO₂ equivalent)	61 332	61 332	58 425	56 291	58 187	62 132	66 707	71 725	78 322	79 142	70 224	67 440	65 268	70 876	74 572	76 738	81 759	85 581	91 165	97 828	99 204	107 033	109 520	112 305	114 845	116 819	111 859	82	
Emissions of HFCs - (kt CO₂ equivalent)	29 126	29 126	29 149	31 575	34 500	39 145	43 752	50 963	58 839	60 510	52 183	53 306	52 622	56 395	63 177	67 070	73 423	77 827	84 014	91 265	94 442	102 494	104 938	108 233	110 512	112 997	107 937	271	
HFC-23	2	2	2	2	2	2	2	3	3	3	2	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	- 95
HFC-32	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	2	2	2	3	3	3	4	4	4	21 594 114	
HFC-41	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0	
HFC-43-10mee	NO,NE,IE	NO,NE,IE	NO,NE,IE	NO,NE,IE	NO,NE,IE	NO,NE,IE	NO,NE,IE	NO,NE,IE	NO,NE,IE	NO,NE,IE	NO,NE,IE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100
HFC-125	0	0	0	0	0	0	0	0	1	1	1	2	2	3	3	4	5	5	6	7	7	8	9	9	10	10	10	113 089	
HFC-134	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0	
HFC-134a	0	0	0	1	3	3	4	6	8	10	11	13	15	16	18	20	22	23	25	26	26	27	27	27	28	28	28	573 767	
HFC-143	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0	
HFC-143a	1	1	1	0	0	0	0	0	0	1	1	2	2	2	3	3	4	4	5	5	5	6	6	6	6	6	6	1 066	
HFC-152	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0	
HFC-152a	0	0	0	0	0	0	1	1	1	1	1	2	3	4	4	4	3	4	4	4	4	4	4	4	4	3	3	1 986 781	
HFC-161	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0	
HFC-227ea	NO,NE,IE	NO,NE,IE	NO,NE,IE	NO,NE,IE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100
HFC-236cb	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0	
HFC-236ea	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0	
HFC-236fa	NO	NO	NO	NO	NO	NO	NO	NO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	
HFC-245ca	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0	
HFC-245fa	NO,NE,IE	NO,NE,IE	NO,NE,IE	NO,NE,IE	NO,NE,IE	NO,NE,IE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	100
HFC-365mfc	NO,NE,IE	NO,NE,IE	NO,NE,IE	NO,NE,IE	NO,NE,IE	NO,NE,IE	NO,NE,IE	NO,NE,IE	NO,NE,IE	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	100
Unspecified mix of HFCs ⁽⁴⁾ - (kt CO ₂ equivalent)	2	2	4	6	37	154	250	608	1 427	1 295	1 117	913	648	478	453	485	501	553	657	752	691	674	899	957	878	784	739	30 077	
Emissions of PFCs - (kt CO₂ equivalent)	26 365	26 365	23 907	19 366	18 347	17 660	17 347	16 634	15 500	14 778	14 390	12 338	10 948	12 645	10 354	8 780	7 384	6 951	6 424	5 631	3 533	4 050	4 320	3 794	4 047	3 601	3 680	- 86	
CF ₄	2	2	2	2	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	- 88	
C ₂ F ₆	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	- 94	
C ₃ F ₈	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	- 16	
C ₄ F ₁₀	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	- 35	
c-C ₄ F ₈	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	- 62	
C ₅ F ₁₂	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	- 100	
C ₆ F ₁₄	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	- 66	
C ₁₀ F ₁₈	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0	
c-C ₃ F ₆	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0	
Unspecified mix of PFCs ⁽⁴⁾ - (kt CO ₂ equivalent)	314	314	328	343	406	398	556	481	440	405	472	510	532	480	601	661	744	744	840	782	634	708	734	756	680	593	550	75	
Unspecified mix of HFCs and PFCs - (kt CO₂)	5 841	5 841	5 369	5 350	5 340	5 327	5 609	4 128	3 983	3 853	3 651	1 796	1 698	1 835	1 042	887	952	803	727	933	1 229	489	262	278	285	220	242	- 96	
Emissions of SF₆ - (kt CO₂ equivalent)	11 004	11 004	11 459	12 283	12 968	14 143	15 194	15 065	13 582	12 846	10 546	10 587	9 733	8 596	8 107	8 114	7 924	7 493	7 085	6 711	6 309	6 436	6 219	6 277	6 191	6 138	6 415	- 42	
SF ₆	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	- 42	
Emissions of NF₃ - (kt CO₂ equivalent)	24	24	25	27	29	32	100	94	102	77	75	103	82	134	147	132	156	141	163	149	77	119	127	93	68	74	69	191	
NF ₃	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	191	

Emission trends for EU-28+ISL: GHG CO₂eq emissions

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year ⁽¹⁾	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Change from base to latest reported year	
	(kt CO ₂ eq)																												%
Total (net emissions)⁽²⁾	5 427 841	5 427 841	5 300 026	5 153 866	5 052 884	5 015 644	5 046 163	5 123 179	5 024 594	4 961 733	4 828 089	4 868 948	4 902 210	4 879 773	4 985 014	4 949 092	4 912 338	4 884 510	4 873 251	4 722 957	4 358 132	4 473 561	4 328 654	4 264 376	4 161 920	3 993 656	4 021 200	- 26	
1. Energy	4 340 923	4 340 923	4 299 374	4 165 174	4 086 573	4 044 229	4 075 463	4 183 512	4 082 224	4 068 403	4 002 966	4 009 464	4 090 639	4 062 256	4 142 204	4 137 071	4 113 416	4 112 432	4 057 147	3 977 883	3 696 027	3 794 716	3 647 849	3 605 087	3 517 587	3 333 029	3 362 266	- 23	
A. Fuel combustion (sectoral approach)	4 149 817	4 149 817	4 120 361	3 991 122	3 915 603	3 884 120	3 914 712	4 027 376	3 931 875	3 928 578	3 868 217	3 878 016	3 959 852	3 936 229	4 018 950	4 021 243	4 000 119	4 003 138	3 952 654	3 875 400	3 599 875	3 698 709	3 552 755	3 511 379	3 425 300	3 243 479	3 272 839	- 21	
1. Energy industries	1 680 666	1 680 666	1 643 398	1 583 575	1 516 401	1 525 997	1 521 970	1 551 671	1 504 757	1 522 390	1 479 715	1 510 364	1 551 467	1 568 509	1 618 995	1 605 797	1 599 000	1 610 133	1 624 540	1 548 518	1 422 442	1 446 485	1 423 644	1 417 659	1 343 505	1 255 649	1 243 231	- 42	
2. Manufacturing industries and construction	836 740	836 740	789 675	753 098	724 402	727 750	743 850	732 668	724 719	692 997	672 150	679 890	656 483	641 110	649 361	646 988	635 432	627 999	629 867	600 822	503 656	537 620	523 598	499 668	489 585	481 768	483 602	- 26	
3. Transport	783 465	783 465	790 899	815 457	820 534	825 700	839 035	866 345	878 032	905 934	924 799	919 692	933 159	943 924	953 329	973 143	972 698	980 665	990 720	966 025	938 778	933 215	921 089	892 442	885 623	893 326	907 625	16	
4. Other sectors	825 603	825 603	876 955	822 221	839 550	790 346	796 217	864 582	812 162	795 655	781 089	758 375	809 828	773 768	787 702	784 731	782 268	773 785	696 655	750 024	726 154	772 886	676 207	694 219	699 342	605 826	631 391	- 24	
5. Other	23 343	23 343	19 435	16 770	14 717	14 327	13 640	12 110	12 205	11 604	10 464	9 696	8 915	8 918	9 562	10 583	10 721	10 557	10 871	10 011	8 845	8 502	8 218	7 393	7 245	6 909	6 990	- 20	
B. Fugitive emissions from fuels	191 106	191 106	179 012	174 051	170 969	160 109	160 751	156 136	150 349	139 825	134 749	131 448	130 788	126 028	123 253	115 828	113 297	109 294	104 492	102 484	96 152	96 007	95 093	93 708	92 287	89 550	89 428	- 53	
1. Solid fuels	102 648	102 648	94 614	91 370	87 472	76 646	78 129	74 360	73 398	64 854	63 231	61 852	62 484	57 611	55 065	49 472	45 528	43 264	39 641	39 050	35 136	35 146	34 829	35 134	33 082	32 076	32 820	- 68	
2. Oil and natural gas and other emissions from energy production	88 458	88 458	84 399	82 681	83 497	83 463	82 623	81 776	76 951	74 971	71 518	69 596	68 303	68 417	68 188	66 356	67 769	66 030	64 852	63 434	61 016	60 861	60 264	58 574	59 205	57 474	56 608	- 36	
C. CO ₂ transport and storage	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	0
2. Industrial Processes	517 841	517 841	483 684	464 324	455 579	483 022	497 785	498 533	504 877	480 932	441 623	453 533	438 183	433 892	447 516	462 509	460 996	458 124	468 989	444 771	373 173	392 081	388 632	376 249	373 646	380 091	376 078	- 27	
A. Mineral industry	145 052	145 052	132 503	128 449	122 877	130 772	135 189	131 193	134 204	136 945	137 536	140 047	137 280	136 929	138 664	144 655	144 674	148 545	153 815	143 562	115 372	116 876	117 435	110 378	106 079	109 161	108 443	- 25	
B. Chemical industry	211 238	211 238	203 236	200 462	193 282	205 602	211 450	216 157	210 825	183 586	150 185	148 303	136 807	124 131	126 650	127 017	124 801	110 358	112 079	97 910	80 410	75 289	70 952	67 409	64 450	62 729	62 682	- 70	
C. Metal industry	132 878	132 878	119 487	105 013	105 504	111 272	111 966	107 016	111 182	106 973	98 331	103 259	96 439	99 776	102 293	103 026	97 863	99 014	96 038	89 414	62 330	76 011	73 344	68 640	71 390	74 061	76 104	- 43	
D. Non-energy products from fuels and solvent use	13 863	13 863	13 166	13 555	13 313	12 777	13 011	13 665	13 136	13 034	12 435	12 523	11 859	12 168	11 918	12 931	11 607	11 484	11 461	11 155	9 799	11 122	10 664	10 313	10 227	10 391	9 958	- 28	
E. Electronic industry	781	781	923	1 053	1 202	1 300	1 649	1 840	2 409	2 174	2 353	2 772	2 458	2 396	2 574	2 436	2 131	1 986	1 818	1 659	1 018	1 200	1 077	898	790	816	813	4	
F. Product uses as ODS substitutes	6	6	21	820	3 810	5 183	7 536	11 787	16 455	22 115	26 652	33 054	40 423	46 775	54 051	61 193	68 348	75 134	82 139	89 516	93 147	100 508	104 003	107 478	109 790	112 593	107 542	1 859 112	
G. Other product manufacture and use	13 544	13 544	13 888	14 505	15 136	15 652	16 548	16 404	16 193	15 657	13 676	13 109	12 408	11 242	10 796	10 808	11 080	10 975	10 980	10 957	10 629	10 602	10 765	10 714	10 411	9 988	10 163	- 25	
H. Other	479	479	461	466	455	433	435	472	472	448	455	465	507	475	570	443	491	629	659	598	469	471	392	419	421	352	373	- 22	
3. Agriculture	549 329	549 329	519 375	497 304	484 658	477 588	479 117	479 766	478 239	474 321	471 858	465 466	458 849	452 239	447 966	447 713	440 735	437 836	440 083	437 392	432 105	426 457	427 168	424 649	427 552	434 772	437 652	- 20	
A. Enteric fermentation	247 035	247 035	236 691	227 346	221 158	218 081	216 570	216 701	213 401	211 385	209 728	206 007	203 317	199 528	198 384	195 940	194 980	193 877	194 910	194 088	192 352	190 032	188 110	187 742	188 636	190 686	192 528	- 22	
B. Manure management	83 903	83 903	79 174	77 164	75 569	74 227	74 104	73 726	73 805	73 557	73 172	72 641	72 543	72 272	72 568	71 730	70 756	70 364	70 536	68 882	68 708	65 998	66 273	64 859	63 260	65 240	65 805	- 22	
C. Rice cultivation	2 787	2 787	2 656	2 626	2 602	2 722	2 705	2 855	2 880	2 738	2 637	2 548	2 541	2 588	2 669	2 802	2 693	2 626	2 680	2 509	2 806	2 847	2 847	2 764	2 609	2 526	2 612	- 6	
D. Agricultural soils	197 067	197 067	185 002	175 283	171 356	169 439	171 520	172 216	173 872	172 631	172 893	171 132	168 584	165 878	162 375	165 951	161 285	160 085	160 011	160 888	156 682	156 324	158 050	156 999	160 261	163 521	163 646	- 17	
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0
F. Field burning of agricultural residues	2 896	2 896	2 521	3 158	2 885	2 551	2 471	2 756	2 274	2 543	2 285	2 246	1 224	1 355	1 448	1 034	989	989	1 625	952	1 018	838	848	1 304	886	862	953	- 67	
G. Liming	11 477	11 477	9 609	8 164	7 500	7 075	8 334	8 131	8 420	7 751	7 308	7 071	6 641	6 632	6 602	6 166	5 979	5 508	5 556	5 492	5 564	5 421	5 619	5 448	6 194	6 017	5 735	- 50	
H. Urea application	3 689	3 689	3 264	3 101	3 143	3 048	2 969	3 056	3 158	3 272	3 381	3 360	3 535	3 508	3 482	3 614	3 367	3 551	3 768	3 516	3 742	3 586	3 896	3 844	4 021	4 454	4 454	21	
I. Other carbon-containing fertilizers	61	61	44	50	42	35	33	25	16	14	16	21	20	20	19	28	23	25	32	30	42	48	57	71	79	75	91	48	
J. Other	413	413	413	411	405	409	410	401	411	431	438	440	444	458	420	449	663	811	966	1 035	1 191	1 364	1 577	1 567	1 788	1 825	1 829	342	
4. Land use, land-use change and forestry⁽²⁾	- 221 647	- 221 647	- 248 367	- 217 388	- 218 451	- 233 532	- 252 022	- 284 351	- 283 058	- 301 134	- 322 425	- 290 737	- 312 982	- 292 692	- 270 919	- 307 768	- 306 283	- 322 301	- 284 924	- 320 570	- 319 886	- 309 888	- 299 486	- 300 910	- 307 997	- 299 079	- 294 573	33	
A. Forest land	- 374 623	- 374 623	- 407 657	- 382 497	- 384 985	- 385 806	- 399 970	- 423 005	- 419 225	- 434 843	- 456 367	- 414 827	- 437 132	- 414 484	- 390 844	- 418 675													

APPENDIX III: MAIN EU PROGRAMMES ON RESEARCH AND SYSTEMATIC OBSERVATION

Section	Project Acronym	Project Title	Project End Date	EC Contribution	International Cooperation i.e. EU - nonEU?	WEBSITE
8.3.5	A2PBEER (FP7)	Affordable and Adaptable Public Buildings through Energy Efficient Retrofitting	08/2017	€ 6 500 000	No	www.a2pbeer.eu
	ADDRESS	Active Distribution networks with full integration of Demand and distributed energy RESourceS	05/2013	€ 8.999.997	No	http://www.addressfp7.org/
8.3.4	ADVANCE	Advanced Model Development and Validation for the Improved Analysis of Costs and Impacts of Mitigation Policies	12/2016	€ 5 699 168	No	http://www.fp7-advance.eu/
8.3.2	APPLICATE	Advanced Prediction in Polar regions and beyond: Modelling, observing system design and Linkages associated with Arctic ClimATE change	10/2020	€ 7 999 591	Yes	http://appliccate.eu/about-the-project
8.4.5	AtlantOS	Optimizing and Enhancing the Integrated Atlantic Ocean Observing System	06/2019	€ 20 652 921	Yes	https://www.atlantos-h2020.eu/

Section	Project Acronym	Project Title	Project End Date	EC Contribution	International Cooperation i.e. EU - nonEU?	WEBSITE
8.3.2	BACCHUS	Impact of Biogenic versus Anthropogenic emissions on Clouds and Climate: towards a Holistic UnderStanding	05/2018	€ 8 746 587	Yes	http://www.bacchus-env.eu/
8.4.7	BE-OI	Beyond EPICA - Oldest Ice	09/2019	€ 2 223 000	Yes	http://www.beyondepica.eu/
8.3.4	BINGO	Bringing INnovation to onGOing water management – A better future under climate change	06/2019	€ 7 822 423	No	http://www.projectbingo.eu/
8.3.5	BIOBOOST	Biomass based energy intermediates boosting biofuel production	06/2015	€ 5 088 531	No	http://www.bioboost.eu/home.php
8.3.5	BIOBUILD (FP7)	High Performance, Economical and Sustainable Biocomposite Building Materials	05/2015	€ 4 878 496	No	www.biobuildproject.eu
8.3.2	Blue-Action	Arctic Impact on Weather and Climate	02/2021	€ 7 500 000	Yes	http://www.blue-action.eu/index.php?id=3498
8.3.5	BRESAER (H2020)	Breakthrough solutions for adaptable envelopes for building refurbishment	07/2019	€ 5 849 107	No	www.bresaer.eu
8.3.5	CAMPUS21 (FP7)	Control & Automation Management of Buildings & Public Spaces in the 21st Century	05/2015	€ 2 286 091	No	www.campus21-project.eu

Section	Project Acronym	Project Title	Project End Date	EC Contribution	International Cooperation i.e. EU - nonEU?	WEBSITE
8.3.4.	CARBON CAP	Carbon emission mitigation by Consumption-based Accounting and Policy	12/2016	€ 3 573 912	No	http://www.carboncap.eu/
8.3.5	CD-LINKS	Linking Climate and Development Policies - Leveraging International Networks and Knowledge Sharing	08/2019	€ 5 037 963	Yes	http://www.cd-links.org/
8.3.5	CHIC	Clean Hydrogen in European Cities	12/2016	€ 25 878 334	No	http://chic-project.eu/
8.3.5	CLAiR-CITY	Citizen Led Air pollution Reduction in Cities	04/2020	€ 6 692 548	No	http://www.claircity.eu/
8.3.6	CLARA	Climate forecast enabled knowledge services	05/2020	€ 3 459 075	No	
8.3.5	CLARITY	Integrated Climate Adaptation Service Tools for Improving Resilience Measure Efficiency		€ 4 999 999	No	
8.3.6	Climateurope	European Climate Observations, Modelling and Services - 2	11/2020	€ 2 994 373	No	-
8.3.4	COP21 RIPPLES	COP21: Results and Implications for Pathways and Policies for Low Emissions European Societies	11/2019	€ 2 986 924	Yes	http://cordis.europa.eu/project/rcn/206263_en.html

Section	Project Acronym	Project Title	Project End Date	EC Contribution	International Cooperation i.e. EU - nonEU?	WEBSITE
8.3.1 8.3.2	CRESCENDO	Coordinated Research in Earth Systems and Climate: Experiments, kNowledge, Dissemination and Outreach	10/2020	€ 14 338 876	No	https://www.crescendoproject.eu/
8.3.2	DACCIWA	Dynamics-aerosol-chemistry-cloud interactions in West Africa	11/2018	€ 8 746 951.77	Yes	www.dacciwa.eu
8.3.5	DEEPEGS	DEPLOYMENT OF DEEP ENHANCED GEOTHERMAL SYSTEMS FOR SUSTAINABLE ENERGY BUSINESS	11/2019	€ 19 999 740	No	http://deepegs.eu/
8.3.5	DESCRAMBLE	Drilling in supercritical geothermal condition	04/2018	€ 6 753 635	No	http://www.descramble-h2020.eu/
8.3.5	Don Quichote	Demonstration Of New Qualitative Innovative Concept of Hydrogen Out of windTurbine Electricity	03/2018	€ 2 954 846	No	http://www.don-quichote.eu/
8.4.1	earth ₂ Observe	Global Earth Observation for integrated water resource assessment	12/2017	€ 8 869 787	Yes	www.earth2observe.eu
8.3.5	ECO-Binder (H2020)	Development of insulating concrete systems based on novel low CO ₂ binders	12/2018	€ 5 846 216	No	www.ecobinder-project.eu
8.3.5	ECOGRID EU	Large scale Smart Grids demonstration of real time market-based integration of DER and DR	02/2015	€ 12 649 939	No	http://www.eu-ecogrid.net/

Section	Project Acronym	Project Title	Project End Date	EC Contribution	International Cooperation i.e. EU - nonEU?	WEBSITE
8.4.6	ECOPOTENTIAL	ECOPOTENTIAL: IMPROVING FUTURE ECOSYSTEM BENEFITS THROUGH EARTH OBSERVATIONS	05/2019	€ 14 874 340	No	http://www.ecopotential-project.eu/
8.3.5	EERA-DTOC	EERA Design Tools for Offshore Wind Farm Cluster	06/2015	€ 2 899 857	No	http://www.eera-dtoc.eu/
8.3.5	e-HIGHWAY2050	Modular Development Plan of the Pan-European Transmission System 2050	12/2015	€ 8.990.672	No	http://www.e-highway2050.eu
8.3.5	3EMOTION	Environmentally Friendly, Efficient Electric Motion	12/2019	€ 14 999 983	No	http://www.3emotion.eu/
8.3.4	ENHANCE	Enhancing risk management partnerships for catastrophic natural hazards in Europe	11/2016	€ 5 992 084	No	http://enhanceproject.eu/
	EUCalc	EU Calculator: trade-offs and pathways towards sustainable and low-carbon European Societies	10/2019	€ 5 283 351	Yes	http://www.european-calculator.eu/index.php/9-uncategorised/71-european-calculator-project
8.3.4	EU-CIRCLE	A panEuropean framework for strengthening Critical Infrastructure resilience to climate change	05/2018	€ 7 283 525	No	http://www.eu-circle.eu/
8.3.6	EU-MACS	European Market for Climate Services	10/2018	€ 1 499 621	Yes	http://eu-macs.eu/#
	EU-PolarNET				Yes	http://www.eu-polarnet.eu/

Section	Project Acronym	Project Title	Project End Date	EC Contribution	International Cooperation i.e. EU - nonEU?	WEBSITE
8.3.2	EUPORIAS	EUropean Provision Of Regional Impact Assessment on a Seasonal-to-decadal timescale	01/2017	€ 8 976 723.45	Yes	www.euporias.eu
8.3.5	EuroBioRef	EUROpean multilevel integrated BIOREFinery design for sustainable biomass processin	02/2014	€ 23 073 794	No	http://www.eurobioref.org/
8.3.5	FLUIDGLASS	Solar Thermal Glass Facades with Adjustable Transparency	08/2017	€ 3.866.050	No	http://www.fluidglass.eu/
8.4.1 8.4.8	GEO-CRADLE	Coordinating and integRating state-of-the-art Earth Observation Activities in the regions of North Africa, Middle East, and Balkans and Developing Links with GEO related initiatives towards GEOSS	07/2018	€ 2 910 800	Yes	
8.3.5	GREEN-WIN	Green growth and win-win strategies for sustainable climate action	08/2018	€ 3 624 763	Yes	http://green-win-project.eu/about
8.4.4 8.4.8	Ground Truth 2.0	Ground Truth 2.0 - Environmental knowledge discovery of human sensed data	08/2019	€ 4 975 094	No	http://gt20.eu/
8.4.6	GROW	GROW Observatory	10/2019	€ 5 096 920	No	http://growobservatory.org/

Section	Project Acronym	Project Title	Project End Date	EC Contribution	International Cooperation i.e. EU - nonEU?	WEBSITE
8.3.6	H2020_Insurance	Oasis Innovation Hub for Catastrophe and Climate Extremes Risk Assessment	04/2020	€ 4 802 522	No	
8.3.5	HARFIR (FP7)	Heusler Alloy replacement for Iridium	03/2017	€ 1 781 910	No	www.harfir.eu
8.3.5	H2ME	Hydrogen Mobility Europe	05/2020	€ 32 000 000	No	http://h2me.eu/
8.3.5	HAWE	High Altitude Wind Energy	09/2014	€ 1 920 470	No	http://www.omnidea.net/hawe/
8.3.3	HELIX	High-End cLimate Impacts and eXtremes	10/2017	€ 8 999 998	Yes	https://www.helixclimate.eu/
8.3.5	HIGH V.LO-CITY	Cities speeding up the integration of hydrogen buses in public fleets	12/2018	€ 13 491 724	No	http://highvlocity.eu/
8.3.5	HYDROSOL-PLANT	Thermochemical HYDROgen production in a SOLar monolithic reactor: construction and operation of a 750 kWth PLANT	09/2017	€ 2 265 385	No	http://hydrosol-plant.certh.gr/
8.3.5	HYFIVE	Hydrogen For Innovative Vehicles	09/2017	€ 17 970 566	No	http://www.hyfive.eu/
8.3.5	HYTRANSIT	European Hydrogen Transit Buses in Scotland	12/2018	€ 6 999 999	No	http://chic-project.eu/fuel-cell-buses-in-europe/hytransit
8.3.5	ICARUS	Integrated Climate forcing and Air pollution Reduction in Urban Systems	04/2020	€ 6 472 015	No	http://icarus2020.eu/
8.3.4	ICE-ARC	Ice, Climate, and Economics - Arctic Research on Change	12/2017	€ 8 874 626	Yes	www.ice-arc.eu

Section	Project Acronym	Project Title	Project End Date	EC Contribution	International Cooperation i.e. EU - nonEU?	WEBSITE
8.3.5	IMAGE	Integrated Methods for Advanced Geothermal Exploration	10/2017	€ 10 051 044	No	http://www.image-fp7.eu/Pages/default.aspx
8.3.4	IMPRESSIONS	Impacts and risks from high-end scenarios: Strategies for innovative solutions	10/2018	€ 8 914 935	Yes	http://www.impressions-project.eu
8.3.4	IMPRESX	IMproving PRedictions and management of hydrological EXtremes	09/2019	€ 7 996 848	No	http://www.impresx.eu/
8.3.4	INNOPATHS	Innovation pathways, strategies and policies for the Low-Carbon Transition in Europe	11/2020	€ 5 996 716	Yes	http://www.innopaths.eu/
8.4.6	INTAROS	Integrated Arctic observation system	11/2021	€ 15 490 067	Yes	
8.3.5	iSCAPE	Improving the Smart Control of Air Pollution in Europe	08/2019	€ 5 850 829	No	https://www.iscapeproject.eu/
8.4.6	LANDSENSE	A Citizen Observatory and Innovation Marketplace for Land Use and Land Cover Monitoring	08/2020	€ 5 088 292	No	http://www.landsense.eu/
8.3.5	LAWIN (H2020)	LARGE AREA FLUIDIC WINDOWS	12/2017	€ 5 983 039	No	http://cordis.europa.eu/project/rcn/193466_en.html
8.3.5	MAGIC	Moving Towards Adaptive Governance in Complexity: Informing Nexus Security	05/2020	€ 7 457 761	No	http://magic-nexus.eu/project-overview/

Section	Project Acronym	Project Title	Project End Date	EC Contribution	International Cooperation i.e. EU - nonEU?	WEBSITE
8.3.6	MARCO	MArket Research for a Climate Services Observatory	10/2018	€ 1 520 304	Yes	http://marco-h2020.eu/
8.3.5	MAT4BAT (FP7)	Advanced Materials for batteries	07/2017	€ 8 191 959	No	www.mat4bat.eu
8.3.2	NACLIM	North Atlantic Climate: Predictability of the climate in the North Atlantic/European sector related to North Atlantic/Arctic sea surface temperature and sea ice variability and change	01/2017	€ 8 598 407	Yes	www.naclim.eu
8.3.5	NANOCATE (FP7)	Nano-carbons for versatile power supply modules	09/2017	€ 3 994 210	No	www.nanocate.eu
8.4.5	NeXOS	Next generation, Cost-effective, Compact, Multifunctional Web Enabled Ocean Sensor Systems Empowering Marine, Maritime and Fisheries Management	09/2017	€ 5 906 479	Yes	www.nexosproject.eu
8.4.1	NextGEOSS	Next Generation GEOSS for Innovation Business	05/2020	€ 9 999 999	No	https://www.nerisc.no/project/nextgeoss
8.3.5	PHBOTTLE (FP7)	Advanced solutions for packaging and non-packaging applications	05/2015	€ 2 873 649	Yes	www.phbottle.eu

Section	Project Acronym	Project Title	Project End Date	EC Contribution	International Cooperation i.e. EU - nonEU?	WEBSITE
8.3.5	PLANGRIDEV	Distribution grid planning and operational principles for EV mass roll-out while enabling DER integration	02/2016	€ 4 875 289	No	http://www.plangridev.eu/
8.3.1 8.3.2	PRIMAVERA	Process-based climate simulation: Advances in high resolution modelling and European climate Risk Assessment	10/2019	€ 14 967 970	No	http://cordis.europa.eu/project/rcn/196807_en.html
8.3.5	PROETHANOL2G	Integration of Biology and Engineering into an Economical and Energy-Efficient 2G Bioethanol Biorefinery	10/2014	€ 980 000	Yes	http://www.proethanol2g.org/
8.3.6	PROSNOW	Provision of a prediction system allowing for management and optimization of snow in Alpine ski resorts	08/2020	€ 3 209 616	No	
8.3.6	PUCS	Pan-European Urban Climate Services	11/2019	€ 2 936 601	No	
8.3.5	PVCROPS	PhotoVoltaic Cost reduction, Reliability, Operational performance, Prediction and Simulation	10/2015	€ 3 798 605	Yes	http://www.pvcrops.eu/
	REINVENT	Realising Innovation in Transitions for Decarbonisation	11/2020	€ 4 500 000	Yes	http://cordis.europa.eu/project/rcn/206259_en.html

Section	Project Acronym	Project Title	Project End Date	EC Contribution	International Cooperation i.e. EU - nonEU?	WEBSITE
8.3.4	RESIN	Climate Resilient Cities and Infrastructures	10/2018	€ 7 466 005	No	http://www.resin-cities.eu/home/
8.3.2	SCENT	Smart Toolbox for Engaging Citizens into a People-Centric Observation Web	08/2019	€ 3 264 675	No	https://scent-project.eu/
8.4.5	SCHeMA	INTEGRATED IN SITU CHEMICAL MAPPING PROBES	09/2017	€ 5 200 489	Yes	www.schema-ocean.eu
8.3.5	SECTOR	Production of Solid Sustainable Energy Carriers from Biomass by Means of Torrefaction	12/2015	€ 7 565 725	Yes	https://sector-project.eu/
8.4.5	SenseOCEAN	SenseOCEAN: Marine sensors for the 21st Century	09/2017	€ 5 924 945	No	www.senseocean.eu
8.4.1	SIGMA	Stimulating Innovation for Global Monitoring of Agriculture and its Impact on the Environment in support of GEOGLAM (SIGMA)	07/2017	€ 8 750 133	Yes	http://www.geoglam-sigma.info
8.3.5	SIM4NEXUS	Sustainable Integrated Management FOR the NEXUS of water-land-food-energy-climate for a resource-efficient Europe	05/2020	€ 7 895 658	No	http://www.sim4nexus.eu/

Section	Project Acronym	Project Title	Project End Date	EC Contribution	International Cooperation i.e. EU - nonEU?	WEBSITE
8.3.5	SOLARH2	European Solar-Fuel Initiative - Renewable Hydrogen from Sun and Water. Science Linking Molecular Biomimetics and Genetics	01/2012	€ 3 927 810	No	http://www.solarh2.tu-darmstadt.de/solarh2/index.en.jsp
8.3.2	SPECS	Seasonal-to-decadal climate Prediction for the improvement of European Climate Services	01/2017	€ 8 224 862	Yes	http://www.specs-fp7.eu/
8.3.2	STRATOCLIM	Stratospheric and upper tropospheric processes for better climate predictions	11/2018	€ 8 548 477.98	Yes	www.stratoclim.org
8.3.5	SWARM	Demonstration of Small 4-Wheel fuel cell passenger vehicle Applications in Regional and Municipal transport	12/2017	€ 6 822 808	No	http://www.swarm-project.eu/
8.4.6	SWOS	Satellite-based Wetland Observation Service	05/2018	€ 4 979 189	No	http://swos-service.eu/
8.3.4	TRANSrisk	Transitions pathways and risk analysis for climate change mitigation and adaption strategies	08/2018	€ 7 454 018	No	http://transrisk-project.eu/
8.3.6	VISCA	Vineyards´ Integrated Smart Climate Application	04/2020	€ 2 793 145	No	http://cordis.europa.eu/project/rcn/210173_en.html

Section	Project Acronym	Project Title	Project End Date	EC Contribution	International Cooperation i.e. EU - nonEU?	WEBSITE
8.3.5	EXILVA (BBI JU)	Flagship demonstration of an integrated plant towards large scale supply and market assessment of MFC (microfibrillated cellulose)	04/2019	€ 27 433 611	N/A	http://www.exilva.com/
8.3.5	AGRIMAX (BBI JU)	Agri and food waste valorisation co-ops based on flexible multi-feedstocks biorefinery processing technologies for new high added value applications	09/2020	€ 12 484 461.46	N/A	http://agrimax-project.eu/
8.3.5	BIOFOREVER (BBI JU)	BIO-based products from FORestry via Economically Viable European Routes	08/2019	€ 9 937 998.02	N/A	https://www.bioforever.org
8.3.5	LIPES (BBI JU)	Life Integrated Process for the Enzymatic Splitting of triglycerides	08/2021	€ 4 295 153.67	N/A	http://www.lipes.eu
8.3.5	PULPACKTION (BBI JU)	Optimised moulded pulp for renewable packaging solutions	09/2020	BBI JU contribution	N/A	N/A
8.3.5	CELBICON (H2020)	Cost-effective CO ₂ conversion into chemicals via combination of Capture, ELeetrochemical and BI-ochemical CONversion technologies	43709	€ 5 429 201 50	N/A	http://www.celbicon.org

Section	Project Acronym	Project Title	Project End Date	EC Contribution	International Cooperation i.e. EU - nonEU?	WEBSITE
8.3.5	FACCE Era Net Plus	Food security, Agriculture, Climate Change ERA-NET plus	43344	€ 4 000 000	N/A	https://www.era-learn.eu/network-information/networks/facce-era-net-plus
8.3.5	SmartSOIL	Sustainable farm Management Aimed at Reducing Threats to SOILs under climate change	Finished Oct 2015	€ 2 989 480	N/A	http://smartsoil.eu/
8.3.5	ANIMALCHANGE	AN Integration of Mitigation and Adaptation options for sustainable Livestock production under climate CHANGE	Finished Feb 2015	€ 8 999 535	N/A	www.animalchange.eu
8.3.5	ACCESS	Arctic Climate Change, Economy and Society	Finished Feb 2015	€ 10 978 468	N/A	www.access-eu.org
8.3.3, 8.3.4 8.3.5	CERES	Climate change and European aquatic RESources	ongoing	€ 5 586 851.25	N/A	http://ceresproject.eu
8.3.3, 8.3.4 8.3.5	ClimeFish	Co-creating a decision support framework to ensure sustainable fish production in Europe under climate change	ongoing	€ 5 000 000	N/A	http://climefish.eu/
8.4.1	AtlantOS	Optimizing and Enhancing the Integrated Atlantic Ocean Observing System	ongoing	€ 20 652 921.00	N/A	www.atlantos-h2020.eu

Section	Project Acronym	Project Title	Project End Date	EC Contribution	International Cooperation i.e. EU - nonEU?	WEBSITE
8.4.1	ODYSSEA	OPERATING A NETWORK OF INTEGRATED OBSERVATORY SYSTEMS IN THE MEDITERRANEAN SEA	Starting on 1st June 2017	€ 8 398 716.00	N/A	N/A
8.4.1	INTAROS	Optimizing and Enhancing the Integrated Atlantic Ocean Observing System	ongoing	€ 15 490 066.78	N/A	http://cordis.europa.eu/project/rcn/205992_en.html
	CATCH-C	Compatibility of Agricultural Management Practices and Types of Farming in the EU to enhance Climate Change Mitigation and Soil Health	Finished December 2014	€ 2 960 679	N/A	www.catch-c.eu
	FORMIT	FORest management strategies to enhance the MITigation potential of European forests	September 2016	€ 2 978 197	N/A	http://www.eu-formit.eu
8.4.8	AGRICAB	A framework for enhancing EO capacity for Agriculture and Forest Management in Africa as a contribution to GEOSS	Finished December 2015	€ 3 499 234	Yes	http://www.agricab.info/Pages/home.aspx
8.4.8	EO2Heaven	Earth Observation and ENVironmental modelling for the mitigation of HEAlth risks	Finished May 2013	€ 6 273 262	Yes	http://copernicus.eu/projects/eo2heaven

Section	Project Acronym	Project Title	Project End Date	EC Contribution	International Cooperation i.e. EU - nonEU?	WEBSITE
Research infrastructure projects						
8.5.1.	ACTRIS PPP	ACTRIS PPP - Aerosols, Clouds and Trace gases Preparatory Phase Project	12/2019	€ 3 999 996		http://actris2.nilu.no/
8.5.1.	ACTRIS-2	Aerosols, Clouds, and Trace gases Research InfraStructure	04/2019	€ 9 541 195	Yes	http://actris2.nilu.no/
8.5.1.	ARISE2	Atmospheric dynamics Research InfraStructure in Europe	08/2018	€ 2 985 250		http://arise-project.eu/
8.5.4.	Advance_eLTER	Advancing the European Long-Term Ecosystem, critical zone and socio-ecological Research Infrastructure towards ESFRI	12/2017	€ 899 820		http://www.lter-europe.net/elter-esfri/advance-elter
8.5.	COOP_PLUS	COOPERATION OF RESEARCH INFRASTRUCTURES TO ADDRESS GLOBAL CHALLENGES IN THE ENVIRONMENT FIELD	08/2018	€ 1 997 990		http://www.coop-plus.eu/

Section	Project Acronym	Project Title	Project End Date	EC Contribution	International Cooperation i.e. EU - nonEU?	WEBSITE
8.5.	DANUBIUS-PP	PREPARATORY PHASE FOR THE PAN-EUROPEAN RESEARCH INFRASTRUCTURE DANUBIUS-RI "THE INTERNATIONAL CENTRE FOR ADVANCED STUDIES ON RIVER-SEA SYSTEMS	11/2019	€ 3 996 405		http://danubius-pp.eu/
8.5.4.	eLTER	European Long-Term Ecosystem and socio-ecological Research Infrastructure	05/2019	€ 4 999 138		http://www.lter-europe.net/elter
8.5.2.	EMBRIC	European Marine Biological Research Infrastructure Cluster to promote the Blue Bioeconomy	05/2019	€ 9 041 611		http://www.embric.eu/
8.5.2.	EMSO-Link	Implementation of the Strategy to Ensure the EMSO ERIC's Long-term Sustainability	02/2020	€ 4 359 451		http://www.emso-eu.org/site/
8.5.2.	EMSODEV	EMSO implementation and operation: DEVELOPMENT of instrument module	08/2018	€ 4 298 602		http://www.emsodev.eu/
8.5.	ENVRI PLUS	Environmental Research Infrastructures Providing Shared Solutions for Science and Society	04/2019	€ 14 683 534		http://www.envriplus.eu/

Section	Project Acronym	Project Title	Project End Date	EC Contribution	International Cooperation i.e. EU - nonEU?	WEBSITE
8.5.4.	ERIFORE	Research Infrastructure for Circular Forest Bioeconomy	01/2018	€ 2 628 700		http://erifore.eu/
8.5.1.	EUROCHAMP-2020	Integration of European Simulation Chambers for Investigating Atmospheric Processes – Towards 2020 and beyond	11/2020	€ 8 941 290		http://www.eurochamp.org/
8.5.4.	GLOBIS-B	GLOBAL Infrastructures for Supporting Biodiversity research	05/2018	€ 1 005 875		http://www.globis-b.eu/
8.5.	HYDRALAB-PLUS	HYDRALAB+ Adapting to climate change	08/2019	€ 9 979 376		http://hydralab.eu/
8.5.3.	INTERACT	International Network for Terrestrial Research and Monitoring in the Arctic	09/2020	€ 10 000 000	Yes	http://www.eu-interact.org/
8.5.2.	JERICO-NEXT	Joint European Research Infrastructure network for Coastal Observatory – Novel European eXpertise for coastal observatories	08/2019	€ 9 998 876		http://www.jerico-ri.eu/
8.5.2.	ODIP 2	Extending the Ocean Data Interoperability Platform	03/2018	€ 1 912 086	Yes	http://www.odip.eu/
8.5.1.	RINGO	Readiness of ICOS for Necessities of integrated Global Observations	12/2020	€ 4 719 680		https://www.icos-ri.eu/ringo

Section	Project Acronym	Project Title	Project End Date	EC Contribution	International Cooperation i.e. EU - nonEU?	WEBSITE
8.5.2.	SeaDataCloud	SeaDataCloud - Further developing the pan-European infrastructure for marine and ocean data management	10/2020	€ 9 999 738	Yes	https://www.seadatanet.org/About-us/SeaDataCloud

ANNEX I: THIRD BIENNIAL REPORT OF THE EU

1. INTRODUCTION

This is the third Biennial Report of the European Union (EU), as required under Article 18(1) of Regulation (EU) No 525/2013 and Decision 2/CP.17 of the Conference of the Parties under the United Nations Framework Convention on Climate Change (UNFCCC).

2. INFORMATION ON GREENHOUSE GAS EMISSIONS AND TRENDS

This section summarises information on the EU's historical greenhouse gas (GHG) emissions since 1990.

The GHG emission data presented in this Biennial Report (referred to here for simplicity as the Report or 3BR) are consistent with the GHG emissions reported by the EU in 2017 under the Convention to the UNFCCC secretariat²⁰⁷ and correspond to the totals in the CRF tables under the Convention²⁰⁸.

2.1. Geographical coverage

The EU submits an inventory for EU-28 under the UNFCCC; a detailed overview of the geographical coverage is presented in Table 1.17 of the EU national inventory report, as submitted to the UNFCCC in 2017 (EU NIR 2017) and is summarised in **Table 3-2** of the 7NC.

This Report presents greenhouse gas emission trends for the European Union (EU) only. The time series considered is 1990 to 2015. In this Report, the European Union is referred to as the EU.

2.2. Sectoral scope

The sectoral scope of the emissions in this Report aligns with the reporting requirements under the Convention²⁰⁹.

Indirect emissions of CO₂ are included in all the emission data quoted in this Report.

International aviation emissions are excluded from the totals, unless otherwise indicated.

2.3. Summary information on GHG emission trends

The emission data presented here is based on the European Union's national greenhouse gas inventory covering the period 1990 to 2015, submitted to the UNFCCC on 31st May, 2017²¹⁰. The inventory is in line with the UNFCCC reporting guidelines on annual inventories for Parties included in Annex I to the Convention (Decision 24/CP.19) and with Regulation (EU) No 525/2013.

2.3.1. Trends in total GHG emissions

EU GHG emissions are the sum of Member State (MS) emissions. This means trends in EU GHG emissions fully reflect emission trends at MS level. Most EU MS reduced GHG emissions between 1990 and 2015 (see Table 2-1) and consequently total GHG emissions,

207 http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/10116.php

208 http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/eua-2017-crf-31may17.zip

209 UNFCCC, 2013 <http://unfccc.int/resource/docs/2013/cop19/eng/10a03.pdf#page=2>

210 UNFCCC National Inventory Submissions 2017 http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/10116.php#fn1

without Land Use, Land-Use Change and Forestry (LULUCF), in the EU-28 decreased by 23.7 % between 1990 and 2015 (-1 337 million tonnes CO₂ equivalents).

For comparability with the EU 2020 target, emissions from international aviation would be included in the totals. When these emissions are included, the decrease is 1 265 million tonnes CO₂ equivalents or 22.1 % in 2015 compared to 1990.

Emissions per capita in the EU-28 dropped by 28.7 % for the same period, from 11.9 t/capita, to 8.9 t/capita. Emissions in the EU-28 have been decreasing while the economy has grown; the decoupling of economic growth from GHG emissions has been progressing steadily since 1990.

Table 2-1 EU-28 GHG emissions in CO₂ equivalents (without LULUCF)

Member State	Emissions (million tonnes)			Change (%)	
	1990	2015	2014 to 2015	2014 to 2015	1990 to 2015
Belgium	146.3	117.4	2.47	2.9%	-19.7%
Bulgaria	103.7	61.5	3.36	6.9%	-40.7%
Czech Republic	197.9	127.9	3.98	1.0%	-35.4%
Denmark	70.4	48.3	0.45	-4.9%	-31.3%
Germany	1 250.9	901.9	0.01	-0.3%	-27.9%
Estonia	40.4	18.0	1.31	-14.4%	-55.3%
Ireland	56.1	59.9	-2.47	3.7%	6.7%
Greece	103.1	95.7	-3.04	-3.7%	-7.1%
Spain	287.8	335.7	-3.57	3.5%	16.6%
France	547.1	457.1	3.64	0.8%	-16.4%
Croatia	31.2	23.5	-2.33	2.0%	-24.6%
Italy	519.9	433.0	-3.64	2.3%	-16.7%
Cyprus	5.6	8.4	3.21	0.1%	50.0%
Latvia	26.2	11.3	2.12	1.0%	-56.8%
Lithuania	48.0	20.1	9.70	1.1%	-58.2%
Luxembourg	12.7	10.3	0.11	-4.5%	-19.3%
Hungary	93.9	61.1	0.23	5.6%	-34.9%
Malta	2.4	2.2	-0.49	-24.0%	-6.5%
Netherlands	221.4	195.2	-0.70	4.1%	-11.8%
Austria	78.8	78.9	7.66	3.2%	0.1%
Poland	467.9	385.8	2.87	0.8%	-17.5%
Portugal	59.6	68.9	4.56	7.1%	15.7%
Romania	246.3	116.4	1.01	0.9%	-52.7%
Slovenia	18.6	16.8	0.59	1.3%	-9.5%
Slovakia	74.5	41.3	0.22	1.5%	-44.6%

Member State	Emissions (million tonnes)			Change (%)	
	1990	2015	2014 to 2015	2014 to 2015	1990 to 2015
Finland	71.3	55.6	11.45	-6.0%	-22.1%
Sweden	71.6	53.7	-0.15	-0.3%	-25.1%
United Kingdom	793.6	503.5	-19.42	-3.7%	-36.6%
EU-28	5 647.1	4 309.6	23.15	0.5%	-23.7%
EU-28 International bunkers: Aviation	69.3	142.2	4.92	1.2%	54.3%
EU-28 International bunkers: Navigation	110.3	134.8	-1.57	-1.1%	22.2%

The overall EU GHG emission trend is dominated by the two largest emitters, Germany and the United Kingdom. Together, these two Member States account for more than one third of total EU-28 GHG emissions in 2015. Germany and the United Kingdom have achieved total domestic GHG emission reductions in 2015 of 639 million tonnes of CO₂ equivalents compared to 1990 (not counting carbon sinks).

The main reasons for the considerable reduction in GHG emissions in Germany since 1990 are increases in efficiency of power and heating plants, and, the economic restructuring of the five new Länder after German reunification. The reduction in GHG emissions in the United Kingdom was primarily the result of liberalising energy markets and the subsequent fuel switching from oil and coal to gas in electricity production, N₂O emission reduction measures taken in the production of adipic acid and limiting emissions from the waste sector.

France and Italy were the third and fourth largest emitters in 2015, with a share in the EU total of 10.6 % and 10.0 % respectively. Italy's GHG emissions were 16.7 % below 1990 levels in 2015. They increased in the years following 1990, primarily due to increases in road transport, electricity and heat production, and petroleum refining. However, Italian emissions decreased after 2004 with significant drops in 2009, 2012 and 2013, which were mainly due to the economic crisis and reductions in industrial output during these years. In France, large reductions were achieved in N₂O emissions from adipic acid production, but CO₂ emissions from road transport and HFC emissions from consumption of halocarbons increased considerably between 1990 and 2015.

Poland and Spain are the fifth and sixth largest emitters in the EU-28, accounting for 9.0 % and 7.8 %, respectively, of total EU-28 GHG emissions in 2015. Spain increased emissions by 16.6 % between 1990 and 2015. This was largely due to emission increases from road transport, electricity and heat production, and households and services. Poland decreased GHG emissions by 17.5 % between 1990 and 2015. The main factors for decreasing emissions in Poland – as with other new Member States – was the decline of energy-inefficient heavy industry and the overall restructuring of the economy in the late 1980s and early 1990s. The notable exception was transport (especially road transport), where emissions increased strongly.

2.3.2. Trends in emission by GHG in the EU-28

Table 2-2 gives an overview of the main trends in EU-28 GHG emissions and removals for 1990 to 2015. Note that in some cases emissions and removals from the LULUCF sectors are included in the totals, and, the GHG emissions are presented as masses and not in terms of CO₂ equivalents.

The most important GHG by far is CO₂, accounting for 81.2 % of total EU-28 emissions in 2015, excluding LULUCF. In 2015, EU-28 CO₂ emissions without LULUCF were 3 498 million tonnes, which was 21.5 % below 1990 levels.

Table 2-2 Overview of EU-28 GHG emissions and removals from 1990 to 2015 in CO₂ equivalents

GHG or category	GHG emissions (million tonnes)							
	1990	1995	2000	2005	2010	2013	2014	2015
CO ₂ emissions (without LULUCF)	4 457	4 199	4 163	4 290	3 931	3 643	3 469	3 498
Net CO ₂ emissions/removals (including LULUCF)	4 206	3 915	3 841	3 954	3 592	3 307	3 141	3 174
CH ₄ emissions without CH ₄ from LULUCF	728	663	606	546	492	465	458	456
CH ₄ emissions with CH ₄ from LULUCF	735	671	614	553	498	470	463	461
N ₂ O emissions without N ₂ O from LULUCF	385	348	305	285	239	233	235	236
N ₂ O emissions with N ₂ O from LULUCF	398	361	319	298	253	246	249	250
HFCs	29	44	53	73	102	110	113	108
PFCs	26	17	12	7	4	4	4	4
Unspecified mix of HFCs and PFCs	6	6	2	1	0	0	0	0
SF ₆	11	15	11	8	6	6	6	6
NF ₃	0	0	0	0	0	0	0	0
Indirect CO ₂ emissions	4	4	3	2	2	2	2	2
Total (without LULUCF with indirect)	5 647	5 295	5 155	5 214	4 777	4 464	4 286	4 310
International bunkers: Aviation	69	86	116	132	132	135	137	142
International bunkers: Marine	110	111	135	161	159	140	136	135

Notes

Indirect CO₂ The CO₂ resulting from the atmospheric oxidation of CH₄, CO and NMVOC is referred to as indirect CO₂. Indirect CO₂ resulting from the oxidation of CH₄, CO and NMVOCs produced by fossil fuel combustion are included in the general methodological approach for the EU GHG inventory which assumes that all the

carbon in the fuel (minus the portion that remains as soot or ash) is oxidized to CO₂ whereas actually a fraction of this carbon is initially emitted as CH₄, CO or NMVOC.

For further details see Section 9 of the EU 2017 NIR “*Indirect CO₂ and nitrous oxide emissions*”.

2.3.3. Trends in GHG emissions from main source and sink categories in the EU-28

Table 2-3 gives an overview of EU-28 GHG emissions in the main source categories for 1990 to 2015. The most important sector by far is energy (which includes emissions from combustion and fugitive sources), accounting for 77.9 % of total EU-28 emissions in 2015. The second largest sector is agriculture (10.1 %), followed by industrial processes and product use (8.7 %).

Table 2-3 Overview of EU-28 GHG emissions in the main source and sink categories 1990 to 2015 in CO₂ equivalents

GHG sector (1 to 6), or category (aviation/marine)		GHG emissions (million tonnes)							
		1990	1995	2000	2005	2010	2013	2014	2015
1. Energy	Emissions	4 337	4 071	4 005	4 108	3 790	3 513	3 329	3 358
	% total emissions	76.8 %	76.9 %	77.7 %	78.8 %	78.7 %	78.7 %	77.7 %	77.9 %
2. Industrial Processes and Product Use	Emissions	516.9	497.2	452.5	460.0	390.0	371.6	378.0	373.9
	% total emissions	9.2 %	9.4 %	8.8 %	8.8 %	8.2 %	8.3 %	8.8 %	8.7 %
3. Agriculture	Emissions	548	478	464	440	426	427	434	437
	% total emissions	9.7 %	9.0 %	9.0 %	8.4 %	8.9 %	9.6 %	10.1 %	10.1 %
4. Land-Use, Land-Use Change and Forestry	Net emissions	-232	-262	-301	-316	-320	-318	-309	-305
5. Waste	Emissions	241	245	231	203	170	151	144	139
	% total emissions	4.3 %	4.6 %	4.5 %	3.9 %	3.6 %	3.4 %	3.4 %	3.2 %
6. Other	Emissions								
	% total emissions								
Indirect CO ₂ emissions	Emissions	4.4	3.7	2.7	2.4	2.0	1.7	1.6	1.7
	% total emissions	0.08 %	0.07 %	0.05 %	0.05 %	0.04 %	0.04 %	0.04 %	0.04 %

GHG sector (1 to 6), or category (aviation/marine)	GHG emissions (million tonnes)								
	1990	1995	2000	2005	2010	2013	2014	2015	
Total (with net CO₂ emissions/removals)	5 415	5 033	4 854	4 897	4 457	4 145	3 977	4 005	
Total (without LULUCF)	5 647	5 295	5 155	5 214	4 777	4 464	4 286	4 310	
International bunkers: Aviation	69	86	116	132	132	135	137	142	
International bunkers: Marine	110	111	135	161	159	140	136	135	

Notes

“% total emissions”: Total emissions without LULUCF, and with indirect CO₂

“Total (with net CO₂ emissions/removals)”: Total includes LULUCF emissions and removals, and, indirect CO₂ emissions

Table 2-4 shows the sources with the largest contribution to the change in total GHG emissions in the EU-28 between 1990 and 2015.

Table 2-4 Overview of EU-28 source categories whose emissions have increased or decreased by more than 20 million tonnes CO₂ equivalent in the period 1990 to 2015.

Source category	Million tonnes (CO ₂ equivalents)
Road transportation (CO ₂ from 1.A.3.b)	142
Refrigeration and air conditioning (HFCs from 2.F.1)	97
Fugitive emissions from natural gas (CH ₄ from 1.B.2.b)	-21
Aluminium production (PFCs from 2.C.3)	-21
Agricultural soils: direct N ₂ O emissions from managed soils (N ₂ O from 3.D.1)	-26
Cement production (CO ₂ from 2.A.1)	-28
Fluorochemical production (HFCs from 2.B.9)	-29
Commercial/institutional (CO ₂ from 1.A.4.a)	-43
Enteric fermentation: cattle (CH ₄ from 3.A.1)	-44
Nitric acid production (N ₂ O from 2.B.2)	-45
Adipic acid production (N ₂ O from 2.B.3)	-57
Manufacture of solid fuels and other energy industries (CO ₂ from 1.A.1.c)	-62

Coal mining and handling (CH ₄ from 1.B.1.a)	-67
Managed waste disposal sites (CH ₄ from 5.A.1)	-78
Iron and steel production (CO ₂ from 1.A.2.a +2.C.1)	-106
Residential: fuels (CO ₂ from 1.A.4.b)	-126
Manufacturing industries (excluding iron and steel) (energy-related CO ₂ from 1.A.2 excl. 1.A.2.a)	-279
Public electricity and heat production (CO ₂ from 1.A.1.a)	-373
Total	-1 336

Notes

As the table only presents sectors whose emissions have increased or decreased by at least 20 million tonnes CO₂ equivalent, the sum for each sector grouping does not match the total change listed at the bottom of the table. International aviation and navigation excluded from the table

Source: EEA

2.3.4. *Change in emissions from Key Categories*

Key categories are defined as the sources or removals of emissions that have a significant influence on the inventory as a whole, in terms of the absolute level of the emissions, the trend, or both. Key categories are normally resolved by fuel, or other activity, in addition to category and gas.

The sections below present information about key categories, grouped according to GHG.

The key categories in the section below are taken from the key category analysis presented in the 2017 GHG inventory, excluding LULUCF. The percentages are expressed as a percentage of the total EU GHG emissions, without LULUCF, and including indirect CO₂. In a couple of cases, a higher level of category aggregation has been used to present the data, for example, 1.B.1 rather than 1.B.1.a.

Figures are provided in each section to illustrate the changes in emissions for key categories. The presentation of the key categories in the figures has been simplified to show the emissions according to GHG from the whole category, but not the emissions from a specific fuel associated with the key category.

2.3.4.1. Carbon dioxide

CO₂ emissions accounted for approximately 81 % of total EU-28 GHG emissions in 2015 and decreased by approximately 22 % since 1990 to 959 million tonnes CO₂ in 2015.

The largest key category in the EU-28, for CO₂ emissions, is ‘electricity and heat production’, accounting for 24.6 % of total greenhouse gas emissions in 2015 and for 86.1 % of greenhouse gas emissions of the ‘energy industries’ sector. Figure 2-1, below, shows this category has the largest decrease in emissions between 1990 and 2015. Fuel used in the category decreased by 13.1 % in the EU-28 between 1990 and 2015, however, CO₂ emissions from ‘public electricity and heat production’ declined faster than the change in fuel consumption. Between 1990 and 2015, CO₂ emissions from electricity and heat production

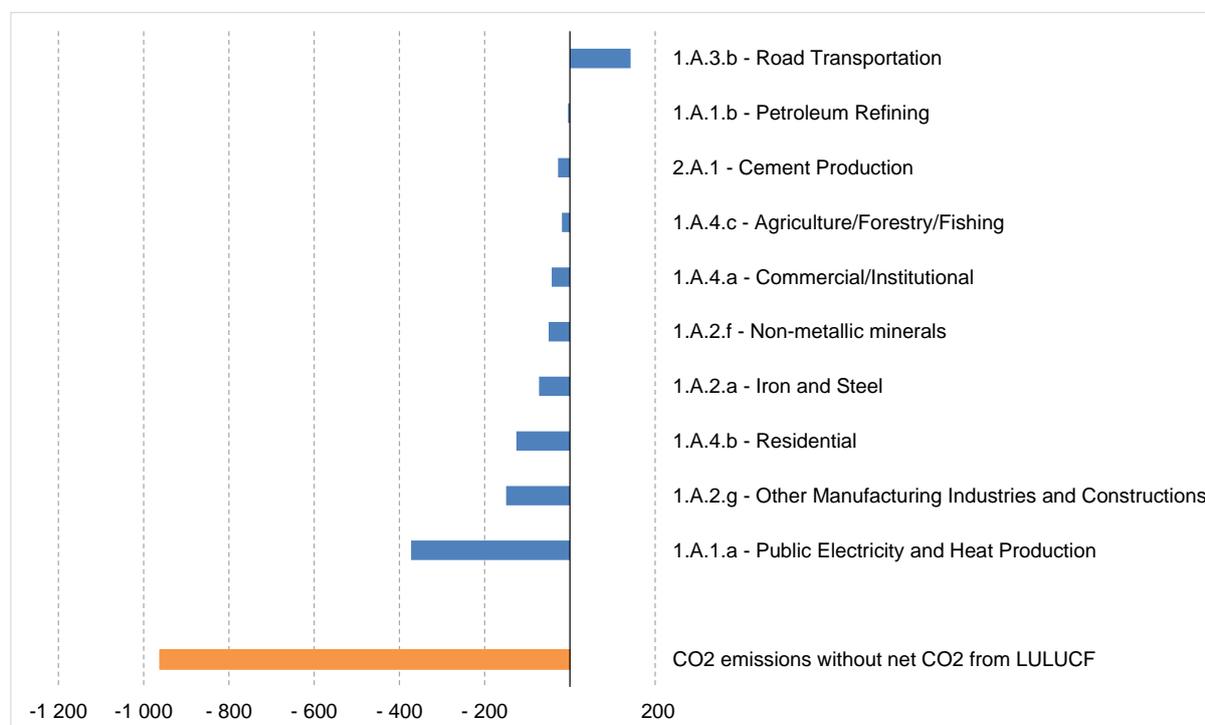
decreased by 26.0 % in the EU-28. The main factors at EU-28 responsible for the decrease have been improvements in energy efficiency and fossil fuel switching from coal to gas.

The second largest key category, for CO₂ emissions, is ‘road transportation’ accounting for 19.8 % of total GHG emissions in 2015 (excluding bunker emissions). By 2015, CO₂ emissions from the category were 20.0 % higher than their 1990 levels in the EU-28 due to an increase in fossil fuel consumption in particular until 2007 (see Figure 2-1). The overall net increase was fully accounted for by a strong uptake of diesel and a decline in gasoline use. Energy efficiency improvements and to a lesser extent increased use of less carbon intensive fuels, such as liquefied petroleum gas (LPG), natural gas, and biofuel blends, have led to levels of road transport emissions that would have been otherwise higher.

The third largest key category, for CO₂ emissions, is ‘residential’ accounting for 8.8 % of total GHG emissions in 2015. Between 1990 and 2015, CO₂ emissions from the category decreased by 25.0 % in the EU-28. The consumption of gas and liquid fuels has fallen in this sector in part due to energy efficiency measures outweighing the increase in energy demand as the number of dwellings has increased.

The fourth largest key category, for CO₂ emissions, is ‘manufacturing industries and construction’ accounting for 3.6 % of total GHG emissions in 2015. Between 1990 and 2015, CO₂ emissions from the category decreased by 49.0 % in the EU-28. Emissions from this key category are due to fossil fuel consumption in, which was 43.8 % below 1990 levels in 2015. A shift from solid and liquid fuels to mainly natural gas took place and an increase of biomass and other fuels has occurred.

Figure 2-1 Change of CO₂ emissions by large key categories 1990 to 2015 in CO₂ equivalents (millions tonnes CO₂) for EU-28.



Source: EEA

2.3.4.2. Methane

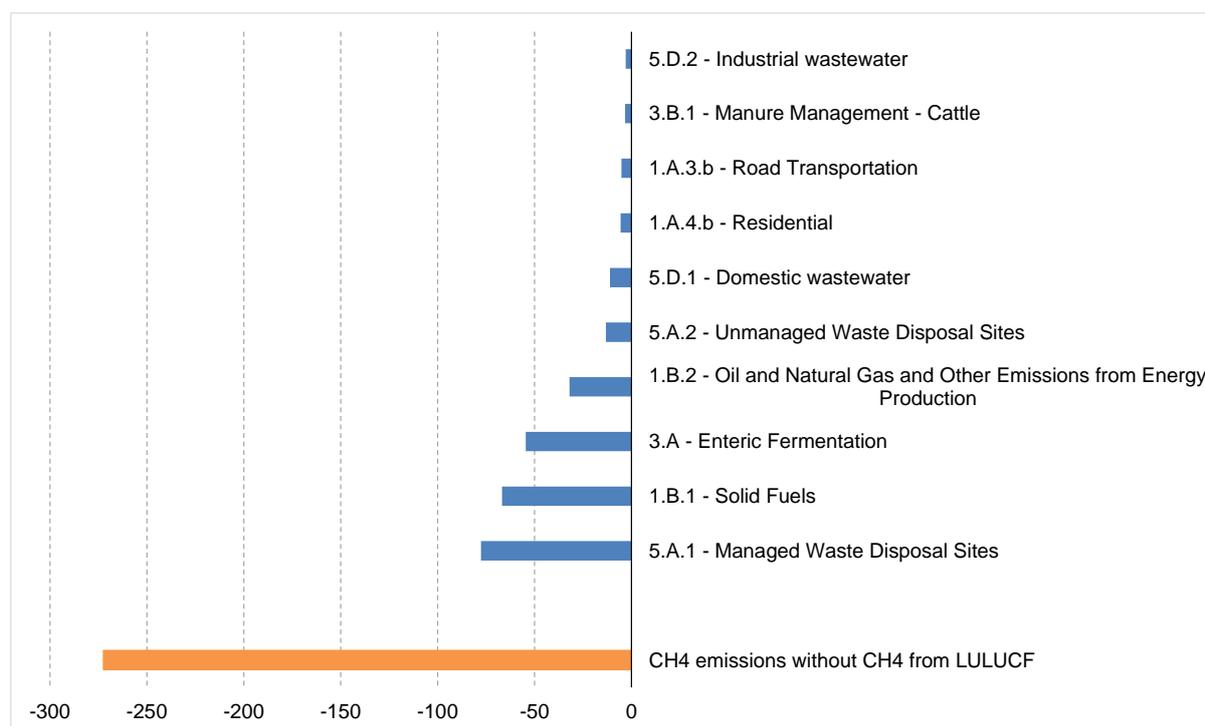
Methane emissions accounted for 10.6 % of total EU-28 GHG emissions in 2015 and decreased by 37.4 % since 1990 to 456.0 million tonnes CO₂ equivalents in 2015 (see Figure 2-2).

We have simplified the presentation of the key categories for CH₄. There are a number of key categories under category 3.A ‘enteric fermentation’, but for simplicity, we have assumed that the category ‘enteric fermentation’ represents all these key categories.

Using this simplifying assumption, the largest key category, for CH₄ emissions, is ‘enteric fermentation (see Figure 2-2), accounting for 4.5 % of total greenhouse gas emissions in 2015. Between 1990 and 2015, CH₄ emissions from the category decreased by 22.1 % due to the impact of the Common Agricultural Policy (CAP). A key factor was overproduction control through ‘milk quotas’ and this has limited the economic attractiveness of cattle production

The second largest key category, for CH₄ emissions, is 5.A.1 ‘managed waste disposal sites’, accounting for 2.0 % of total greenhouse gas emissions in 2015. Between 1990 and 2015, CH₄ emissions from the category decreased by 47.3 %. Key factors here are the increased use of recycling which have reduced volumes of waste going to landfill, and the incineration of waste with energy recovery.

Figure 2-2 Change of CH₄ emissions by large key categories 1990 to 2015 in CO₂ equivalents (million tonnes) for EU-28.



Source: EEA

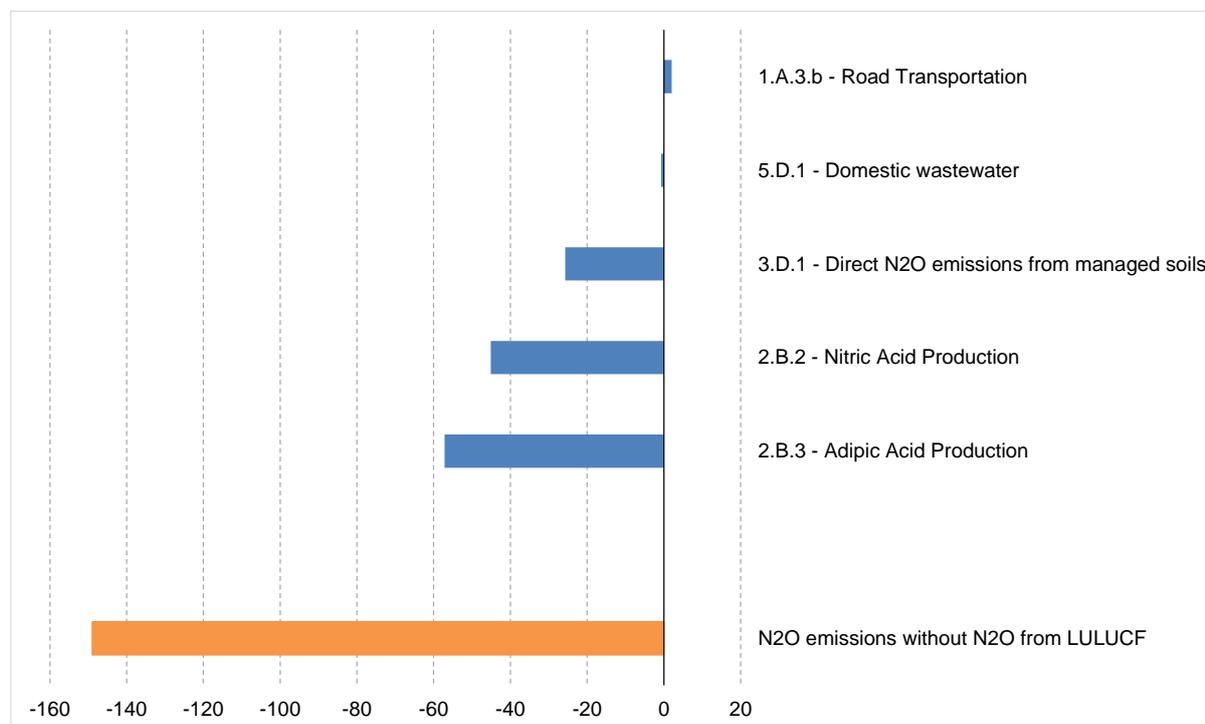
2.3.4.3. Nitrous oxide

N₂O emissions accounted for 5.5 % of total EU-28 GHG emissions and decreased by 38.7 % to 236 million tonnes CO₂ equivalents in 2015 (see Figure 2-3).

The largest key category, for N₂O emissions, is ‘Direct N₂O emissions from managed soils’ accounting for 3.1 % of total GHG emissions in 2015. Between 1990 and 2015, N₂O emissions from the category decreased by 16.2 % in the EU-28. Lower use of fertilisers per cropland combined with lower cropland area led to substantial reductions in N₂O emissions from agricultural soils.

The second largest key category, for N₂O emissions, is ‘road transportation’ accounting for 3.1 % of total GHG emissions in 2015. It is the use of diesel fuel that makes this category a key category. Between 1990 and 2015, N₂O emissions from the category increased by 30.9 % in the EU-28. A key factor here is the increase in the proportion of diesel fuelled vehicles over the time period.

Figure 2-3 Change of N₂O emissions by large key categories 1990 to 2015 in CO₂ equivalents (million tonnes) for EU-28.



Source: EEA

2.3.4.4. Fluorinated gases

Fluorinated gas emissions (HFCs, PFCs, SF₆ and NF₃) accounted for 2.7 % of total EU-28 GHG emissions and increased by 64.1 % to 117.9 million tonnes CO₂ equivalents in 2015 (see Figure 2-4).

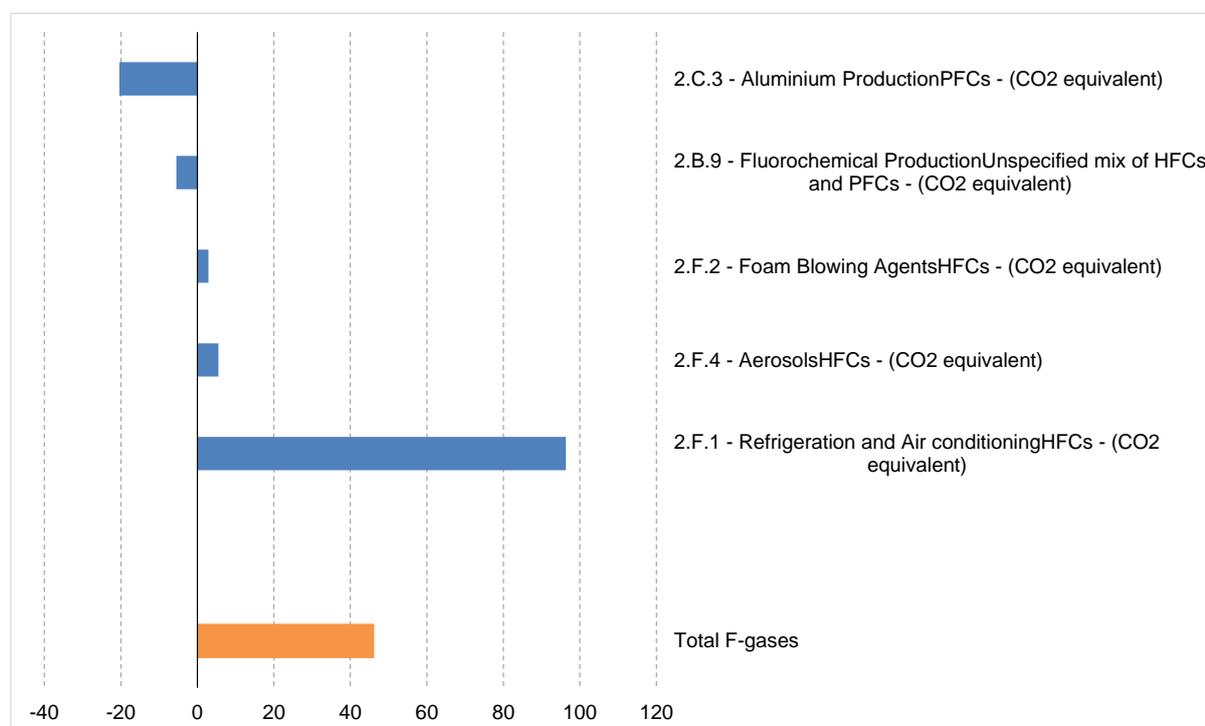
The largest and dominant key category, for fluorinated gas emissions, is ‘refrigeration and air conditioning’ accounting for 2.2 % of total GHG emissions in 2015. It is HFC emissions that

make this category a key category. In 1990 HFC emissions from this category were trivial. By 2015, emissions had risen to 96.3 million tonnes CO₂ equivalents. The main reason for this is the phase-out of ozone-depleting substances such as chlorofluorocarbons under the Montreal Protocol and the replacement of these substances with HFCs, mainly in refrigeration, air conditioning, foam production and as aerosol propellants.

Providing some counterbalance to this increase, HFC emissions from the ‘production of halocarbons’ decreased substantially. The decrease started in 1998 and was strongest in 1999 and 2000. This is mostly the result of reducing HFC-23 by-production by destroying this substance as part of the process.

Of the remaining F-gas emissions, both perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆) decreased.

Figure 2-4 Change of F-gas emissions by large key categories 1990 to 2015 in CO₂ equivalents (million tonnes) for EU-28.

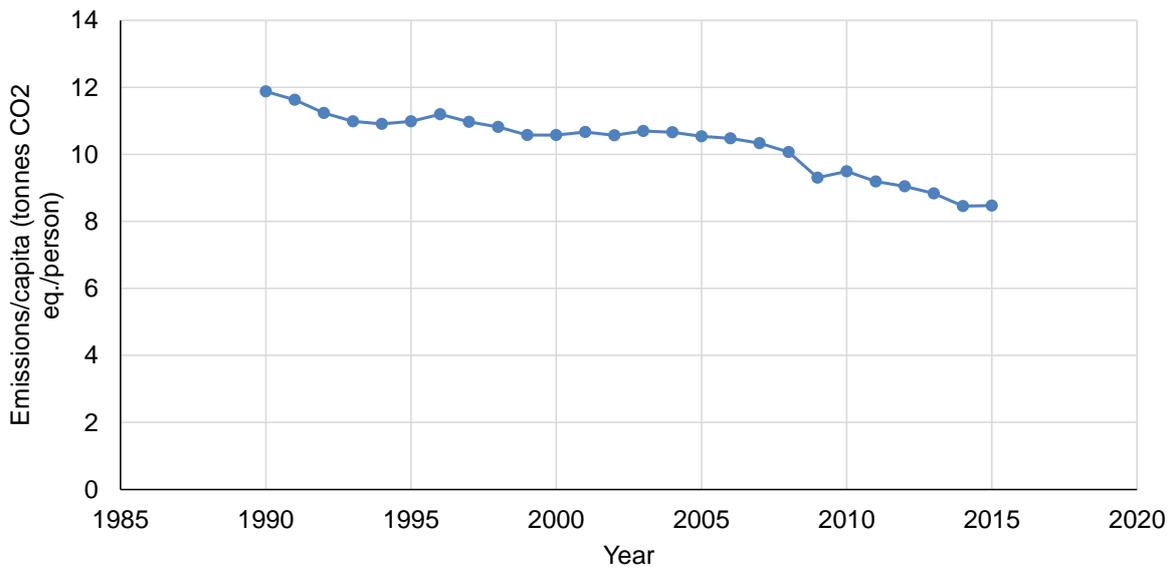


Source: EEA

2.3.5. Key drivers affecting emission trends

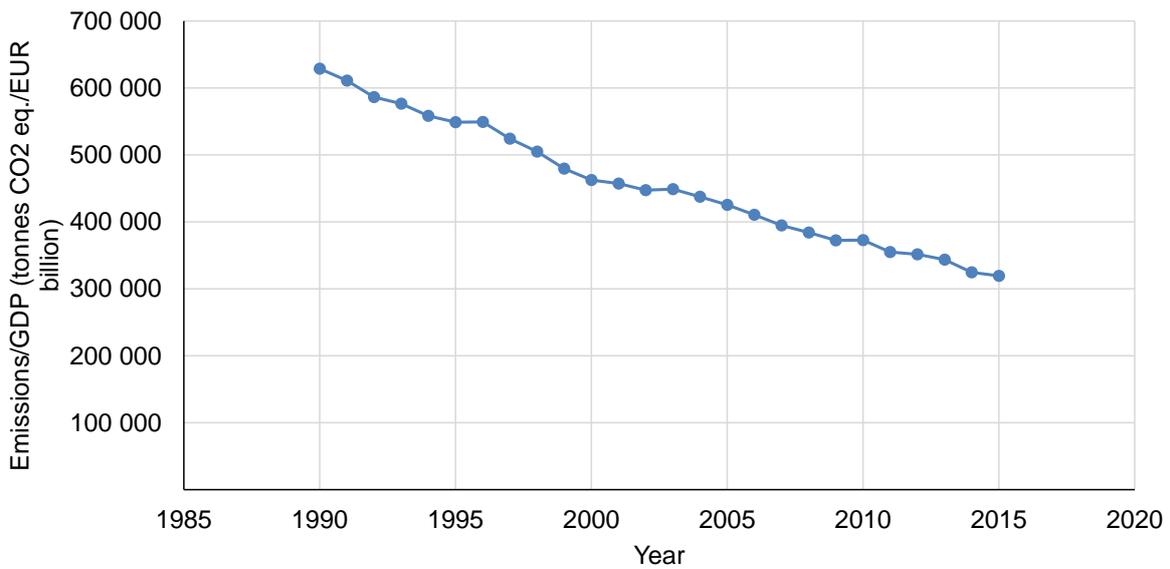
The main reasons for the changes during the period 1990 to 2015 are described in more detail in Section 2 “National Circumstances” of the 7NC. Two main drivers of GHG emissions are population and economic growth. As described in Section 2, population grew by 7 % and GDP increased by approximately 50 % between 1990 and 2015. As GHG emissions declined by 23.7 %, without LULUCF and without international aviation, and, with indirect CO₂, both GHG per capita (see Figure 2-5) and GHG emissions per GDP (see Figure 2-6) fell considerably. The decoupling of economic growth from GHG emissions has been progressing steadily since 1990.

Figure 2-5 GHG emissions per capita 1990 to 2015 for EU-28.



Source: EEA, Eurostat

Figure 2-6 GHG emissions per GDP 1990 to 2015 for EU-28.



Source: EEA, Eurostat

The sections below summarise the main reasons for the changes in GHG emissions in the EU during the period 2014 to 2015.

2.3.5.1. Main reasons for changes in EU-28 emissions, 2014 to 2015

The section discusses the changes in GHG emissions between 2014 and 2015, based on the 2017 inventory.

The analysis in Table 2-5 shows that the largest increases occurred in the 'buildings' sector, including residential, commercial and institutional, and, in road transportation.

Table 2-5 Overview of the largest emission changes by key sector in EU-28, 2014-2015

Source category	Million tonnes (CO ₂ equivalents)
Public electricity and heat production (CO ₂ from 1.A.1.a)	- 13.2
Refrigeration and air conditioning (HFCs from 2.F.1)	- 5.0
Managed waste disposal sites (CH ₄ from 5.A.1)	- 4.0
International aviation (CO ₂ from 1.D.1.a)*	5.0
Commercial/institutional (CO ₂ from 1.A.4.a)	5.6
Road transportation (CO ₂ from 1.A.3.b)	13.6
Residential (CO ₂ from 1.A.4.b)	19.5
Total	23.1

Notes The table shows only those sectors where emissions have increased or decreased by at least 3 million tonnes of CO₂ equivalent between 2014 and 2015. The table reflects the emission reductions according to the EU's geographical scope under KP and includes Iceland *International aviation is not included in national totals under KP/UNFCCC but it is included under the EU internal scope. Iceland is included in the former but not in the latter.

Source: EEA

Heat consumption in the EU can be supplied via distributed systems from thermal stations (reported under public electricity and heat production) and/or as a process of direct combustion in buildings (reported under residential and commercial/institutional). The consumption and emissions of the residential and commercial sectors reported in GHG inventories capture by and large the bulk of heat consumption and emissions from fossil fuels. Emissions in these sectors increased by 4.9 % in 2015 yet 2015 had the second lowest heat consumption in the EU. This is because 2014 recorded the lowest ever heat consumption and the highest average temperatures in Europe during the previous 25 years. There was subsequently an increased demand for heating in 2015 compared to 2014.

It is worth noting that emissions from public electricity and heat production decreased in 2015 even though the production of both heat and electricity actually increased that year. The main reason was lower use of coal and increased use of gas and biomass, which led to an improvement of the carbon intensity of the power sector and resulted in lower emissions in spite of increased output. The trigger for such an increase in output could higher heat consumption or electricity, or both.

GHG inventories provide evidence of the fuel input and the emissions output from electricity and heat production, but without distinguishing between emissions from heat and from electricity. According to energy statistics reported to Eurostat, there was an increase in both heat output and electricity output from conventional thermal power stations (including district heating) and this overall increase also applied to the residential sector. In addition, electricity in some countries is also used for heating purposes, so part of the increase in electricity in 2015 may also be attributed to higher heat demand in these countries.

The other key sector where emissions increased in 2015 was road transportation. It is the second largest source of emissions in the EU (after the power sector) and the positive trend of emission reductions observed since 2007 was reversed in 2014 and confirmed in 2015.

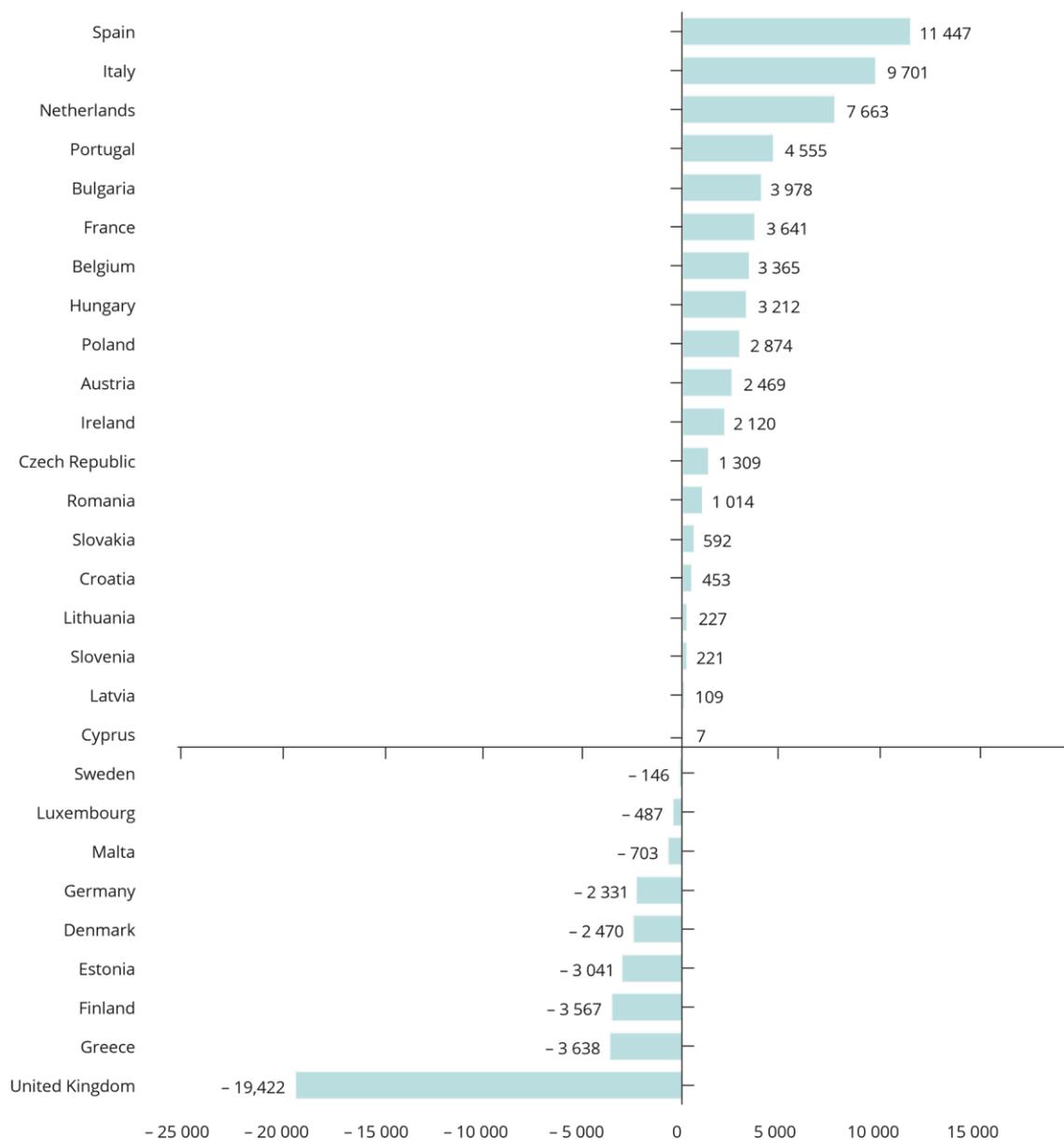
Road transport emissions increased by 1.6 % in 2015. The increase was fully accounted for by diesel consumption, whereas gasoline emissions continued declining. About 70 % of the increase came from passenger cars, 20 % from heavy duty vehicles, 4 % from light duty vehicles and the remaining 1 % from motorcycles.

International aviation is not included in national totals under the Kyoto Protocol but it is integrated in the EU internal scope and the 20 % 2020 target. Emissions continued increasing in 2015.

Figure 2-7 shows the absolute change in total GHG emissions, excluding LULUCF, by Member States between 2014 and 2015. Emissions increased in 19 Member States, particularly in Spain, Italy and the Netherlands, and decreased in 9 Member States, mainly in the United Kingdom.

The main reasons for the increase in emissions in Spain are the substantial increase in coal for electricity generation, the increase in the use of diesel for road transportation, particularly passenger cars, and the higher use of gas in the commercial/institutional sector. GDP also went up strongly in 2015 and renewables decreased in terms of primary energy, mainly for hydro but also for wind and biogas. In Italy, the main reasons were the strong increase in gas consumption in the residential sector, due to higher heat demand, as well as in the power sector. In the Netherlands, higher emissions were by and large the result of increased coal used for power generation as well as of gas in the residential sector due to colder winter conditions. Finally, the United Kingdom reported the largest decrease in emissions of the EU in 2015, in spite of the colder winter. This was primarily due to a strong reduction in coal use and an increase in renewables and nuclear for electricity generation.

Figure 2-7 Change in total GHG emissions, excluding LULUCF, between 2014 and 2015 by EU Member State (kilo tonnes CO₂ equivalent)



Source: EEA

2.3.6. Information on indirect GHG emissions

Emissions of CO, NO_x, NMVOC and SO₂ have to be reported under the UNFCCC because these gases influence climate change indirectly: CO, NO_x and NMVOC are precursor substances for ozone which itself is a greenhouse gas. Sulphur emissions produce microscopic particles (aerosols) that can reflect sunlight back out into space and also affect cloud formation. Table 2-6 shows the total indirect GHG and SO₂ emissions in the EU-28 between 1990 and 2015.

All emissions were reduced significantly from 1990 levels: the largest reduction was achieved in SO₂ (-87 %) followed by, CO (-67 %), NO_x (-57 %) and NMVOC (-60 %).

The largest emitters, Germany, France, the United Kingdom, Spain, and Italy made up 61 % of total EU NO_x emissions in 2015. All EU-28 Member States reduced their NO_x emissions between 1990 and 2015.

Table 2-6 Overview of EU-28 indirect GHGs for 1990 to 2015

GHG or category	GHG emissions (kilo tonnes)							
	1990	1995	2000	2005	2010	2013	2014	2015
NO _x	17 991	15 439	13 394	12 275	9 649	8 527	8 003	7 667
CO	63 998	51 875	40 073	31 593	26 765	23 138	21 414	21 155
NMVOC	16 952	13 696	11 255	9 277	7 777	7 058	6 758	6 751
SO ₂	24 876	15 911	9 589	7 407	4 531	3 545	3 217	3 114

Notes These emissions include the very small contribution from Iceland
Source: EEA

2.3.7. Accuracy/Uncertainty of the data

Table 2-7 shows the main results of the uncertainty analysis on the magnitude (level) of emissions for the EU-28. Fuel combustion activities are associated with the lowest uncertainties (0.9 %) and the highest uncertainties are associated with agriculture (46 %). Overall uncertainty estimates including LULUCF of all the EU-28 GHG emissions are estimated at 6.1 %, and excluding LULUCF, slightly lower, at 5.1 %.

With regard to uncertainty estimates on the trend in emissions, fuel combustion activities are associated with the lowest uncertainties (0.3 %) and the highest estimates are for LULUCF (19 %). Overall trend uncertainty (including LULUCF) of all GHG emissions is estimated to be 1.1 %.

Table 2-7 Approach 1 uncertainty estimates of EU-28 GHG emissions for the main sectors. (Emissions in kilo tonnes CO₂ eq.)

Sector	Emissions 1990	Emissions 2015	Emission trends 1990 to 2015	Level uncertainty estimates based on MS uncertainty estimates	Trend uncertainty estimates based on MS uncertainty estimates
1.A Fuel combustion activities	4 135 921	3 235 842	-21.8 %	0.9 %	0.3 %
1.B Fugitive emissions	196 697	89 108	-54.7 %	18.3 %	8.1 %
2. Industrial Processes and Product Use	517 735	342 609	-33.8 %	11.0 %	4.9 %
3. Agriculture	540 946	435 365	-19.5 %	45.8 %	2.9 %
4. LULUCF	-208 240	-282 549	35.7 %	36.7 %	18.6 %

Sector	Emissions 1990	Emissions 2015	Emission trends 1990 to 2015	Level uncertainty estimates based on MS uncertainty estimates	Trend uncertainty estimates based on MS uncertainty estimates
5. Waste	239 014	136 092	-43.1 %	52.3 %	11.9 %
Total (including LULUCF)	5 422 073	3 956 467	-27.0 %	6.1 %	1.1 %
Total (excluding LULUCF)	5 630 313	4 239 017	-24.7 %	5.1 %	0.8 %

Notes These estimates include the very small effects of Iceland. Uncertainties for the sum of GHGs. Emissions are in Gg CO₂ equivalents; they are slightly lower than the emissions included in CTF Table 1 (a) because not all Member States estimate uncertainties for all emissions and this table reflects the emissions for which uncertainty estimates are available. Values expressed as 95 % Confidence Intervals.

Source: EEA

2.4. The EU inventory arrangements

Section 3.3 of the National Communication provides full details of the EU inventory arrangements.

In the EU, the legal basis for the compilation of the Union greenhouse gas inventory is Regulation (EU) No 525/2013 of the European Parliament and of the Council of 21 May 2013 *on a mechanism for monitoring and reporting greenhouse gas emissions and for reporting other information at national and Union level relevant to climate change and repealing Decision No 280/2004/EC* (hereafter referred to as the Monitoring Mechanism Regulation or MMR). Commission delegated regulation (EU) 666/2014 establishes the substantive requirements for the EU national system²¹¹. The EU national inventory system as well as the QA/QC programme is described in more detail in a Commission Staff Working Document²¹².

The main institutions involved in the compilation of the EU GHG inventory are the Member States, the European Commission Directorate-General for Climate Action, the European Environment Agency (EEA) and its European Topic Centre on Air Pollution and Climate Change Mitigation (ETC/ACM), Eurostat, and the Joint Research Centre (JRC).

Since the submission of the second biennial report from the European Union under the UNFCCC, no changes have occurred in the inventory arrangements.

It is important to mention that in the context of the Kyoto Protocol, a key change to previous inventory submissions of the EU under the Kyoto Protocol is that the Kyoto greenhouse inventory for the second commitment period has a different coverage of countries due to the

211 <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AAOJ.L..2014.179.01.0026.01.ENG>

212 Commission Staff Working Document SWD(2013)308 final on Elements of the Union greenhouse gas inventory system and the Quality Assurance and Control (QA/QC) programme.

scope of the terms of the joint fulfilment agreement for the second commitment period which includes 28 Member States and Iceland.

2.5. Quality Assurance/Quality Control (QA/QC) procedures

The quality of the Union GHG inventory depends on the quality of the Member States' inventories, the QA/QC procedures of the Member States and the quality of the compilation process of the EU inventory. The Member States and also the EU as a whole have implemented QA/QC procedures in order to comply with the IPCC good practice guidance.

The EU QA/QC programme²¹³ describes the quality objectives and the inventory quality assurance and quality control plan for the Union GHG inventory including responsibilities and the time schedule for the performance of the QA/QC procedures. Definitions of quality assurance, quality control and related terms used are those provided in IPCC 2006 Guidelines and Guidelines for National Systems under the Kyoto Protocol. The EU QA/QC programme is reviewed annually and modified or updated as appropriate.

The European Commission (DG Climate Action) is responsible for coordinating QA/QC activities for the Union inventory and ensures that the objectives of the QA/QC programme are implemented and the QA/QC plan is developed. The European Environment Agency (EEA) is responsible for the annual implementation of QA/QC procedures for the Union inventory.

The overall objectives of the EU QA/QC programme are:

- To establish quality objectives for the Union GHG inventory, taking into account the specific nature of this inventory as a compilation of Member States' GHG inventories;
- To implement the quality objectives in the design of the QA/QC plan, defining general and specific QC procedures for the EU GHG inventory submission;
- To provide a Union inventory of GHG emissions and removals consistent with the sum of Member States' inventories and covering the EU's geographical area;
- To ensure the timeliness of Member States' GHG inventory submissions To the EU;
- To ensure the completeness of the Union GHG inventory, inter alia, by implementing procedures To estimate any data missing from the national inventories, in consultation with the MS concerned;
- To contribute To the improvement of quality of Member States' inventories and;
- To provide assistance for the implementation of national QA/QC programmes.

A number of specific objectives have been elaborated in order to ensure that the Union GHG inventory complies with the UNFCCC inventory principles of transparency, completeness, consistency, comparability, accuracy and timeliness.

213 Commission Staff Working Document. Elements of the Union greenhouse gas inventory system and the Quality Assurance and Control (QA/QC) programme Brussels, 12.8.2013 SWD(2013) 308 final. https://ec.europa.eu/clima/sites/clima/files/strategies/progress/monitoring/docs/swd_2013_308_en.pdf

In the QA/QC plan, quality control procedures before and during the compilation of the Union GHG inventory are listed. In addition, QA procedures, procedures for documentation and archiving, the time schedules for QA/QC procedures and the provisions related to the inventory improvement plan are included.

QC procedures are performed at several different stages during the preparation of the Union inventory. Firstly, a range of checks are used to determine the consistency and completeness of Member States' data so that they may be compiled in a transparent manner at EU level. Secondly, checks are carried out to ensure that the data are compiled correctly at EU level to meet the overall reporting requirements. Thirdly, a number of checks are conducted with regard to data archiving and documentation to meet various other data quality objectives.

2.5.1. Data gap filling procedure for GHG emissions

The Union GHG inventory is compiled by using the inventory submissions of the EU Member States. If a MS does not submit all data required for the compilation of the Union inventory by 15 March of a reporting year, the Commission prepares estimates for data missing for that MS. Gap filling techniques are only used where necessary. The EU NIR 2017 provides a description of the approach taken to “gap fill”, in Section 1.7.3 “*Data gaps and gap-filling*”.

Since 2011, GHG inventory estimates have been complete for all EU Member States, and therefore no gap filling has been needed.

3. QUANTIFIED ECONOMY-WIDE EMISSION REDUCTION TARGET

This section explains the EU 2020 emission reduction target under the UNFCCC and the target compliance architecture set up within the EU in order to meet that target. It also gives an overview of other EU emission reduction targets that are helping achieve the quantified economy-wide emission reduction target under the UN.

3.1. The EU target under the Convention

In 2010, the EU submitted a pledge to reduce its GHG emissions by 2020 by 20 % compared to 1990 levels, in order to contribute to achieving the ultimate objective of the UNFCCC: 'to stabilise GHG concentrations at a level that would prevent dangerous anthropogenic (human-induced) interference with the climate system'²¹⁴, or, in other words, to limit the global temperature increase to less than 2°C compared to temperature levels before industrialization (FCCC/CP/2010/7/Add.1). The EU had also committed to raising this target to a 30 % emission reduction by 2020 compared with 1990 levels, provided that other developed countries also commit to achieving comparable emission reductions, and that developing countries contribute adequately, according to their responsibilities and respective capabilities. This offer was reiterated in the submission to the UNFCCC by the EU-28 and Iceland on 30 April 2014²¹⁵.

The definition of the Convention target for 2020 is documented in the revised note provided by the UNFCCC Secretariat on the 'Compilation of economy-wide emission reduction targets to be implemented by Parties included in Annex I to the Convention' (FCCC/SB/2011/INF.1/Rev.1 of 7 June 2011). In addition, the EU provided additional information relating to its quantified economy wide emission reduction target in a submission as part of the process of clarifying the developed country Parties' targets in 2012 (FCCC/AWGLCA/2012/MISC.1).

The EU's accounting rules for the target under the UNFCCC are more ambitious than the current rules under the Kyoto Protocol, for example, including international aviation, and adding an annual compliance cycle for emissions under the Effort Sharing Decision (ESD; see section) or higher Clean Development Mechanism (CDM) quality standards under the EU Emissions Trading System (EU ETS) (FCCC/TP/2013/7). Accordingly, the following assumptions and conditions apply to the EU's 20 % target under the UNFCCC:

- The EU Convention pledge does not include emissions/removals from Land Use, Land Use Change and Forestry, but it is estimated to be a net sink over the relevant period. EU inventories also include information on emissions and removals from LULUCF in accordance with relevant reporting commitments under the UNFCCC. Accounting for LULUCF activities only takes place under the Kyoto Protocol;
- The target covers the gases CO₂, CH₄, N₂O, HFCs, PFCs and SF₆;

²¹⁴ First steps to a safer future: Introducing the United Nations Framework Convention on Climate Change <http://unfccc.int/essential/background/convention/items/6036.php>

²¹⁵ European Union, its Member States and Iceland submission pursuant to par 9 of decision 1/CMP.8' http://ec.europa.eu/clima/policies/international/negotiations/docs/eu_submission_20140430_en.pdf

- The target refers to 1990 as a single base year for all covered gases and all Member States. Emissions from international aviation to the extent it is included in the EU ETS are included in the target²¹⁶;
- A limited number of CERs, ERUs and units from new market-based mechanisms may be used to achieve the target (see Section 2.2.2.3): in the ETS, the use of international credits is capped (up to 50 % of the reduction required from EU ETS sectors by 2020). Quality standards also apply to the use of international credits in the EU ETS, including a ban on credits from LULUCF projects and certain industrial gas projects. In the ESD sectors, the annual use of international credits is limited to up to 3 % of each Member State's ESD emissions in 2005, with a limited number of Member States being permitted to use an additional 1 % from projects in Least Developed Countries (LDCs) or Small Island Developing States (SIDS), subject to conditions;
- The Global Warming Potentials (GWPs) used to aggregate GHG emissions up to 2020 under EU legislation were those based on the Second Assessment Report of the IPCC when the target was submitted. In accordance with the CMP Decision to revise the GWPs to those from the IPCC Fourth Assessment Report (AR4) revised GWPs from AR4 were adopted for the EU ETS. The revised GWPs were taken into account for the revision of the ESD target. For the implementation until 2020, GWPs from AR4 will be used consistently with the UNFCCC reporting guidelines for GHG inventories.

Table 3-1 Key facts of the Convention target of the EU-28

Parameters	Target
Base Year	1990
Target Year	2020
Emission Reduction target	-20 % in 2020 compared to 1990
Gases covered	CO ₂ , CH ₄ , N ₂ O, HFCs, PFCs, SF ₆
Global Warming Potential	AR4
Sectors Covered	All IPCC sources and sectors, as measured by the full annual inventory and international aviation to the extent it is included in the EU ETS.
Land Use, Land-Use Change, and Forests (LULUCF)	Accounted under KP, reported in EU inventories under the Convention. Assumed to produce net removals
Use of international credits (JI and CDM)	Possible subject to quantitative and qualitative limits.
Other	Conditional offer to move to a 30 % reduction by 2020 compared to 1990 levels as part of a global and comprehensive agreement for the period beyond 2012, provided that other developed countries commit themselves to comparable emission reductions and that developing countries contribute adequately according to their responsibilities and respective capabilities.

²¹⁶ In the EU, the sum of emissions covered by categories 1.A.3.a 'domestic aviation' and memo item 'international bunkers - aviation' go beyond the scope of the EU target, as emissions from international aviation are included in the EU Climate and Energy Package and the EU target under the UNFCCC to the extent to which aviation is part of the EU ETS.

3.2. The EU target compliance architecture

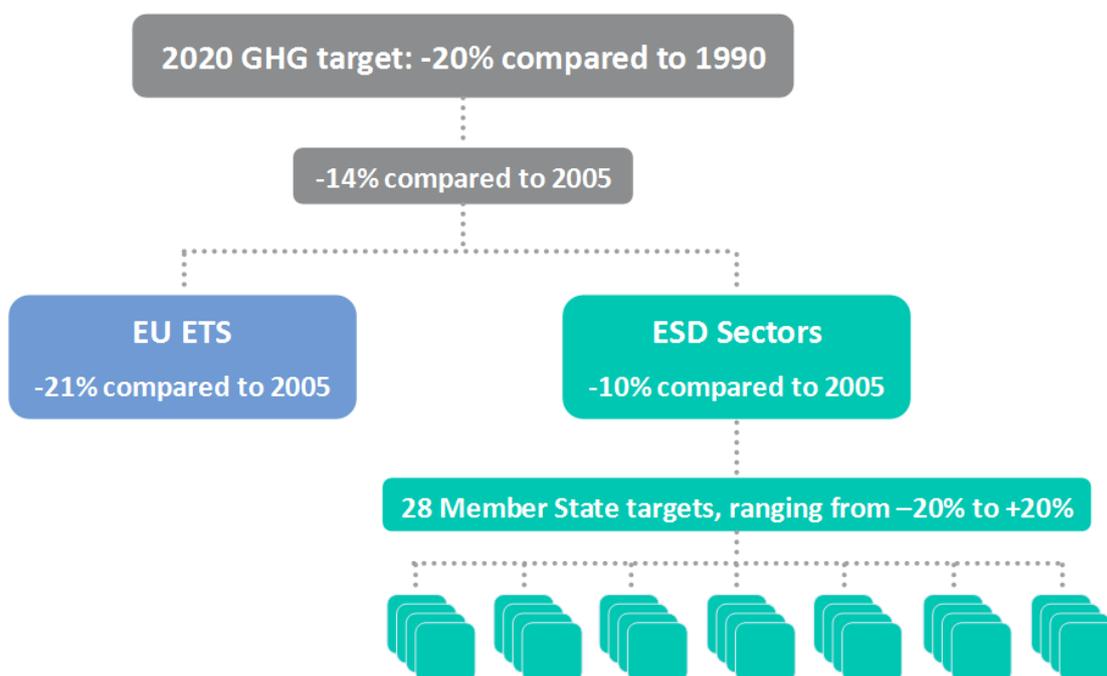
3.2.1. The 2020 climate and energy package

In 2009 the EU established internal rules under its “2020 climate and energy package”²¹⁷ - these underpin the EU implementation of the target under the Convention. The package introduced a clear approach to achieving the 20 % reduction of total GHG emissions from 1990 levels, which is equivalent to a 14 % reduction compared to 2005 levels. This 14 % reduction objective is divided between the ETS and ESD sectors. These two sub-targets are:

- a 21 % reduction target compared to 2005 for emissions covered by the ETS (including domestic and international aviation);
- a 10 % reduction target compared to 2005 for ESD sectors, shared between the 28 Member States (MS) through individual national GHG targets.

The distribution of the total target across the ETS and ESD is shown in Figure 3-1.

Figure 3-1 GHG targets under the 2020 climate and energy package



Source: European Commission

Under the revised EU ETS Directive (Directive 2009/29/EC), a single ETS cap covers the EU Member States and three participating non-EU countries (Norway, Iceland and Liechtenstein), and there are no further individual caps by country. Allowances allocated in the EU ETS from 2013 to 2020 decrease by 1.74 % annually, starting from the average level of allowances issued by Member States for the second trading period (2008–2012).

²¹⁷ http://ec.europa.eu/clima/policies/package/index_en.htm

The three non-EU countries participating in EU ETS (Norway, Iceland and Liechtenstein) are also subject to a similarly defined cap and the same annual decrease in allowance allocation.

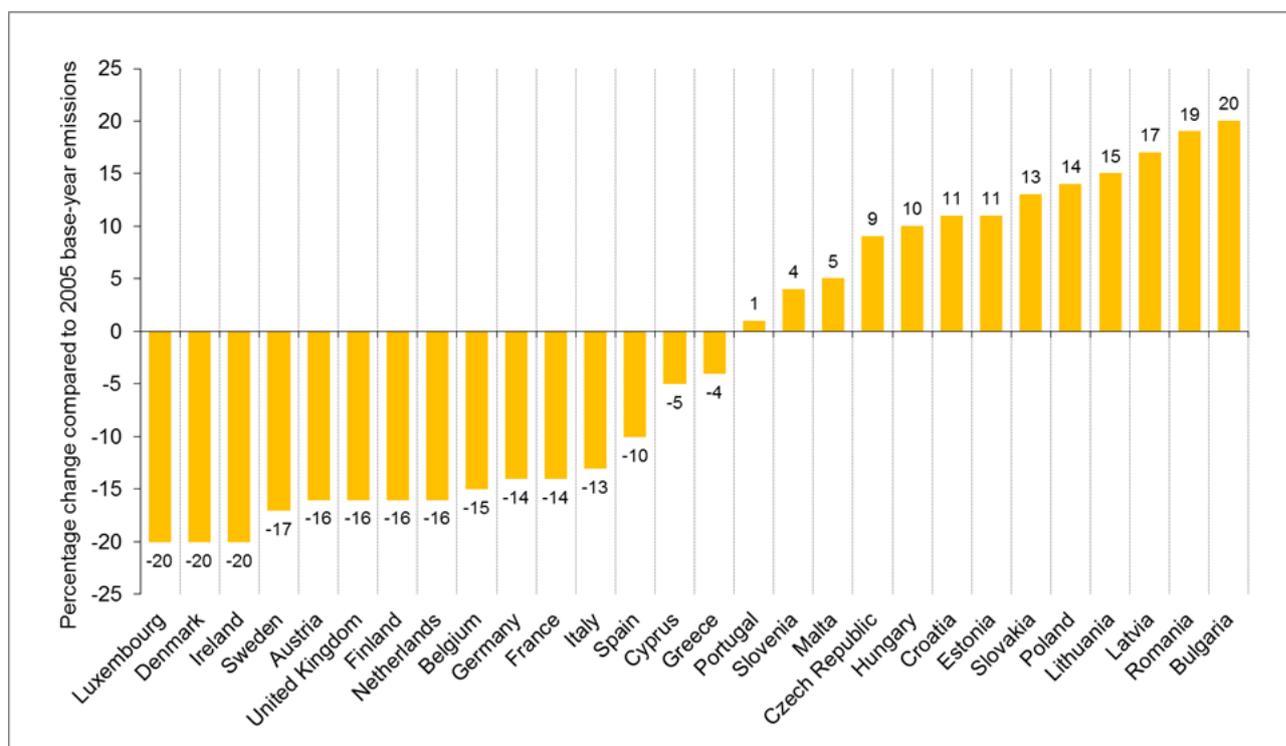
For further additional information on recent changes in the EU ETS see section 4.2.1.

The vast majority of emissions within the EU which fall outside the scope of the EU ETS are addressed under the Effort Sharing Decision (ESD) (Decision No 406/2009/EC). The ESD covers emissions from all sources outside the EU ETS, except for emissions from domestic and international aviation (which were included in the EU ETS from 1 January 2012), international maritime emissions, and emissions and removals from land use, land-use change and forestry (LULUCF). It thus includes a diverse range of small-scale emitters in a wide range of sectors: transport (cars, trucks), buildings (in particular heating), services, small industrial installations, fugitive emissions from the energy sector, emissions of fluorinated gases from appliances and other sources, agriculture and waste. Such sources accounted for 55 % of total GHG emissions in the EU in 2013²¹⁸.

While the EU ETS target is to be achieved by the EU as a whole, the ESD target was divided into national targets to be achieved individually by each Member State (see Figure 3-2). Under the Effort Sharing Decision, national emission targets for 2020 are set, expressed as percentage changes from 2005 levels. These changes have been transferred into binding quantified annual reduction targets for the period from 2013 to 2020 (Commission Decisions 2013/162/EU and 2013/634/EU), denominated in Annual Emission Allocations (AEAs). At country level, 2020 targets under the ESD range from -20 % to +20 %, compared to 2005 levels. ESD targets for 2020 for each EU Member State are shown in Figure 3-2 .

²¹⁸ European Commission. Commission Staff Working Document - Accompanying the document: 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. (SWD(2016) 251 final). 2016.
<https://ec.europa.eu/transparency/regdoc/rep/10102/2016/EN/10102-2016-251-EN-F1-1-ANNEX-1.PDF>

Figure 3-2 National 2020 GHG emission limits under the ESD, relative to 2005 emissions levels



Source: EU Decision No 406/2009/EC, Annex 2

The target levels have been set on the basis of Member States' relative Gross Domestic Product per capita. In addition, different levels of development in the EU-28 are taken into account by the provision of several flexibility options. Up to certain limitations, the ESD allows Member States to make use of flexibility provisions for meeting their annual targets: carry-over of over-achievements to subsequent years within each Member State, transfers of AEAs between Member States and the use of international credits (credits from Joint Implementation and the Clean Development Mechanism). MS exceeding their annual AEA, even after taking into account the flexibility provisions and the use of JI/CDM credits, will face inter alia a penalty – a deduction from their emission allocation of the following year (excess emissions, multiplied by 1.08).

For additional information on recent changes related to the ESD see section 4.2.2.

3.2.2. Monitoring on progress to 2020 targets

For the monitoring of GHG emissions at the EU and the Member State level, the Monitoring Mechanism Regulation has been adopted, see section 2.2.2.1 of the EU's second Biennial Report. Also for the effective operation of the EU ETS, robust, transparent, consistent and accurate monitoring and reporting of greenhouse gas emissions are essential, therefore an annual procedure of monitoring, reporting and verification (MRV) at the installation level is implemented. For a description of the requirements contained therein, please refer to section 2.2.2.1 of the EU's second Biennial Report. Installation and aircraft operators have to monitor, report and verify their annual emissions in accordance with two EU Regulations, the

Monitoring and Reporting Regulation (MRR) and the Accreditation and Verification Regulation (AVR). For a description of the requirements contained therein, please refer to in section 2.2.2.2 of the EU's second Biennial Report.

Monitoring, reporting and verification of the ESD targets mainly takes place through the submission of the national GHG inventories by MS. Chapter III of the Commission Implementing Regulation 749/2014 sets out strict criteria by which MS national GHG inventories GHG emissions are reviewed annually at the EU-level. Based on this review, the European Commission issues an implementing decision on MS ESD emissions in the given year, which might lead to MS inter alia facing penalties as described above.

3.2.2.1. Accounting for Flexible Mechanisms under the 2020 target

In general, in the EU the use of flexible mechanisms can take place on the one hand by operators in the EU ETS, on the other hand by governments for the achievement of ESD targets.

The amended EU ETS Directive 2009/29/EC (Article 11a(8)) sets the upper limit for credit use for the period from 2008 to 2020 at a maximum of 50 % of the reduction effort below 2005 levels. This is further specified into installation-level limits in the Commission Regulation on international credit entitlements (RICE) (EU No 1123/2013). Since some entitlements are expressed as a percentage of verified emissions over the entire period, the overall maximum amount will only be known at the end of the third trading period.

Since 2013 it is no longer possible to track the use of flexible mechanisms in the EU ETS directly via information on the EUTL public website because CERs and ERUs are no longer surrendered directly but are exchanged into EUAs. These exchanges will become public on an installation level after three years²¹⁹; however aggregated data at EU-level is available earlier.

The ESD allows Member States to make use of flexibility provisions for meeting their annual targets, with certain limitations. In the ESD sectors, the annual use of carbon credits is limited to up to 3 % of each Member State's ESD emissions in 2005. Member States that do not use their 3 % limit for the use of international credits in any specific year can transfer the unused part of their limit to another Member State or bank it for their own use until 2020. Member States fulfilling additional criteria (Austria, Belgium, Cyprus, Denmark, Finland, Ireland, Italy, Luxembourg, Portugal, Slovenia, Spain and Sweden) may use credits from projects in Least Developed Countries (LDCs) and Small Island Developing States (SIDS) up to an additional 1 % of their verified emissions in 2005. These credits are not bankable and transferable. Approximately 750 Mt of international credits can be used during the period from 2013 to 2020 in the ESD.

²¹⁹ Annex XIV of European Commission. Commission Regulation (EU) No 389/2013. 2013. <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32013R0389>

3.3. **Other EU emission reduction targets**

In addition to the EU target under the Convention, the EU also committed to a legally binding quantified emission limitation reduction commitment for the second commitment period of the Kyoto Protocol (2013 - 2020). In Table 3-2 all relevant GHG reduction targets for the EU and their key facts are displayed in an overview. On the left, the table includes the international commitments under the Kyoto Protocol and the UNFCCC. On the right, the EU commitments under the Climate and Energy Package are included.

Table 3-2 Overview of EU targets

	International commitments			EU domestic legislation	
	Kyoto Protocol		UNFCCC	Climate and Energy Package	
				EU ETS	ESD
Target year of period	First commitment period (2008-2012)	Second commitment period (2013-2020)	2020	2013-2020	2013-2020
Emission reduction target	-8 %	-20 %	-20 %	-21 % compared to 2005 for ETS emissions	Annual targets by MS. In 2020 -10 % compared to 2005 for non-ETS emissions
Further targets	-	-	Conditional target of -30 % if other Parties take on adequate commitments	Renewable Energy Directive: 20 % share of renewable energy of gross final energy consumption; Energy Efficiency Directive : Increase energy efficiency by 20 %	
Base year	1990 KP Flexibility rules (Art 3(5)) regarding F-Gases and Economies in Transition	1990, but subject to flexibility rules. 1995 or 2000 may be used as the base year for NF ₃	1990	1990 for overall emission reduction target; 2005 for renewable energy and energy efficiency target; as well as for targets broken down into ETS and non-ETS emissions	
LULUCF	Included ARD and other activities if elected	Includes ARD and forest management, other activities if elected (new accounting rules)	Excluded	Excluded	
Aviation	Domestic aviation included. International aviation excluded	Domestic aviation included. International aviation excluded	Aviation in the scope of the EU ETS included. In practice total aviation emissions considered	Domestic and international aviation included, as in the scope of EU ETS	Aviation generally excluded, some domestic aviation included (operators below ETS de minimis thresholds)

	International commitments			EU domestic legislation	
	Kyoto Protocol		UNFCCC	Climate and Energy Package	
				EU ETS	ESD
Use of international credits	Use of KP flexible mechanisms subject to KP rules	Use of KP flexible mechanisms subject to KP rules	Subject to quantitative and qualitative limits	Subject to quantitative and qualitative limits, see section 3.2.2.1	Subject to quantitative and qualitative limits, see section 3.2.2.1
Carry-over of units from preceding periods	Not applicable	Subject to KP rules including those agreed in the Doha Amendment	Not applicable	EU ETS allowances can be banked into subsequent ETS trading periods since the second trading period	No carry-over from previous period
Gases covered	CO ₂ , CH ₄ , N ₂ O, HFCs, PFCs, SF ₆	CO ₂ , CH ₄ , N ₂ O, HFCs, PFCs, SF ₆ , NF ₃	CO ₂ , CH ₄ , N ₂ O, HFCs, PFCs, SF ₆	CO ₂ , CH ₄ , N ₂ O, HFCs, PFCs, SF ₆ ²²⁰	
Sectors included	Annex A of KP (Energy, IPPU, agriculture, waste), LULUCF according to KP accounting rules for CP1	Annex A of KP (Energy, IPPU, agriculture, waste), LULUCF according to KP accounting rules for CP2	Energy, IPPU, agriculture, waste, aviation in the scope of the EU ETS	Power & heat generation, energy-intensive industry sectors, aviation (Annex 1 of ETS directive)	Transport (except aviation), buildings, non-ETS industry, agriculture (except forestry) and waste
GWPs used	IPCC SAR	IPCC AR4	IPCC AR4	IPCC AR4	

²²⁰ In its third trading period, the EU ETS however only covers the gases CO₂, N₂O, CH₄ and C₂F₆.

4. PROGRESS IN ACHIEVEMENT OF QUANTIFIED ECONOMY-WIDE EMISSION REDUCTION TARGETS AND RELEVANT INFORMATION

4.1. Introduction

As outlined in Chapter 4 of the EU's 7NC this chapter in the EU's 3BR provides an overview of the EU policies which contribute to meeting the EU emission reduction target as explained in section 4.3 of the EU's 7NC. Wider information on the overarching climate change policy landscape in the EU, along with other issues such as assessments of economic or social consequences, and the monitoring and evaluation of progress, are covered in the EU's Seventh NC.

As explained in the EU's 7NC, there are two distinct levels of policies in the EU that have an impact on greenhouse gas emissions:

- European Union policies, which are proposed by the Commission and subsequently approved, amended or rejected by the Council of the European Union and the European Parliament. These EU policies are applicable to all Member States, though Member States may implement Directives at different points in time;
- National policies developed and implemented by Member States themselves.

The reporting in this BR concentrates on the EU policies; national policies and measures are outside the scope of the report.

This report focuses in particular on updates or changes to the policies and measures at the EU level, and does not attempt to include a comprehensive background to each Policy. If more background is required, links are provided or the reader can refer to the EU's Second BR.

Quantifications of the policy impacts on GHG emission reduction are attached in Table 3 of the Common Tabular Format (CTF). These (mostly) ex-ante estimates are produced by the European Commission as part of the impact assessments of the individual policies. The estimates are for the EU as a whole, and assume full implementation of the policies. However, estimates are not available for all EU policies and all years covered in CTF Table 3. Some older estimates refer to the EU-15 while more recent estimates are for the EU-27 or the EU-28.

4.2. Cross-cutting policies and measures

This section focuses on two key cross-cutting policies and measures, the EU Emissions Trading System and the Effort Sharing Decision. It then goes on to look at some key cross-cutting funding mechanisms, such as Horizon 2020 and the European Structural and Investment Funds.

The two main overarching policies are the EU Emissions Trading System (EU ETS) and the Effort Sharing Decision (ESD), both establishing EU internal rules under the "2020 climate and energy package" which underpin the implementation of the target under the Convention.

The main elements of the EU ETS, the ESD and the EU monitoring system are presented in section 2. Details on the EU ETS and ESD were reported in sections 4.2.2 and 4.2.3 of the first biennial report from the European Union under the UNFCCC (1BR), and relevant updates were described in Section 3.1 of the 2BR. Changes and updates compared to the information provided in the 2BR are explained in the following two sections.

4.2.1. *The EU Emissions Trading System (EU ETS)*

The EU ETS is based on the 'cap and trade' principle, and has been operational since 2005. It limits emissions from nearly 11,000 heavy energy-using installations (power stations & industrial plants) and slightly over 500 aircraft operators operating between EEA countries, and covers around 45 % of the EU's greenhouse gas emissions.

As described in the EU's 2BR, on 15 July 2015, the Commission presented a legislative proposal on the revision of the EU ETS for Phase 4 in line with the 2030 Climate and Energy policy Framework.

The legislative proposal included:

- An aim of achieving a 43 % reduction in emissions of installations in energy production, industry and aviation by 2030 compared to 2005 levels;
- An increase in the annual reduction in the overall number of allowances from the current 1.74 % to 2.2 % from 2021 onwards in order to provide the emissions reductions and thus deliver the underlying environmental objective;
- The continued free allocation after 2021, including elements such as the necessary updates to the relevant benchmarks to reflect technological progress, the criteria for the future inclusion of sectors in the carbon leakage list and procedures to account for changes in production levels;
- The creation of several low carbon funding mechanisms, in particular an Innovation Fund (to support demonstration of innovative renewable energy and low-carbon innovation in industry, as well as carbon capture, use and storage) and a Modernisation Fund (to contribute to modernising the energy systems of 10 EU Member States with lower GDP).

Since then, the following activities have taken place as part of the process leading up to the Phase 4 revision:

- An expert meeting was hosted by the European Commission in April 2016, to discuss technical aspects of the proposed free allocation and carbon leakage rules for Phase 4 of the EU ETS;
- At the start of 2017, the Commission, through DG CLIMA, launched a consultation period with EU ETS stakeholders and financiers to ensure a quick start of the Innovation Fund. The consultation process was initiated with a high level conference on 20th January to be followed by a number of expert roundtables in the following months to discuss the way forward for the Fund;
- In November 2017, the European Parliament and the Council agreed on a common position, and legislation would be adopted before end 2017.

4.2.2. *The Effort Sharing Decision*

The EU **Effort Sharing Decision** (2013-2020) covers emissions from the non-ETS sectors such as buildings, transport and agriculture. It sets national emission targets for 2020, expressed as percentage changes from 2005 levels. By 2020, these national targets will collectively deliver a reduction of around 10 % in total EU emissions from the sectors covered compared with 2005 levels.

Emissions not covered by the EU ETS decreased by 11 % in 2016 compared to 2005, i.e. below the 2020 target of -10 %. However, they increased for the second year in a row by 0.8 % compared to 2015, although less than the increase in GDP. This is at least partly explained by the low oil prices and higher needs for heating due to weather conditions in both 2015 and 2016.

The progress of Member States in meeting the emission reduction targets set in the Effort Sharing Decision (ESD) for the period 2013-2020 is assessed under the Monitoring Mechanism Regulation (Regulation No 525/2013), and also as part of the European Semester²²¹.

The ESD and the MMR introduced an annual compliance cycle requiring a review of Member States' greenhouse gas inventories for the purpose of compliance with their obligations under the ESD in the period 2013-2020. These reviews are carried out within a shorter time frame than the current UNFCCC inventory review to enable the use of flexibilities and the application of corrective action, where necessary, at the end of each relevant year. The following progress has been made with the reviews:

- In 2016 a comprehensive review was completed, establishing the GHG emission levels for the compliance years 2013 and 2014 in the ESD;
- A further review was completed in 2017, to establish the emission levels for the compliance year 2015.

As part of the flexibilities allowed under the Decision, Member States are able to transfer part of their Annual Emission Allocation (AEA) that exceeds its greenhouse gas emissions for that year. The first transfers were concluded in 2017 for compliance with the year 2013.

In accordance with Article 14 of the Decision, the European Commission prepared an evaluation²²² of the implementation of the Effort Sharing Decision up to 2015. The evaluation concluded that the commitments under the Decision have contributed to stimulating new national policies and measures promoting effective reductions of greenhouse gas emissions. It also found that the Decision has resulted in Member States becoming more active in considering new measures to reduce emissions in those sectors within the Decision's scope, as well as in improved coordination between national, regional and local governments.

The results of the evaluation were used by the Commission when preparing two legislative proposals setting out how EU Member States should implement their commitment to reduce

221 The European Semester is the EU's annual cycle of economic policy guidance and surveillance:

http://ec.europa.eu/economy_finance/economic_governance/the_european_semester/index_en.htm

222 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 <http://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX:52016DC0483>

its non-ETS emissions by 30 % by 2030 compared to 2005. The proposals were tabled on 20 July 2016^{223,224}.

First, for sectors outside the ETS and Land Use, Land Use Change and Forestry (LULUCF), each Member State would be subject to a binding annual greenhouse gas emission limits for the period 2021–2030. Member States agreed to share the relevant efforts on the basis of fairness, solidarity, cost-effectiveness and environmental integrity. The proposal thus recognises Member States' varying capacities to take action by differentiating 2030 targets primarily based on 2013 GDP per capita. The proposed 2030 targets range from 0 % to -40 % compared to 2005 levels.

Secondly, Member States would be required to balance greenhouse gas emissions and removals from land use, land use change and forestry under the 'no debit rule'. It is proposed that greenhouse gas emissions from land use would have to be entirely compensated by an equivalent removal of CO₂ from the atmosphere through action in this sector or alternatively in the effort sharing sectors.

For example, if a Member State cuts down its forests, it must compensate for the resulting emissions by planting new forest, by improving the sustainable management of its existing forests, croplands and grasslands, or alternatively by further reductions in the Effort Sharing sectors. In addition, Member States will also have the possibility to trade LULUCF credits. If implemented, this accounting system will help Member States to incentivise farmers and foresters to move towards climate-smart agriculture and forest management.

The European Parliament adopted its position with respect to the proposed regulation on 14 June 2017, and the European Council adopted its position later in 2017, enabling the start of trilogue negotiations.

4.2.3. *Other cross-cutting policies and measures*

Climate action is a key priority for the EU. To respond to challenges and investment needs related to climate change, the EU has agreed that at least 20 % of its budget for 2014-2020 – as much as € 180 billion – should be spent on climate change-related action. To achieve this increase, mitigation and adaptation actions are integrated into all major EU spending programmes.

Current estimates show that the EU budget annual allocation to climate action has exceeded the 20 % target in 2016 and will remain close to it over 2017-2020. It is set to deliver slightly above EUR 200 billion²²⁵.

The key developments in cross cutting funding policies include:

4.2.3.1. European Structural and Investment Funds (ESIF)

Climate change mitigation and adaptation receives significant support from ESI Funds amounting to more than EUR 114 billion of which almost half – about EUR 56 billion –

²²³ <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52016PC0482>

²²⁴ <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52016PC0479>

²²⁵ Mid-term review/revision of the multiannual financial framework 2014-2020 An EU budget focused on results. COM(2016) 603 final

comes from the European Agricultural Fund for Rural Development (EAFRD). The European Regional Development Fund (ERDF) and the Cohesion Fund also have a significant contribution of about EUR 55 billion collectively.

4.2.3.2. Horizon 2020

Horizon 2020 is the biggest EU Research and Innovation (R&I) programme ever with nearly € 80 billion of funding available over 7 years (2014 to 2020), in addition to private and national domestic investment. The EU aims to spend 35 % of the overall Horizon 2020 budget on climate relevant R&I, including physical and socio-economic sciences, Earth observations, technology research and innovation and climate policy analysis. Horizon 2020 is explained in more detail in Section 8.2.2.1 of the EU's 7NC.

The key developments in cross cutting regulatory policies include:

4.2.3.3. Energy Taxation Directive

There have been no further updates since the EU's 2BR. Please see the 2BR for details.

4.2.3.4. Covenant of Mayors for Climate and Energy

In 2015, Commissioner Miguel Arias Cañete launched the integrated Covenant of Mayors for Climate and Energy, extending the initiative to 2030 and incorporating adaptation into existing climate change and energy requirements (thus merging with the initiative Mayors Adapt). Since 2015, Covenant signatories have voluntarily pledged action to support the implementation of the EU's 40 % greenhouse gas reduction target by 2030 and have adopted a joint approach to tackling climate change mitigation and adaptation. More than 800 cities have committed to the new targets outlined since December 2015.

4.3. Sectoral policies and measures

4.3.1. Energy

4.3.1.1. Overview

The Commission adopted the Clean Energy for All Europeans Package²²⁶ on 30 November 2016 to keep the European Union competitive as the clean energy transition is changing global energy markets. In this way, the EU can lead the clean energy transition, not only adapt to it. The eight legislative proposals, which are part of the Package, aim at three main goals: putting energy efficiency first, achieving global leadership in renewable energies and providing a fair deal for consumers. These proposals also include three directives amending, respectively, the directives on energy efficiency, the Directive on the energy performance of buildings and the Directive on renewable energy. On the same day, the Commission adopted measures in relation to eco-design and energy labelling, as well as an overarching strategy on Accelerating Clean Energy Innovation²²⁷. The strategy recognises the central role played by

²²⁶ <https://ec.europa.eu/energy/en/news/commission-proposes-new-rules-consumer-centred-clean-energy-transition>; http://eur-lex.europa.eu/resource.html?uri=cellar:fa6ea15b-b7b0-11e6-9e3c-01aa75ed71a1.0001.02/DOC_1&format=PDF

²²⁷ European Commission. Accelerating Clean Energy Innovation. COM(2016)763final. 2016. <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52016DC0763>

innovation and the importance of a regulatory framework that is conducive to innovation. This strategy sets 20 different actions to boost research and innovation in clean energy solutions and to bring results to the market quickly and successfully.

More information on these policy proposals, and progress with current policies, can be found in the section below.

4.3.1.2. Promotion of renewable energy

As outlined in Section 3.2.1, the EU has renewable energy targets for 2020 (20 % share of energy) and 2030 (at least a 27 % share of energy). Every two years, the EU publishes a renewable energy progress report. The 2017 report²²⁸, published in February 2017, shows that the EU as a whole achieved a 16 % share of renewable energy in 2014 and an estimated 16.4 % share in 2015.

The vast majority of EU countries are well on track to reach their 2020 binding targets for renewable energy but the report did note that countries cannot be complacent and will have to continue their efforts on renewable energy to meet the 2020 target and to lay the foundations for achieving the 2030 target. The report also showed how the increasing levels of renewable energy was helping to drive other benefits, including:

- A € 16 billion saving in fossil fuel imports in 2015 (projected to rise to € 58 billion in 2030);
- Improvement in energy performance of buildings by reducing primary energy consumption;
- Turnover of € 144 billion in 2014 from the renewables industry;
- Job creation;
- Improved air quality.

The Commission’s proposal²²⁹ for an amended Renewable Energy Directive aims to make the EU a global leader in renewable energy. It also ensures the collective EU achievement of the 2030 renewable energy target in a cost-effective manner across the three renewable energy sectors of electricity (RES-E), heating and cooling (RES-H&C) and transport (RES-T), taking into account certain key objectives, including cost-effectiveness and addressing investment uncertainty. The specific elements of the proposal are set out below in Table 4-1.

Table 4-1 Key elements in the proposal for a revised Renewable Energy Directive

Renewable energy sector	Proposal
RES-E	<p>Introduction of design principles for Member State renewable energy support schemes, to encourage greater consistency, thus increasing investor confidence.</p> <p>A more coordinated regional approach to Member State renewable energy support schemes, to lower overall system costs and support costs by ensuring that investments are increasingly located where potential and other conditions are most</p>

²²⁸ <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52017DC0057&qid=1488449105433&from=EN>

²²⁹ http://eur-lex.europa.eu/resource.html?uri=cellar:3eb9ae57-faa6-11e6-8a35-01aa75ed71a1.0007.02/DOC_1&format=PDF

	favourable.
	A renewable-focused financial instrument, to enhance the use of funds under existing or new financial instruments to support the high ambition of Member States in deploying renewables.
	Administrative simplification, such as “one-stop-shop” and/or time-limited permitting processes.
RES-H&C	Mainstream renewables in the heating and cooling supply, by introducing a RES H&C obligation for fuel suppliers.
	Facilitate the uptake of renewable energy and waste heat in District Heating and Cooling (DHC) systems, e.g. through sharing of best practice, energy performance certificates and opening access to local H&C and an additional reinforced consumer rights framework.
RES-T	Incorporation of an obligation for advanced renewable transport fuels (including advanced biofuels), alongside a reduction of food-based biofuels.

The proposal also puts forward options to empower and inform consumers of renewable energy and to strengthen the EU sustainability framework for bioenergy. To specifically support on RES-H&C, the European Commission launched an EU heating and cooling strategy²³⁰ in February 2016. This covers the heating and cooling sector’s contribution to both renewable energy and energy efficiency targets. More information on this strategy is set out in Box 4-1 below.

Box 4-1 EU heating and cooling strategy

Heating and cooling accounts for half of the EU’s annual overall energy consumption and 68 % of all its gas imports. However, renewables only account for 18 % of energy in this sector and a large amount of energy is wasted by industry. Taking action to curb energy use and boost renewables in the heating and cooling sector would therefore have numerous benefits – reducing energy costs, helping to reduce dependence on imported fossil fuels and reducing carbon emissions, and will help with meeting both the renewable energy and energy efficiency targets for 2020 and 2030.

The strategy has a number of key elements – energy efficiency in buildings, energy efficiency guidelines for public schools and hospitals, better integration of the electricity system with district heating and cooling systems and cutting energy waste in industry.

4.3.1.3. Increase of energy efficiency

As outlined in Section 3.2.1, the EU has energy efficiency targets for 2020 (20 % improvement in energy efficiency). As regards 2030, the Commission proposed a 30 % energy efficiency target for 2030 in the Clean Energy for All Europeans Package.

Meeting the EU energy efficiency targets will not just help to lower GHG emissions, but will also have numerous other benefits, including:

²³⁰ <https://ec.europa.eu/energy/en/news/commission-launches-plans-curb-energy-use-heating-and-cooling>

- Lower demand for EU gas imports;
- Lower energy costs for people who live and work in energy efficient buildings, as well as additional benefits such as improved air quality and protection from external noise provided by energy efficient windows;
- Targeted energy efficiency measures in buildings can help households with lower incomes to improve their living conditions;
- Lower energy costs for companies, in particular energy-intensive industries;
- Less need for additional generation and grid capacities with higher energy efficiency levels;
- Boosting domestic energy efficiency investments will bring new business opportunities for European companies such as construction firms and manufacturers of energy-using or transport equipment, which is likely to have a positive impact on economic growth in Europe;
- New jobs in construction, manufacturing, research, and other industries investing in energy efficiency.

The most recent EU progress report on energy efficiency, published in 2016, found that in 2014, primary energy consumption was already only 1.6 % above its 2020 primary energy consumption target and was already 2.2 % below the 2020 final energy consumption target²³¹. On this basis, the European Commission is optimistic that the 2020 energy efficiency target will be met, provided that Member States continue to successfully implement their energy efficiency policies.

In order to ensure the 2030 target is met the Clean Energy for All Europeans Package included proposals for amending the Energy Efficiency Directive and the Energy Performance of Buildings Directive.

The main elements of the proposed revisions of the Energy Efficiency Directive (EED) are:

- Extension of the energy savings requirement to 2030 (specified in Article 7);
- Streamlining of the report requirements;
- Strengthening of the provisions relating the social requirements.

The proposal for the revised Energy Performance of Buildings Directive (EPBD) aim to:

- Incorporate the provisions on long-term renovation strategies (Article 4 of the EED) also in the EPBD, in view of obtaining a decarbonised building stock by 2050;
- Provide clearer requirements for feasibility studies before buildings are commissioned (Article 6);

²³¹ Primary energy consumption measures the total energy demand of a country, covering consumption of the energy sector itself, losses during transformation (for example, from oil or gas into electricity) and distribution of energy, and the final consumption by end users. Final energy consumption is the total energy consumed by end users, such as households, industry and agriculture.

- Streamline provisions on inspections of heating systems and air-conditioning systems (Articles 14, 15, 16), while enhancing the use of building automation and control to ensure continuous buildings' performance;
- Promote e-mobility, by boosting the installation of recharging points for electric vehicles where they are most needed, i.e. in private spaces;
- Define smart buildings, by introducing a smartness indicator that assesses the technological ability of the building to interact with the occupants and with the grid;
- Link policy and financing to results through the use of the energy performance certificates;
- Making more and better data on buildings available to market actors, through collecting actual energy consumption data and more robust Energy Performance Contracting (EPC) databases.

Alongside the above proposals, the Commission also adopted a number of measures that will improve the energy efficiency of products, in particular a new Ecodesign Working Plan for the 2016-2019. The Plan sets out the Commission's priorities for the next three years, including reviews of existing product specific measures to keep them up-to-date with new technological developments as well as new products to be studied with a view to possible regulation to reap untapped potential. Taken together, all measures identified in the Ecodesign Working Plan have a potential to deliver a total of more than 600 TWh of annual primary energy savings in 2030, which is comparable to the annual primary energy consumption of a mid-sized Member State. This will ensure that Europe maintains its global leadership with regard to product efficiency standards and continues to deliver economic and environmental benefits for consumers and businesses²³²²²³³.

Finally, the Clean Energy for All Europeans package also included revised rules for the design of the electricity market²³⁴.

A voluntary industry agreement has also been made to improve the energy consumption of games consoles within the EU²³⁵.

4.3.2. *Transport*

EU-level transport policies that can support climate action are a key element of the 2020, 2030 and 2050 GHG targets set out in Section 4.3. The 2011 White Paper on Transport put forward a goal of reducing EU transport GHG emissions by at least 60 % by 2050 relative to 1990. This target was reiterated by the EU low-emission mobility strategy, adopted in 2016, which additionally set the ambition of drastically reducing without delay the emissions of air pollutants from transport. The analytical work underpinning the strategy showed that cost-

232 Ecodesign measures include standards for heating and cooling products, solid fuel boilers, refrigerated storage cabinets, blast cabinets, condensing units and process chillers. See regulations 2016/2281, 2015/1189, 2015/1188 and 2015/1095 implementing Directive 2009/125/EC.

233 COM(2016) 860 final, pg6 see also: COM(2016) 766, COM(2016) 773; C(2016) 7764, 7765, 7767, 7769, 7770 and 7772.

234 <http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1490867812536&uri=CELEX:52016SC0410>

235 <https://ec.europa.eu/docsroom/documents/9932/attachments/1/translations/en/renditions/native>

effective CO₂ emissions reductions of 18-19 % are needed by 2030 for transport, relative to 2005²³⁶.

This is in the context of the transport sector being the only major sector in the EU where emissions are still much above their 1990 levels²³⁷, see Chapter 2 of this report.

4.3.2.1. Optimising the transport system and improving its efficiency

To optimise the transport system and improving its efficiency, the Commission has adopted a European Strategy for Low-emission mobility and an agenda for a socially fair transition towards clean, competitive and connected mobility for all. The Commission also adopted a European strategy on Cooperative Intelligent Transport Systems, a milestone towards cooperative, connected and automated mobility.

The proposed revision for EU rules on buses and coaches targets a level playing field for all operators and better travel options for consumers. The proposed revision on combined transport will promote cleaner freight transport.

4.3.2.2. Efficiency and technical standards

Section 3.4.1 of the EU's 2BR gives background on the key policies and measures that aim to improve vehicle efficiency across the EU, including the CO₂ and Cars Regulation (EC 443/2009), the CO₂ and Vans Regulation (EC 510/2011), car and tyre labelling (1999/94/EC and EC 1222/2009 respectively) and other fuel efficiency-related legislation (e.g. Regulation 661/2009 on tyre pressure monitoring systems and gear shift indicators).

Passenger car and light duty vehicle fuel efficiency: Provisional data published by the European Environment Agency showed that good progress continues to be made on fuel efficiency of new cars, with the average emissions level of a new car sold in 2016 at 118.1 grams of CO₂ per kilometre, significantly below the 2015 target of 130 g²³⁸.

The CO₂ and Cars Regulation requests the Commission to review the legislation by 2015 and if appropriate make proposals for CO₂ emission targets for new cars for the period beyond 2020, including possibly setting a 2025 target. A public consultation on the revision of the cars and vans regulations ran between July 2016 and October 2016. Issues covered included whether the regulatory approach should be extended to cover heavier (N2) vehicles, what the basis for target-setting should be whether there should continue to be a parameter in the targets that reflects vehicle utility, whether derogations for small volume and niche manufacturers should be continued, whether there should be specific incentives for low and zero emission vehicles and whether there should be flexibilities for vehicle manufacturers in meeting the targets. A summary report of responses has been published²³⁹ and more extensive analysis of the replies will be included in a future impact assessment.

The Commission has made proposals for certifying, monitoring and reporting data on fuel consumption from heavy duty vehicles

²³⁶ http://ec.europa.eu/transport/sites/transport/files/themes/strategies/doc/2011_white_paper/white-paper-illustrated-brochure_en.pdf

²³⁷ https://ec.europa.eu/clima/policies/transport/vehicles_en

²³⁸ https://ec.europa.eu/clima/news/new-cars-sold-europe-fuel-efficiency-improvements-continued-2016_en

²³⁹ https://ec.europa.eu/clima/sites/clima/files/consultations/docs/0030/summary_report_en.pdf

Car and tyre labelling: the Car Labelling Directive and the Regulation on Tyre Labelling are described in Section 3.4.1 of the EU's Second BR. A public consultation on an evaluation of the car labelling directive ran until January 2016²⁴⁰. The evaluation²⁴¹ found that the Car Labelling Directive continues to be relevant given the need to further reduce greenhouse gas emissions from road transport. However further clarification and simplification of the car labelling Directive could increase its relevance, effectiveness, efficiency, and coherence. This could involve a common methodology for labelling, specific requirements for alternatively-fuelled vehicles, increasing scope of the Car labelling Directive and including information on air pollutant emissions.

Other fuel efficiency-related legislation: There are no updates to report on Regulation 661/2009 on tyre pressure monitoring systems and gear shift indicators.

In terms of aviation technologies, Horizon 2020 the EU Research and Innovation Programme contributes to substantially lowering the environmental impact of aviation by decreasing aviation emissions from all market segments (short and long haul as well as regional and general aviation). The EU Aviation research budget within Horizon 2020 weights € 2.72 billion of investment in research and innovation projects at different Technology Readiness Levels that contribute to lowering approximately 1.5 % aviation emissions year-on-year, with advancements in lighter aerostructures, efficient propulsion systems, advancements in aerodynamics, electric aircraft systems, design, manufacturing and recycling.

4.3.2.3. Fuels from renewable energy sources

The main EU-wide policies and measures that influence GHG emissions from transport fuels are the Renewable Energy Directive (2009/28/EC) and the Fuel Quality Directive (2009/30/EC)²⁴².

The Renewable Energy Directive aims to mainstream renewable energy consumed in the transport sector (which can include biofuels (including biogas), renewable electricity or hydrogen originating from renewable sources).

As explained in Section 4.3.1.2, in November 2016, the Commission published a proposal for a revised Renewable Energy Directive. This looked at four options for increasing low-carbon and renewable energy in the transport sector:

1. EU incorporation obligation for advanced renewable fuels;
2. EU incorporation obligation for advanced renewable transport fuels (including advanced biofuels), alongside a reduction of food-based biofuels with a range of variants covering the speed and extent of reduction;
3. A dedicated EU incorporation obligation for aviation and maritime renewable fuels; and;
4. GHG emission reduction obligation (continuation of the Fuel Quality Directive).

The Commission preferred approach is option 2, since it builds on the practice of 25 Member States, which have introduced biofuel blending mandates, and provides industry with greater

240 https://ec.europa.eu/clima/clima/consultations/articles/0027_en

241 <https://ec.europa.eu/transparency/regdoc/rep/10102/2016/EN/10102-2016-270-EN-F1-1.PDF>

242 2009/30/EC, <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0088:0113:EN:PDF>

certainty about future market demand/volumes for advanced biofuels²⁴³. It will also allow for a gradual reduction of food-based biofuels, as indicated in the July 2016 Strategy on Low Emission Mobility²⁴⁴.

A description of the Fuel Quality Directive can be found in Section 3.4.2 of the EU's 2BR. The Commission has published a consultation on the implementation of various issues relating to Article 7a, which introduces a Low Carbon Fuel Standard on fuel suppliers. The consultation sought views on a methodology for calculating the life-cycle GHG intensity of fuels, other than biofuels. The Commission also carried out a pre-consultation exercise in relation to policy options for addressing indirect land use change from biofuels.

New rules came into force in 2015 which amend the current legislation on biofuels – specifically the Renewable Energy Directive and the Fuel Quality Directive - to reduce the risk of indirect land use change and to prepare the transition towards advanced biofuels.

4.3.2.4. Infrastructure

The completion of the TEN-T core network, including the nine corridors stimulates modal shift, especially through the implementation of major rail and inland waterway projects as well as through the enhancement of a multi-modal transport network. The development of the core network corridors also includes, as integral part, components such as alternative fuels infrastructure, intelligent and innovative transport systems. Thereby, it plays an indispensable role as enabler for the decarbonisation of the transport system as a whole.

Preliminary estimates show that the completion of the Core Network Corridors in accordance with the latest work plans is expected to lead to an overall reduction of CO₂ emissions of about 7 million tons between 2015 and 2030. These preliminary estimates draw on the 2016 EU Reference scenario assumptions (i.e. including policies related to infrastructure and other transport policy measures) and will be deepened in an ongoing study, the results of which will become available in 2018.

Information on the Directives on road user charges (Directives 1999/62/EC, 2006/38/EC, 2011/76/EC) and on Directive 2014/94/EU on Deployment of Alternative Fuels Infrastructure, can be found in Section 3.4.3 of the EU's 2BR.

In May 2017 the Commission made a proposal for revised rules on road user charges²⁴⁵ that aims at providing for fairer pricing, rewarding environmentally-friendly vehicles and contributing to sustainable infrastructure funding. Road-charging is a national competence. Member States are and will remain free to introduce or not road-charging on their territory. Should they decide to do so, the Commission proposes that they follow certain rules for all categories of vehicles. To reward environmental-friendly vehicles, in line with the “polluter-pays” principle, Member States should vary the level of the charge based on the CO₂ performance of vehicles.

243 http://eur-lex.europa.eu/resource.html?uri=cellar:3eb9ae57-faa6-11e6-8a35-01aa75ed71a1.0007.02/DOC_1&format=PDF

244 "A European Strategy for Low-Emission Mobility" (COM(2016) 501 final).

245 <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52017PC0275>

The Commission has adopted an Alternative Fuels Infrastructure Action Plan, including the report on the implementation of Directive 2014/94/EU, to support the deployment of an EU backbone charging infrastructure.

4.3.2.5. Other relevant policies and measures

There are a range of other relevant policies and measures that support moves at the EU level towards low-emission mobility. The proposed revision of the Clean Vehicle Directive will better promote the use of public procurement to incentivise the creation of markets for innovative and low-emitting vehicles.

Action is also being taken to support electric and hydrogen-fuelled vehicles.

The European Green Vehicles Initiative (EGVI) is a contractual Public Private Partnership launched in 2014 with an estimated budget of EUR 1.5 billion (Horizon 2020 contribution: around EUR 750 million; matching amount from industrial partners). The expected impact is to improve transport system efficiency, develop alternative powertrains and improve batteries. EGVI is included in the Horizon 2020 Smart, Green and Integrated Transport Challenge, allocating almost € 6.4 billion for the period 2014-2020.

On hydrogen for transport, an implementation plan was published in 2007 which identified key issues and priorities for accelerating deployment of portable, stationary and transport applications. This led to the formation of a Public Private Partnership - the 'Fuel Cells and Hydrogen Joint Undertaking' (JU) - between the European Commission, industry and the research community. A main aim of the JU is to enable commercial deployment by 2020. In future, the European Commission will channel support for fuel cell and hydrogen research and demonstration through the JU. For the period 2007-2013, European Commission support amounted to EUR 470 million²⁴⁶. And work is being encouraged at local level through initiatives such as The hydrogen bus demonstration projects CUTE, its successor HyFLEET:CUTE²⁴⁷, the ZERO REGIO project²⁴⁸ that is demonstrating two small fuel cell car fleets in Rhein Main and Lombardia, and the HyChain Mini-Trans project²⁴⁹ that is demonstrating around 50 innovative fuel cell vehicles of different types in four European regions.

In addition, a Strategic Transport Research and Innovation Agenda was adopted this year as part of the European Commission's Strategy for low emission mobility. The agenda outlines seven innovation roadmaps reflecting the 'state of the art' of technologies, identifying focus areas for Research and Innovation (R&I) to enable and deliver a systemic transformation of the transport system in the short term (2018-2020) and in the medium to long term (towards 2030 and up to 2050).

²⁴⁶ https://ec.europa.eu/transport/themes/urban/vehicles/road/hydrogen_en

²⁴⁷ <https://www.global-hydrogen-bus-platform.com/>

²⁴⁸ http://www.transport-research.info/sites/default/files/project/documents/20120508_141128_35179_Project%20Brochure.pdf

²⁴⁹ [http://ieahia.org/Activities/National-Projects-\(1\)/France/08-04-18-Cessa-presentation_Hychain-Minitrans_Bese.aspx](http://ieahia.org/Activities/National-Projects-(1)/France/08-04-18-Cessa-presentation_Hychain-Minitrans_Bese.aspx)

4.3.3. *Industry / industrial processes*

Greenhouse gas emissions arising from industrial processes in the mineral, chemical and metal industry are controlled as part of the EU Emissions Trading System (see section 2). Further controls on emissions are applied through other sectoral policies.

To control emissions from fluorinated greenhouse gases (F-gases), including hydrofluorocarbons (HFCs), the European Union has adopted two legislative acts: the ‘MAC Directive’ (2006/40/EC) on air conditioning systems used in small motor vehicles, and the ‘F-gas Regulation’ (No 517/2014) which covers all other key applications in which F-gases are used. These policies are estimated to lead to cumulative emission savings of 1.5 Gt CO₂eq. by 2030 and 5 Gt CO₂eq. by 2050. For the first time in 13 years of increasing emissions of F-gases, the latter have declined in 2015 compared to the previous year, a clear signal that the policy measures are effective.

The action taken by the EU and its Member States under the F-gas Regulation will enable the EU to comply with the Kigali amendment to the Montreal Protocol on a global phase-down of hydrofluorocarbons (HFCs).

Further controls on emissions from industrial activities in the EU are applied through the Industrial Emissions Directive 2010/75/EU (IED). The IED regulated greenhouse gases (CO₂, CH₄, N₂O, fluorinated gases) to the extent they are not covered by the ETS or where this would be necessary to prevent significant local pollution, and by regulating indirect greenhouse gases such as NO_x and SO_x and short-lived climate forcers such as black carbon. Furthermore, the IED promotes energy efficiency and makes fuel switching more attractive. Further details on the IED are provided in Section 3.5.3 of the EU’s 2BR.

4.3.4. *Agriculture*

Agricultural activities can result in methane emissions from livestock digestion processes and storage of animal manure and the use of organic and mineral nitrogen fertilisers can lead to nitrous oxide emissions. On the other hand, products of agricultural activities can be a renewable energy source and can contribute to CO₂ savings. These are allocated to the energy sector (see Section 4.3.1 for more details).

A study was made in January 2015 titled “An economic assessment of GHG mitigation policy options for EU agriculture (EcAMPA)”²⁵⁰. This gave an overview of the historical and projected development of agricultural GHG emissions in the EU, as well as a quantitative assessment of illustrative GHG mitigation policy options in the agricultural sector, and their production and economic implications. Importantly this showed that implementing mitigation options in the agriculture sector in a more flexible manner could minimise effects on agricultural production. This was followed up by a further study in 2016 (EcAMPA 2²⁵¹), which assessed the possible inclusion of the agriculture sector in the EU 2030 Climate and Energy Framework. The study found that without further policy action, agricultural GHG emissions in the EU-28 are projected to decrease by 2.3 % by 2030 compared to 2005. It also found that potential adverse effects on EU agricultural production and emission leakage are

250 http://publications.jrc.ec.europa.eu/repository/bitstream/JRC93434/jrc90788_ecampa_final.pdf

251 http://publications.jrc.ec.europa.eu/repository/bitstream/JRC101396/jrc101396_ecampa2_final_report.pdf

significantly reduced if subsidies are paid for the application of technological emission mitigation options. However, this comes along with considerable budgetary costs, as farmers are projected to widely adopt the technologies.

4.3.4.1. Common Agricultural Policy

Section 3.6.1 of the EU's 2BR describes the key elements of the Common Agricultural Policy and how these relate to climate action.

Implementation of the new Common Agricultural Policy (CAP) regulations started only in 2015 (with 2014 being a transitional year). For direct payments, implementation choices by Member States were finalised and notified to the European Commission during 2014, with the rules coming into force on 1 January 2015. An initial analysis of implementation choices taken by Member States suggests that in most cases the choices made are relevant to the GHG emission reduction/ climate needs and priorities identified. Contribution to climate action will be achieved through the combined effects of a number of different CAP measures, encompassing cross-compliance The 'Fuel Cells and Hydrogen Joint Undertaking' standards, direct payments under the EAGF and rural development policy under the European Agricultural Fund for Rural Development (EAFRD) and accompanied by support from the Farm Advisory Service, and the activities of the European Innovation Partnership for Agriculture and the national Operational Groups.

In relation to direct payments, the 'greening' rules within CAP mean that 30 % of the payments going directly to farmers are linked to improving the environmental performance, for example to adopt practices beneficial for the climate. Some 30 % of rural development funds are also aimed at specific regional environmental priorities. In 2015, € 13.6bn of the committed allocations under the CAP budget were climate relevant; this value rose to € 18.7bn in 2016.

4.3.5. Forestry / LULUCF

For background on the land use, land use change and forestry (LULUCF) policy framework, see Section 3.7 of the EU's 2BR.

In July 2016 the European Commission presented a legislative proposal to integrate greenhouse gas emissions and removals from LULUCF into the 2030 climate and energy framework²⁵². The proposal follows the agreement with EU leaders in October 2014 that all sectors should contribute to the EU's 2030 emission reduction target, including the land use sector. It is also in line with the Paris Agreement, which points out to the critical role of the land use sector in reaching our long-term climate mitigation objectives. The proposal sets a binding commitment for each Member State to ensure that accounted emissions from land use are entirely compensated by an equivalent removal of CO₂ from the atmosphere through action in the sector, this being known as the "no debit rule." Member States already include accounted emissions and removals from land use, with similar rules, under the Kyoto Protocol up to 2020; the proposal extends this for the period 2021-2030.

²⁵² <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52016PC0479>

Forest management is the main source of biomass for energy and wood production and hence has a pivotal role to play in EU renewable energy policy. The proposal calls for emissions of biomass used in energy to be recorded and counted towards each Member State's 2030 climate commitments, meaning that emissions from biomass in energy production will be accounted for under EU law.

The proposal simplifies and upgrades the current LULUCF accounting methodology under the Kyoto Protocol, and establishes a new EU governance process for monitoring how Member States calculate emissions and removals from actions in their forests and agricultural land use. It also introduces flexibilities so that a Member State that has net emissions from land use and forestry can use allocations from the Effort Sharing Regulation to satisfy its "no debit" commitment, and a Member State that has net removals can use the corresponding credits for compliance under the Effort Sharing Regulation (with some limitations).

4.3.6. *Waste management / waste*

Policies and measures relating to solid waste disposal, biological treatment of waste, waste incineration and open burning of waste, as well as wastewater treatment and discharge, are climate relevant. Important GHGs in this sector are methane (CH₄), which mainly arises from the treatment and disposal of solid waste, and nitrous oxide (N₂O) originating from waste water. In addition, a substitution of primary raw materials by secondary raw materials coming from recycling allow for significant GHG savings due to lower demand for energy needed to extract raw materials and turn them into products.

4.3.6.1. Circular economy

The circular economy will boost the EU's competitiveness by protecting businesses against scarcity of resources and volatile prices, helping to create new business opportunities and innovative, more efficient ways of producing and consuming. It will create local jobs at all skills levels and opportunities for social integration and cohesion. At the same time, it will save energy and help avoid the irreversible damages caused by using up resources at a rate that exceeds the Earth's capacity to renew them in terms of climate and biodiversity, air, soil and water pollution.

The EU's Circular Economy Action Package²⁵³ was adopted in December 2015. It puts forward a number of actions and commitments, with clear timetables, for all phases of the circular economy, including production (product design and production processes), consumption, waste management, and for boosting the market for secondary raw materials and water reuse. The strategy set out a number of priority issues, including plastics, food waste, critical raw materials, construction and demolition, biomass and bio-based products, innovation and investment and monitoring progress.

At the same time, the Commission also published revised legislative proposals. The key elements of these proposals are set out below and feature in a number of different proposals covering the Directive on Waste, the Directive on Packaging Waste, the Landfill Directive and Directives on End-of-Life Vehicles, on Batteries and Accumulators and Waste Batteries and Accumulators, and on Waste Electrical and Electronic Equipment.

²⁵³ http://eur-lex.europa.eu/resource.html?uri=cellar:8a8ef5e8-99a0-11e5-b3b7-01aa75ed71a1.0012.02/DOC_1&format=PDF

- A common EU target for recycling 65 % of municipal waste by 2030;
- A common EU target for recycling 75 % of packaging waste by 2030;
- A binding landfill target to reduce landfill to maximum of 10 % of municipal waste by 2030;
- A ban on landfilling of separately collected waste;
- Promotion of economic instruments to discourage landfilling;
- Simplified and improved definitions and harmonised calculation methods for recycling rates throughout the EU;
- Concrete measures to promote re-use and stimulate industrial symbiosis - turning one industry's by-product into another industry's raw material;
- Economic incentives for producers to put greener products on the market and support recovery and recycling schemes (e.g. for packaging, batteries, electric and electronic equipment, vehicles).

In January 2017, the Commission published a report on implementation of the Circular Economy Action Package²⁵⁴. The report provides an overview of the action taken to develop the circular economy in the EU since December 2015 when it was adopted. Key deliverables included:

- A legislative proposal on online sales of goods (December 2015);
- A legislative proposal on fertilisers (March 2016);
- Launch of the Innovation Deals for a circular economy (May 2016);
- An Ecodesign Working Plan 2016-2019 as part of the Clean Energy for All Europeans package (November 2016);
- Establishment of the EU Platform on Food Losses and Food Waste (August 2016);
- A Communication on waste-to-energy processes and their role in the circular economy (January 2017);
- A proposal to amend the Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment (January 2017);
- The launch of a platform to support the financing of circular economy (January 2017).

4.3.6.2. Waste to landfill

Where waste needs to be landfilled, it must be sent to landfills which comply with the requirements of Directive 1999/31/EC on the landfill of waste. As outlined above, one of the proposals published alongside the Circular Economy Action Package was a proposal to amend the Landfill Directive²⁵⁵. The proposal includes a gradual limitation of the landfilling of municipal waste to 10 % by 2030. It also promoted the use of economic instruments to

²⁵⁴ http://ec.europa.eu/environment/circular-economy/implementation_report.pdf

²⁵⁵ <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52015PC0594&from=EN>

discourage landfilling, for example landfill charges or pay-as-you-throw schemes. The legislative proposals set out provisions to promote greater use of economic instruments.

4.3.6.3. Management of biodegradable waste

Management of biodegradable waste is mainly done through three EU directives – the Landfill Directive (see above), the Waste Framework Directive²⁵⁶ (provides for a general framework of waste management requirements and sets the basic waste management definitions for the EU) and the Industrial Emissions Directive²⁵⁷, which is the main EU instrument regulating pollutant emissions from industrial installations.

4.3.6.4. EU policies targeting waste streams

This section groups together various different policies which target other specific waste streams.

Plastics: An amendment made to the Packaging and Packaging Waste Directive²⁵⁸ in April 2015 requires EU Member States to either reduce annual average consumption of lightweight plastic bags per citizen, or to ban the giving out of free bags.

Addressing plastic waste is a key component of the Circular Economy Action Package. It proposes raising the recycling target for plastic packaging to 55 %, and reducing landfilling to no more than 10 % by 2030. In January 2017, the Commission published the roadmap of the Communication on Plastics in a Circular Economy²⁵⁹ (including action on marine litter). A new dedicated plastics strategy is now being prepared, to help Europe improve recycling, cut marine litter, and remove potentially dangerous chemicals.

Electrical and Electronic Equipment: Section 3.8.4 of the EU's 2BR describes the Directive on Waste of Electrical and Electronic Equipment²⁶⁰, with the new WEEE Directive 2012/19/EU becoming effective in February 2014.

In February 2017, the Commission published proposals²⁶¹ for further revisions to the WEEE Directive, as well as to Directive 2006/66/EC on batteries and accumulators and waste batteries and accumulators²⁶², amending, improving and simplifying the reporting process for Member States.

End-of life vehicles: Dealing with waste streams from motor vehicles is governed at the EU level by the End-of-Life Vehicles (ELV) Directive 2000/53/EC²⁶³, which aims to increase re-use, recycling and other forms of recovery of end-of-life vehicles and their components, and

256 <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008L0098&from=EN>

257 <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32010L0075&from=EN>

258 <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32015L0720&from=EN>

259 http://ec.europa.eu/smart-regulation/roadmaps/docs/plan_2016_39_plastic_strategy_en.pdf

260 <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32012L0019&from=EN>

261 <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52015PC0593&from=EN>

262 <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02006L0066-20131230&rid=1>

263 <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02000L0053-20130611&qid=1405610569066&from=EN>

the Motor Vehicles Directive 2005/64/EC²⁶⁴, which sets targets for re-use, recycling and other forms of recovery of end-of-life vehicles and their components.

The proposal mentioned above that addressed the WEEE Directive and batteries also covered the ELV Directive, again amending, improving and simplifying the reporting process for Member States.

4.3.6.5. Reduction of GHG Emissions from Urban Waste Water Treatment

Information on the Urban Waste Water Directive 91/271/EEC²⁶⁵ can be found in Section 3.8.5 of the EU's 2BR. In March 2016, the eighth implementation report²⁶⁶ was published by the Commission which showed high compliance rates in the EU-15, and that the implementation of the Directive has significantly reduced organic and nutrient pollution load discharges in the EU. That said, some gaps in compliance were found, in particular on treatment. It concludes that reinforced action and investments are needed to reach full compliance within reasonable time delays.

4.4. Assessment of the economic and social consequences of response measures

To ensure that all relevant possible impacts are taken into account, the EU has established processes that assess the economic and social consequences of climate policy measures.

For the development of new policy initiatives through legislative proposals by the European Commission, an impact assessment system has been established in which all proposals are examined before any legislation is passed. It is based on an integrated approach which analyses both benefits and costs, and addresses all significant economic, social and environmental impacts of possible new initiatives (for details please refer to Section 4.10 of the EU 1BR as well as Chapter 15 of the EU National Inventory Report 2017).

Beyond this internal impact assessment system, procedures for assessing the impacts of EU (climate change) policies on external countries have also been established. Even though there is no explicit dialogue on response measures, the impacts of policy measures implemented by the EU are naturally being discussed within the framework of bilateral and regional cooperation. Such processes are included in various EU cooperation policies and agreements with third countries on a sectoral level, such as for trade agreements, as well as on an overarching political level in regional cooperation with Africa, Asia and Latin America as well as in bilateral relations. This way, it is ensured that the effects of such policies on non-EU countries are taken into account.

The free Trade Agreements that have been concluded between the EU and third countries provide pertinent examples. For instance, the Deep and Comprehensive Free Trade Area (DCFTA) signed between the EU and Ukraine on 27 June 2014, which came into force on 1 September 2017, sets out various processes which enable concerned stakeholders to get in contact with the EU on potential impacts of policies and regulations under the Trade Agreement.²⁶⁷ These include provisions that allow interested parties to comment on proposed

²⁶⁴ <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32005L0064&from=EN>

²⁶⁵ <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31991L0271&from=EN>

²⁶⁶ http://ec.europa.eu/environment/water/water-urbanwaste/implementation/implementationreports_en.htm

²⁶⁷ For more information see <http://ec.europa.eu/trade/policy/countries-and-regions/countries/ukraine/>.

regulations under the agreement. Furthermore, enquiry or contact points are established to respond to questions arising from the application of regulations included in the agreement. Negotiations of similar agreements are taking place between the EU and Morocco, Tunisia and Jordan, among others.

Furthermore, dialogues on impacts of EU policies on third countries take place in the context of the European Neighbourhood Policy (ENP). As the basis for cooperation between the EU and a neighbouring country an Association Agreement is negotiated bilaterally between the two partners. In such an agreement, specific political priorities are set for the country concerned. Following the agreement, actions plans are negotiated between the EU and the respective neighbouring country which include priority areas for cooperation and a specific focus of action for each of these areas for three to five years. In the negotiations of an action plan, the country is able to raise specific issues of concern with the EU. Additionally, in technical discussions within sub-committees established through the Association Agreement (particularly on energy, transport and the environment), targeted exchanges on policy issues and directions for future cooperation at bilateral level take place. Partner countries can ask questions about planned EU initiatives and legislatives at such meetings to technical experts.²⁶⁸

The EU is also supporting third countries to effectively implement the Paris Agreement in a manner that unlocks socio-economic opportunities and supports climate objectives, by providing capacity building for partner countries across all regions. For examples, the Africa LEDS project is supporting Low Emissions Development in nine African countries in the context of socio-economic development priorities as stipulated in countries' development visions and strategies. One of the two components of the project focuses on technical capacity building for a strong analytical framework, including modelling, for long-term policy decision making.

²⁶⁸ For further information on the ENP see <http://eeas.europa.eu/enp/>.

5. PROJECTIONS

- The GHG projections prepared by EU Member States and aggregated at EU-level (which take into account the implementation of the 2020 Climate and Energy Package) show that the EU-28 is on track to achieve its 2020 target. Under the "With Existing Measures" (WEM) scenario, total GHG emissions (including international aviation, excluding LULUCF) are projected to be 26.2 % lower in 2020 than in 1990 and 30.2 % lower in 2030 compared to 1990.
- Under the "With Additional Measures" (WAM) scenario, as reported by Member States, the projected GHG emissions compared to 1990 would decrease by 26.8 % in 2020, and 32.2 % in 2030.
- The most significant sectoral contribution in absolute GHG emission reductions in the EU-28 WEM scenario from 1990 to 2020 is projected to stem from the energy sector (without transport) where emissions are projected to decrease by 36.5 % compared to 1990 in 2020 and by 41.8 % up to 2030 under the WEM, and 37.1 % in 2020 and 44.0 % in 2030 under the WAM scenario. The energy sector is followed by agriculture, industry and the waste sector.
- The transport sector is the only sector where emissions would still be higher by 2030 relative to 1990, due to high emissions growth during the '90s. Under the WEM scenario GHG emissions from the transport sector are projected to be 13.8 % higher than 1990 levels in 2020 and 13.4 % higher in 2030, under the WAM scenario 12.7 % higher in 2020 and 9.9 % higher in 2030.
- Reductions in CO₂ emissions are expected to contribute most to overall emission reductions in the EU-28. Throughout the two scenarios and the timeline from 2020-2025, CO₂ contributes between 85-90 % to total emissions, followed by N₂O with roughly 4-8 % and CH₄ with roughly 4-6 %.

5.1. Projections of EU GHG emissions

5.1.1. Summary

Figure 5-1 presents total aggregate GHG emission trends and the With Existing Measures (WEM) projection for EU-28 (including international aviation, excluding LULUCF). The figure includes historical values (solid lines) and projected values (dotted line). In the WEM scenario, total EU-28 GHG in 2020 are projected to be 26.2 % below 1990 GHG emissions in 2020 and 30.2 % in 2030. Considering also planned measures (With Additional Measures – WAM - scenario), GHG emission are projected to be 26.8 % below 1990 levels in 2020 and 32.2 % below 1990 levels in 2030.

Figure 5-1 Total, aggregate, absolute historic and projected EU-28 GHG emissions

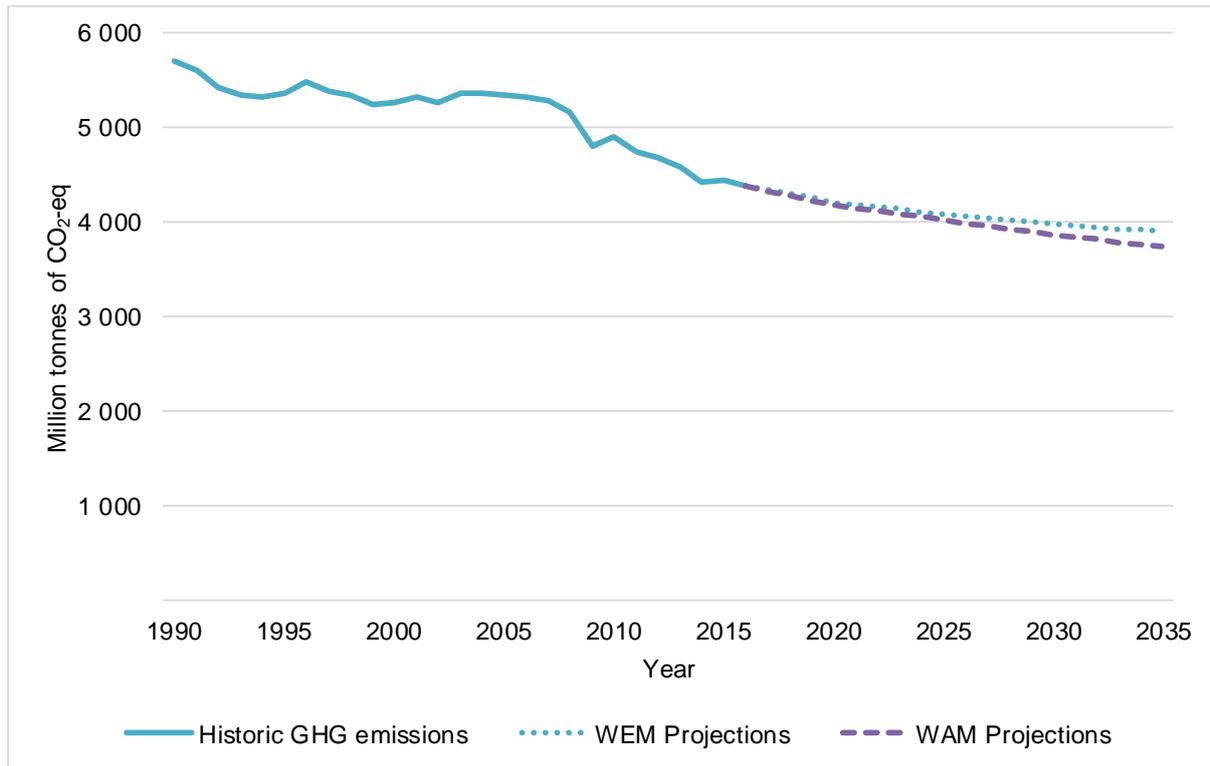


Table 5-1 summarises historical and projected greenhouse gas emissions as totals, by sector and by gas for the WEM and WAM scenario.

Aviation emissions between the EU and three countries not belonging to the EU (Norway, Iceland and Liechtenstein) are included under the EU ETS, though some of these flights are considered international aviation in terms of GHG accounting rules. The UNFCCC reporting guidelines for national GHG inventories requires that Parties present the contribution of emissions from international aviation separately. EU-28 emissions from all international aviation activities are included separately; a further split to deduct the ETS countries is however not possible. This would require high effort (and thus costs) while achieving a very limited increase in accuracy.

Table 5-1 Historical greenhouse gas emissions and greenhouse gas emission projections in the ‘with existing measures’ scenario

	1990	1995	2000	2005	2010	2015	2020	2025	2030	2035
Historical emissions (Mt CO₂equivalent)										
Total GHG emissions (excluding LULUCF; indirect CO ₂ . Including international aviation.)	5 712	5 378	5 268	5 343	4 908	4 450				
By sector										
Energy	3 555	3 233	3 087	3 138	2 859	2 452				
Transport	782	837	918	971	931	906				
Industrial processes and product use	517	497	452	460	390	374				
Agriculture	548	478	464	440	426	437				
Waste management/waste	241	245	231	203	170	139				
By gas										
CO ₂ emissions excluding net CO ₂ from LULUCF	4 526	4 285	4 277	4 421	4 062	3 639				
CH ₄ emissions excluding CH ₄ from LULUCF	728	663	606	547	492	456				
N ₂ O emissions excluding N ₂ O from LULUCF	386	348	306	286	240	237				
HFCs	35	49	55	74	103	108				
PFCs	26	17	12	7	4	4				
SF ₆	11	15	11	8	6	6				
Other (NF ₃)	0.0	0.1	0.1	0.2	0.1	0.1				
Memo items										
<i>Memo item: international aviation</i>	69	86	116	132	132	142				
<i>Memo item: international navigation</i>	110	111	135	161	159	135				
With Existing Measures' scenario (Mt CO₂ equivalent)										
Total GHG emissions (excluding LULUCF; indirect CO ₂ . Including							4 213	4 089	3 988	3 901

	1990	1995	2000	2005	2010	2015	2020	2025	2030	2035
international aviation.)										
By sector										
Energy							2 256	2 163	2 069	1 984
Transport							890	882	886	889
Industrial processes and product use							373	353	340	336
Agriculture							431	431	431	430
Waste management/waste							118	106	99	91
By gas										
CO ₂ emissions excluding CO ₂ from LULUCF							3 463	3 374	3 299	3 231
CH ₄ emissions excluding net CH ₄ from LULUCF							418	405	395	386
N ₂ O emissions excluding N ₂ O from LULUCF							231	232	233	233
HFCs							91	69	54	45
PFCs							3	3	3	3
SF ₆							7	5	4	4
Other (NF ₃)							0.1	0.1	0.1	0.1
Memo items										
<i>Memo item: international aviation</i>							145	154	163	171
<i>Memo item: international navigation</i>							171	181	190	199
With Additional Measures' scenario (Mt CO₂ equivalent)										
Total GHG emissions (excluding LULUCF; indirect CO ₂ . Including international aviation.)							4 179	4 020	3 872	3 741
By sector										
Energy							2 236	2 119	1 990	1 875
Transport							881	866	859	849
Industrial processes and product use							372	350	337	334

	1990	1995	2000	2005	2010	2015	2020	2025	2030	2035
Agriculture							428	427	425	424
Waste management/waste							117	104	96	88
By gas										
CO ₂ emissions excluding CO ₂ from LULUCF							3 435	3 315	3 193	3 083
CH ₄ emissions excluding net CH ₄ from LULUCF							415	402	390	379
N ₂ O emissions excluding N ₂ O from LULUCF							228	229	229	229
HFCs							90	66	53	44
PFCs							3	3	3	3
SF ₆							7	5	4	4
Other (NF ₃)							0.1	0.1	0.1	0.1
Memo items										
<i>Memo item: international aviation</i>							146	155	163	171
<i>Memo item: international navigation</i>							151	159	167	174

Notes

1. The EU's greenhouse gas projection is the result of an aggregation of Member States individual GHG projections. Member States had to submit these projections under the MMR in March 2015.
2. The preparation of the projections takes considerable time. It is therefore likely that the F-Gas Regulation which was adopted in 2014 could not be considered within individual greenhouse gas projections. Therefore its anticipated effects are not completely reflected in the EU's greenhouse gas projection.

5.1.2. *Total aggregate GHG emission projections per sector*

From a sectoral perspective, Figure 5-2 shows that the largest share of GHG emission reductions are from the energy sector. The emissions from the energy sector shown in Figure 5-2 do not include emissions from the transport sector. The energy sector also contributes the most to aggregate GHG emissions. The transport sector makes the second largest contribution to aggregate GHG emissions, followed by agriculture, industrial processes and product use (IPPU) and waste. This is the same for both WEM and WAM.

Energy sector (without transport) emissions are projected to decrease by 36.5 % compared to 1990 in 2020 and by 41.8 % up to 2030 under the WEM, and 37.1 % in 2020 and 44.0 % in 2030 under the WAM scenario. In general, EU-28 GHG emissions from the energy sector show a gradual downward trend from 1990 to the present day, with a short and steep decrease during the financial crisis (2008-2009), after which they increased again somewhat and then continue with the downward trend also in projections. These decreases can be explained by a variety of factors but are mainly due to increased use of renewables, fuel switching to gas (which also has reduced fugitive CH₄ emissions from coal mining), increased energy and technical efficiency and decreases in fuel combustion in manufacturing industries. In the Eastern Member States, construction and restructuring of industry have also played a role in reducing emissions. However, such reductions have been counteracted by increased housing stock and growth in the services sector, resulting in increased demand for energy services in buildings and homes, and in particular, strong growth in demand for electricity to provide these. Recent economic growth in the Eastern Member States is reflected in increased demand for energy services. Projections for the sector anticipate that emissions from energy will further decrease due to the effects of existing policies and measures.

The only sector which is projected to exhibit 2020 GHG emissions larger than 1990 is the transport sector. After 2007 a slow but steady decline in transport emissions is visible, due to a combination of higher fuel prices and more stringent policies, such as stricter CO₂ emission standards for cars and vans. Under the WEM scenario GHG emissions from the transport sector²⁶⁹ are projected to be 13.8 % higher than 1990 levels in 2020 and 13.4 % higher in 2030, under the WAM scenario 12.7 % higher in 2020 and 9.9 % higher in 2030.

Process and product related GHG emissions from the industry sector are projected to decrease by approximately 27.8 % in 2020 compared to 1990, and decrease by 34.3 % by 2030 under the WEM scenario. Under the WAM scenario this would be 28.0 % in 2020 and 34.7 % in 2030.

GHG emissions are projected to steadily decline in the agriculture sector. Compared to 1990, emissions in 2020 are projected to have declined by 21.3 % in 2020 and by 21.5 % in 2030 under the WEM scenario, by 22.0 % in 2020 and 22.4 % in 2030 under the WAM scenario. Changes in agricultural policy and farming subsidies as well as increased productivity have driven reduced animal numbers, reduced nitrogen fertiliser production and use and improved manure management resulting in reduced emissions from agricultural soils and livestock.

²⁶⁹ The transport sector as reported here does not include international aviation. According to the IPCC 2006 Guidelines for national GHG inventories, international aviation is to be reported as memo item. We therefore present the GHG emission development in the international aviation sector individually further below.i

GHG emissions are projected to steadily decline in the waste sector. Compared to 1990, emissions in 2020 are projected to have declined by 51.2 % and declined by 58.9 % in 2030 under the WEM scenario and by 51.4 % in 2020 and 60.0 % in 2030 under the WAM scenario. Past and future emission decreases can largely be attributed to successful waste legislation. Examples of this include increased recycling, bans on landfilling, landfill taxes and methane recovery from treated wastewater and landfill. In particular, the Landfill Directive (see Section 4.8.3) has established objectives for the progressive reduction of biodegradable waste to landfill by 25 % within five years of Member State implementation of the Directive, by 50 % within eight years, and by 65 % within fifteen years, compared to 1995 levels.

Emissions from international aviation are projected to continue to increase, reaching 109.7 % above 1990 levels by 2020, and 135.1 % above 1990 levels by 2030 under the WEM scenario and 110.2 % in 2020 and 135.6 % in 2030 under the WAM scenario.

Emissions from international shipping are projected to increase as well, however far less steeply than for international aviation. In 2020 levels are projected to 55.0 % above 1990 levels, and in 2030 72.1 % above 1990 levels under the WEM scenario. Under the WAM scenario emission levels are projected to be 37.0 % above 1990 levels in 2020 and 51.2 % in 2030.

Figure 5-2 EU-28 GHG emissions per sector in the WEM scenario

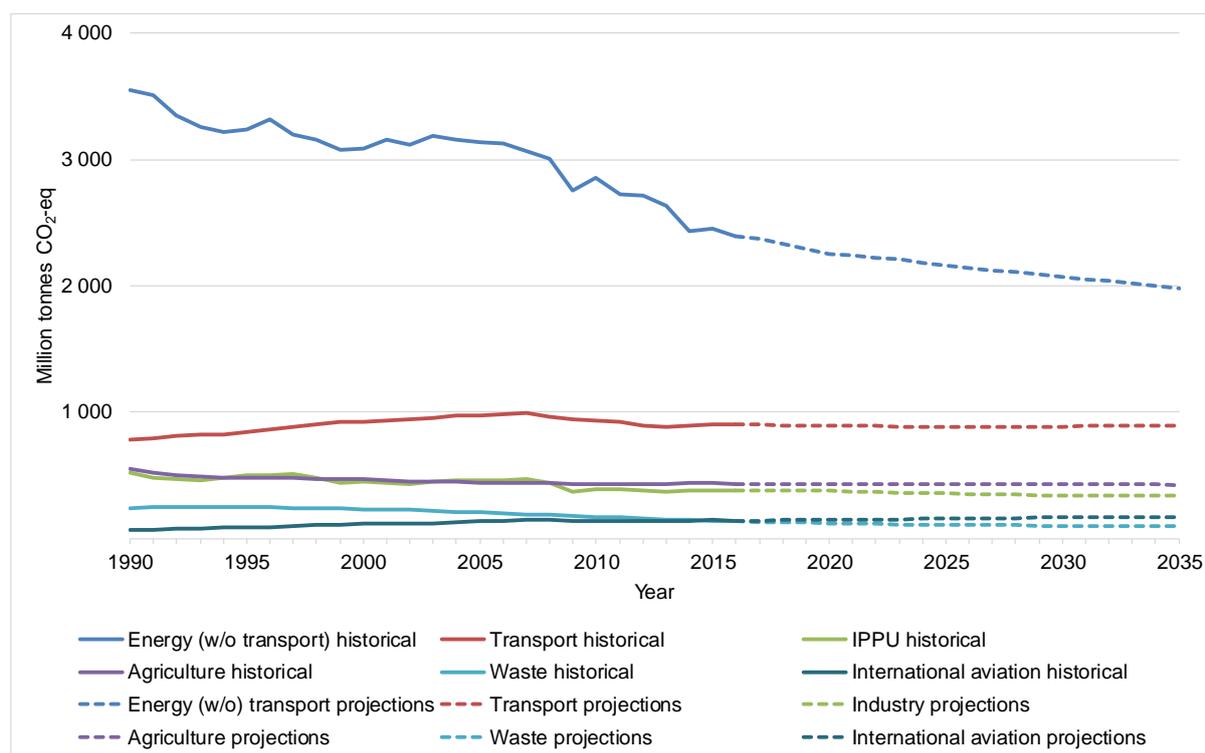
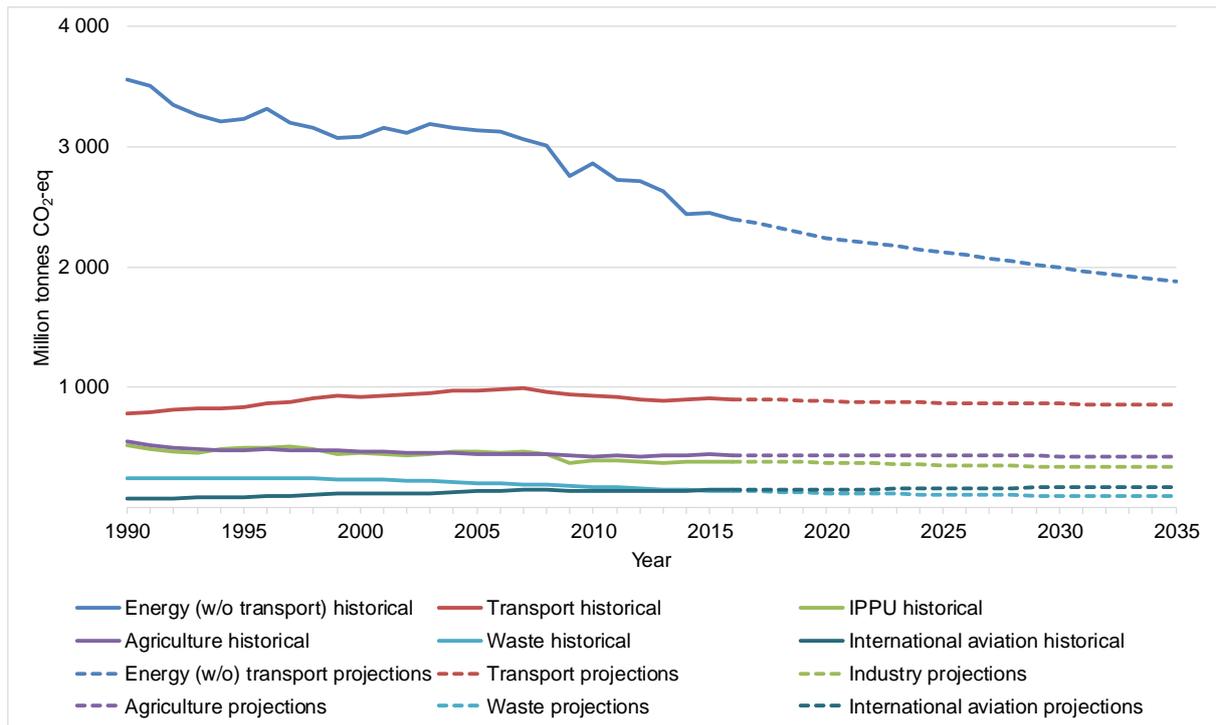


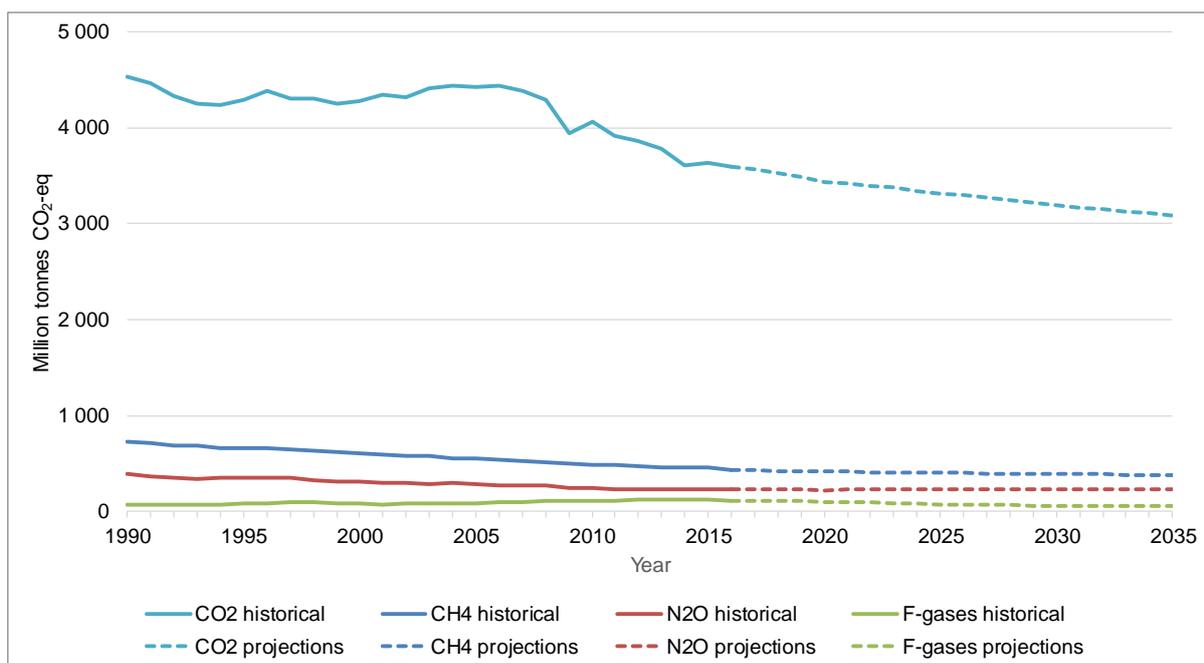
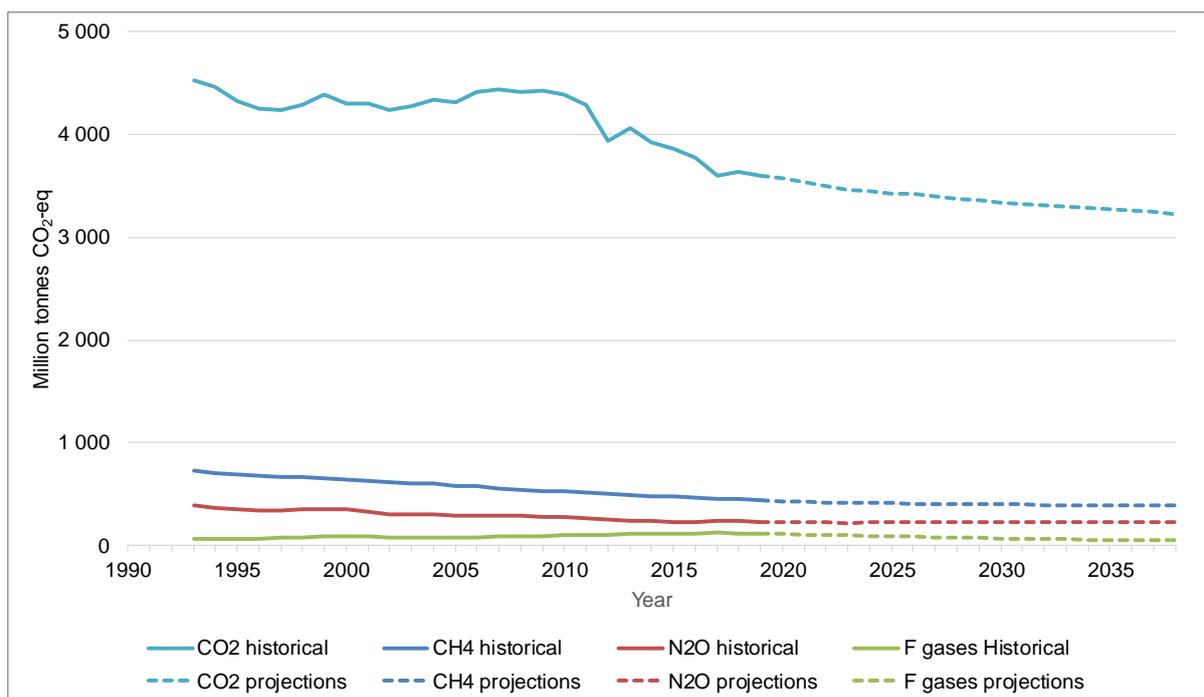
Figure 5-3 EU-28 GHG emissions per sector in the WAM scenario



5.1.3. *Total aggregate GHG emission projections per gas*

Figure 5-4 below illustrates the expected change in emissions from individual greenhouse gases between 1990 and 2030 under the WEM scenario. F-gases are presented as a group, the development for individual F-gases is presented in Table 5-1 above.

Figure 5-4 EU-28 GHG emissions per gas in the WEM and WAM scenario



The major contributor to current GHG emissions in the EU-28 is CO₂ with around 82.2 % of total emissions in 2020 under the WEM scenario, followed by emissions of CH₄ with 9.9 %, N₂O with 5.5 % and F-gases 2.4 % for the same year and scenario. These shares remain roughly the same over the timeline in both the WEM and WAM scenario.

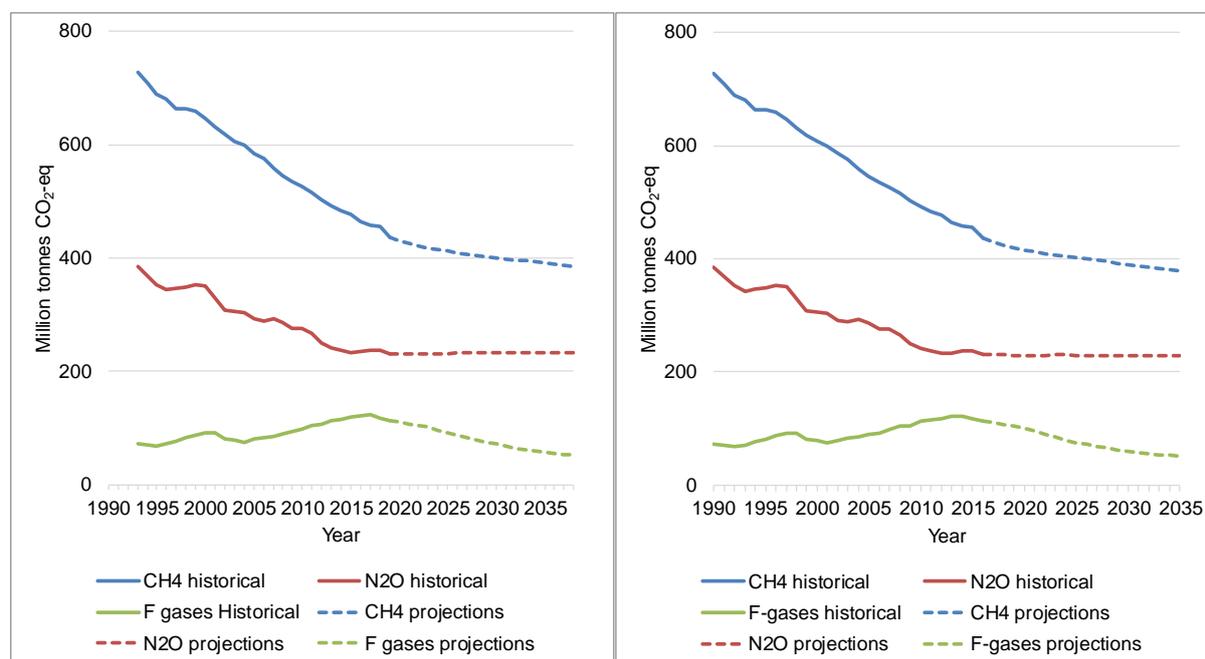
CO₂ emissions are projected to decline by approximately 23.5 % compared to 1990 in 2020 and by about 27.1 % by 2030 under the WEM scenario and by approximately 24.1 % compared to 1990 in 2020 and by about 29.5 % by 2030 under the WAM scenario.

Emissions of CH₄ steadily declined in the past and are projected to do so in the future, although at a slightly slower pace. Emissions will be 42.7 % below 1990 in 2020 and 45.8 % in 2030 under the WEM scenario and 43.0 % below 1990 in 2020 and 46.4 % in 2030 under the WAM scenario.

Emissions of N₂O are projected to stabilise with an indication of a very slight increase by 2030. Emissions will be 40.1 % above below 1990 in 2020 and 39,5 % in 2030 under the WEM scenario and 40.8 % below 1990 in 2020 and 40.5 % in 2030 under the WAM scenario.

F-gas emissions have been steadily rising between 2000-2014, driven mainly by the use of HFCs in refrigeration and air conditioning. However, the projections indicate F-gas emissions will steadily decrease up to 2030 due to the implementation of EU F-Gas legislation, achieving a level of 41.2 % above 1990 levels under the WEM scenario in 2020 and a level of 14.9 % under the same scenario in 2030. For the WAM scenario emissions fall only slightly quicker with 40.5 % above 1990 levels in 2020 and 17.0 % below 1990 levels in 2030. The contributions of the various F-gases to these overall developments differ. As contribution of F-gases to the 2020 EU GHG emission total is relatively small at 2.4 % in 2020 under the WAM scenario and the contribution is projected to remain roughly at this level over time in both scenarios, the projected decline in F-gas emissions will have only a small effect on the projected decline in total GHG emissions at EU level.

Figure 5-5 EU-28 GHG emissions per gas in the WEM and WAM scenario – CH₄, N₂O and F-gases only



5.2. **Supplementarity**

As an additional means of meeting commitments under the Kyoto Protocol (KP), Parties may use three market-based mechanisms to lower the overall costs of achieving emission targets for the commitment period: project-based mechanisms in industrialised countries (Joint Implementation - JI); the Clean Development Mechanism (CDM) in developing countries; and international emissions trading IET, which allows countries that have achieved emission reductions beyond those required by the KP to sell their surplus Kyoto units to countries finding it more difficult or expensive to meet their commitments. Use of these mechanisms must be 'supplemental to domestic action' to achieve KP targets. The three mechanisms are often referred to as flexible mechanisms.

For the EU-28 the maximum use of flexible mechanisms in the framework of the two most important cross-sector measures, the Emission Trading Scheme (ETS) and Effort Sharing Decision (ESD) is described in Section 2.2.2.3.

As the chapter on projections only focuses on the development of GHG emissions until 2030, the question of supplementarity cannot be raised for this time horizon as no targets are finally defined and no final decisions are taken with regard to the (supplementary) use of Kyoto mechanisms.

5.3. **Methodology**

5.3.1. *Compilation of the EU projections*

The projections of GHG emissions for EU-28 are based on individual national projections of Member States' submissions to the European Commission under Regulation 525/2013/EU in 2015. The EEA's European Topic Centre on Air Pollution and Climate Change Mitigation (ETC/ACM) has compiled the national projections and applied QA/QC procedures to ensure consistency of the data reported by Member States (see Section 5.3.4). The reported scenario is documented in Section 5.1. The following points apply to the projections:

- Projections unless otherwise noted are reported excluding governmental use of Kyoto mechanisms and carbon sinks;
- The sector breakdown reported follows the structure of the CTF tables and includes: Energy (without transport), transport, industry/industrial processes and product use, Agriculture, Forestry and Other Land Use (AFOLU) (without FOLU), and waste;
- The gases which are covered are: CH₄ emissions excluding FOLU, CO₂ emissions excluding FOLU, N₂O emissions excluding FOLU, and total F-Gases;
- Figures represent historic GHG emissions up to 2014, projections are represented starting 2015.

5.3.2. *Projection methodology*

Information presented in Section 5.1 for the EU-28 is derived through an aggregation of individual Member State projections. Detailed descriptions of the methodologies used to generate individual Member State projections, further information on their sensitivity

analyses and their key parameters and assumptions are presented in individual Member State Biennial Reports. The EU-28 GHG projection has been aggregated using Member States' submissions to the European Commission under Regulation 525/2013/EU in 2015.

5.3.3. *Key parameters and assumptions*

The key parameter assumptions of individual Member States are documented in their national projection methodologies, and reported in their biennial reports. Where appropriate, the information has been aggregated to create information for the EU-28. To improve the consistency of Member State projections, the Commission provided Member States with recommended values for the evolution of the EU ETS CO₂ price, and, for international fuel import prices.²⁷⁰ It also provided default values for GDP growth rates and population. The use of these parameters and assumptions by EU Member States is voluntary. These values as well as weighted averages of the assumptions used by the EU Member States are presented and compared in section 5.3.8.

5.3.4. *QA/QC procedure*

The QA/QC procedures applied to the projections data follow a clear and thorough EU QA/QC procedure. These procedures follow the core IPCC principles of QA/QC that apply to historical inventories. The procedures are required under Regulation (EU) No 525/2013 and are set out in “Elements of the Union System for Policies and Measures and Projections and the Quality Assurance and Control (QA/QC) Programme”²⁷¹. The procedures are also described in the 2015 ETC technical report “Quality assurance and quality control procedure for national and Union GHG projections”. A summary is provided in the paragraphs below.

The EEA’s European Topic Centre for Air Pollution and Climate Change Mitigation (ETC/ACM) has compiled the national projections as submitted by the EU Member States under the MMR and applied quality assurance and quality control (QA/QC) procedures. These procedures consist of a number of checks against quality criteria such as completeness, consistency, comparability, accuracy and transparency of reported data.

A number of qualified ETC/ACM reviewers are used to review the projections. If the quality checks showed that the submission did not follow the quality criteria, the ETC/ACM reviewer sought explanation in the accompanying documents submitted by Member States. If no explanations could be found, the reviewers asked Member States projection experts to provide clarification or correct the dataset as necessary. If Member States did not provide the requested information, the ETC/ACM proceeded with corrective actions which consist of filling identified data gaps and performing error corrections and the reference year calibration. Such corrective actions are essential to ensure the quality of projections data used in the annual reports of the Commission and the EEA. The EU-28 emission projections presented here conform to the EEA’s and European Commission’s 2017 reports on progress towards the 2020 GHG target²⁷²²⁷³.

²⁷⁰ European Commission. Recommended parameters for reporting on GHG projections in 2017. *Final*, 14/06/2016.

²⁷¹ https://ec.europa.eu/clima/sites/clima/files/strategies/progress/monitoring/docs/union_pams_projections_en.pdf

²⁷² European Environment Agency. Trends and projections in Europe 2016 - Tracking progress towards Europe's climate and energy targets. 2016.

5.3.5. Changes in methodologies

The methodologies to report on greenhouse gas projections remained unchanged to the second Biennial Report from the European Union under the UNFCCC (see EU 2BR, Section 4.1.4.2). The QA/QC procedure remains unchanged as well.

5.3.6. *Sensitivity Analysis*

Under Article 14 of Regulation 525/2013/EU Member States are required to report on results of a sensitivity analysis of their greenhouse gas projections. This is a mandatory reporting requirement, and EC recommended MS which used different assumptions for key parameters than those recommended by EC (see above) to use the latter for sensitivity analysis. However, this is voluntary and the divergence only applies to some MS. As a consequence, Member States' sensitivity analyses are based on different assumptions and methodologies, and take into account different national circumstances and structures. It is thus not meaningful to aggregate the results of individual Member State sensitivities into an EU-28 sensitivity projection scenario. Information about sensitivity analyses at Member State level is reported in individual Biennial Reports of the Member States. Thus, instead of a sensitivity analysis for the aggregate projections, a cross-check or benchmarking with an alternative modelling exercise seems to be more useful for the EU projections.

A Reference Scenario has been developed by the EC in consultation with the Member States, to provide insights about how current trends and existing policies translate into EU-28 projections. This was published by the Directorates-General Energy, Climate Action and Mobility and Transport in 2016²⁷⁴. The EU Reference Scenario 2016 is comparable with the projection for the WEM scenario.

A comparison of key parameters used is shown in section 5.3.3 and results between the two different approaches are shown in section 5.3.9.

5.3.7. *The EU Reference Scenario 2016*

The EU Reference Scenario 2016 (Reference Scenario) covers the EU energy system, transport and GHG emission developments from all sectors. It includes specific sections on emission trends not related to energy, and on the various interactions among policies in these sectors.

The time horizon is up to 2050, based on five year steps. The Reference Scenario includes all EU-28 Member States individually. Similar as the national WEM projections the policies agreed at EU and Member State level will be implemented, with December 2014 being used as cut-off date for adopted policies. This includes the assumption that legally binding targets for 2020 will be achieved, i.e. the national renewable energy targets (unless indicated otherwise by the MS) and the 2020 GHG target for the non-ETS sectors at EU level (given national flexibilities), which turned out to be the case with adopted policies.

273 European Commission. Implementing the Paris Agreement - Progress of the EU towards the at least -40% target. (COM(2016) 707 final). 2016. <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52016DC0707&from=EN>

274 European Commission. EU Reference Scenario 2016: Energy, transport and GHG emissions - Trends to 2050. 2016. https://ec.europa.eu/energy/sites/ener/files/documents/20160713%20draft_publication_REF2016_v13.pdf

The Reference Scenario is based on the latest available statistical data from Eurostat at the time of the modelling. The "2015 Ageing Report" has been the starting point of this exercise giving long term population and GDP growth trends while the short and medium term GDP growth projections were taken from DG ECFIN. Fuel price and technology trends have been updated as necessary based on more recent evidence.

The development of the Reference Scenario involved interactions with Member State experts at various stages of the process, organised via a specific European Commission Reference Scenario expert group. The work started from a detailed policy questionnaire. Consultation with experts from the Member States on draft outcomes of the core modelling and projections was conducted and written replies were provided by the vast majority of Member States.

The modelling suite used for the Reference Scenario is based on a series of interlinked models which combine technical and economic methodologies (as shown in Figure 5-6). The models have been peer-reviewed and/or have been used for numerous publications in peer-reviewed journals. The models produce detailed projections per sector and per country and use updated databases. Calibration ensures continuity between historical data and projections.

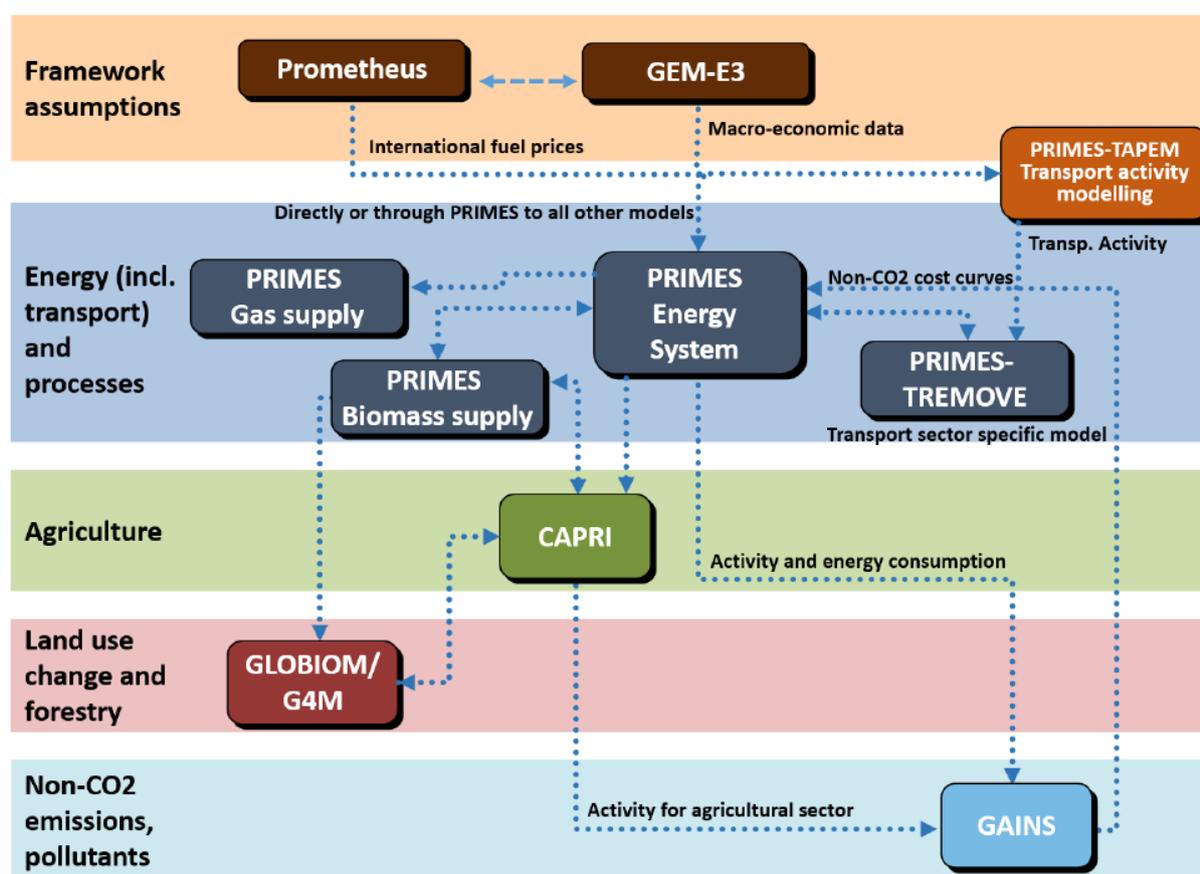
5.3.7.1. The Models

Models only represent the real world as defined in the respective simplifying assumptions. Moreover, each projection into the future is subject to significant uncertainties.

The PRIMES modelling suite was the core element of the modelling framework for transport, energy and CO₂ emission projections. The GAINS model was used for non-CO₂ emission projections and the GLOBIOM- G4M models deployed for LULUCF emission and removal projections, further supported by some more specialised models. The GEM-E3 macroeconomic model was used for value added projections by branch of activity. In addition, the PROMETHEUS global energy model was deployed for projections of world energy prices and the CAPRI model for agricultural activity projections. For details on the latter specialised models see the referred Reference Scenario publication.

The model interactions are displayed in Figure 5-6.

Figure 5-6 Model interactions



PRIMES Energy system model

PRIMES Energy system model, operated by ICCS/E3MLab, covers in detail energy demand, energy supply, energy markets, CO₂ emissions from energy combustion and CO₂ emissions from industrial processes, and it represents policy measures, technologies, means for emission reductions in all sectors, and evaluates cost of emission reduction. PRIMES uses as inputs macroeconomic and multi-sectorial projections from GEM-E3 and projections of world energy prices from PROMETHEUS. PRIMES conveys projections to GAINS, GEM-E3 and CAPRI. Within this Reference Scenario process the PRIMES model provides the energy system projection for demand and supply side sectors including full energy balance, investment costs, prices and related CO₂ emissions per country. Further it calculates total GHG emissions using inputs of other models on non-CO₂ GHG emissions (GAINS).

GAINS

The GAINS model, operated by IIASA, covers projections of air pollution and non-CO₂ GHG, including costs of emission reductions and projections of atmospheric emissions. GAINS allows exploring trade-offs and synergies between GHG emission reductions and air pollution. The model also evaluates and projects atmospheric dispersion, air quality impacts, health impacts, impacts on ecosystems, and climate impacts. Moreover, it assesses costs of abatement strategies. The model takes inputs from PRIMES, PRIMES-TREMOVE, and

CAPRI, and produces outputs for use by other models, e.g. PRIMES. For the Reference Scenario, GAINS provides non-CO₂ GHG and air pollutant emissions.

GLOBIOM/G4M

GLOBIOM/G4M model, operated by IIASA, provides projections for EU LULUCF CO₂ emissions/removals. It consists of a global economic agricultural and forest sector model (GLOBIOM) linked with a detailed forest model (G4M). For the EU, GLOBIOM/G4M receives important inputs from GEM-E3, PRIMES-biomass and CAPRI models while POLES provides bioenergy demand projections for the global analysis. For the EU agricultural sector, GLOBIOM is aligned with the CAPRI model to ensure consistency in Reference scenario projections.

5.3.8. Key parameters used

The key parameters and assumptions of the EU Reference Scenario 2016 are presented in Table 5-2 below. These are the same parameters as provided to the EU Member States as recommended standardised assumptions for the projections to be submitted in March 2017.

The use of these parameters and assumptions by EU Member States is voluntary. In national projections these assumptions were used to varying extents. In cases where Member States have not used the recommended values and had used their own national assumptions, Member States were invited to use the recommended values for sensitivity analyses of their projections. For documentation of the EU-28 projection, key parameters have been derived as weighted averages or sums of the values of key parameters as reported by Member States. These are shown in CTF Table 5 as well as in below.

EU MS assumptions related to population, GDP, international gas and coal prices as well as EU ETS carbon prices are overall broadly similar to the assumptions provided by the EU Commission, with some non-systematic differences for single projection years. ETS carbon prices in 2020 are around 13 % lower and in 2030 around 7 % higher. GDP is 7 % higher in 2030 and 9 % in 2035. MS on average assume a higher international oil price, which is around 39 % higher in 2020 and 53 % higher in 2035.²⁷⁵ On this basis, the EU Commission's recommendations for projection assumptions seem to generally function well as a soft coordination mechanism.

Table 5-2 Standardised projection assumptions used for the EU Reference Scenario 2016

Parameter	2020	2025	2030	2035
GDP (million EUR)/2013	14 549 911	15 584 576	16 682 321	17 977 449
Population (Mio.)	510.0	513.2	516.9	518.4

²⁷⁵ This does not stem from the fact that EU Member States uniformly assume a higher international oil price. Instead, the assumptions used by the EU MS vary widely. Taking 2025 as an example, the lowest value assumed by EU Member States amounts to less than half and the highest value more than three times the value suggested by the EU Commission.

Parameter	2020	2025	2030	2035
International coal price (Euro (2013)/GJ)	2.2	2.6	3.2	3.4
International gas price (Euro (2013)/GJ)	7.5	8.1	8.8	9.4
International oil price (Euro (2013)/GJ)	11.6	13.2	14.5	15.1
CO ₂ -price (EUR (2013) /tCO ₂)	15.0	22.5	33.5	42.0

Table 5-3 Weighted averages of projection assumptions used by the EU Member States

Parameter	2020	2025	2030	2035
GDP (million EUR)/2013	14 806 022	15 505 440	17 816 533	19 597 094
Population (million)	514.2	518.3	521.4	524.3
International coal price (EUR (2013) / GJ)	2.3	2.8	3.4	3.5
International gas price (EUR (2013) / GJ)	7.5	8.5	9.5	10.2
International oil price (EUR (2013) / GJ)	16.1	19.2	22.2	23.1
EU ETS price (EUR (2013) /tCO ₂)	13.0	22.0	35.9	43.4

5.3.9. Results

Figure 5-7 below shows a comparison of total aggregate GHG emissions on EU-28 level for the WEM and WAM projections as well as the EU Reference Scenario 2016.

The EU Reference Scenario 2016 starts in 2015, which is a projected year in this scenario, at a higher point GHG emission level than the WEM and WAM projections, roughly 130 Mt CO₂-eq or 3 %. Until 2020 The EU Reference Scenario 2016 and the WEM fall at a similar pace, with the WAM falling only slightly more slowly. In this timeframe emissions under the EU Reference Scenarios 2016 remain higher than under the WEM and WAM, with the difference in emission levels reduced to 1.5 % (WEM) and 2.3 % (WAM) in 2020. From 2020 onwards GHG emissions levels under the EU Reference Scenario 2016 fall more rapidly than under the WEM and WAM scenario and are thus lower than GHG emission levels under the WEM from 2023 onwards and lower than under the WAM from 2026 onwards. In 2030 emission levels under the EU Reference 2016 Scenario are projected to be 6.4 % lower than emissions under the WEM and 3.6 % lower than emissions under the WAM scenario, increasing to 9.9 % and 6.1 % respectively by 2035.

Figure 5-7 Total aggregate EU-28 GHG emissions in the EU-reference scenario 2016²⁷⁶, WEM and WAM (please note that the y-axis starts at 3000 Million t CO₂-eq)

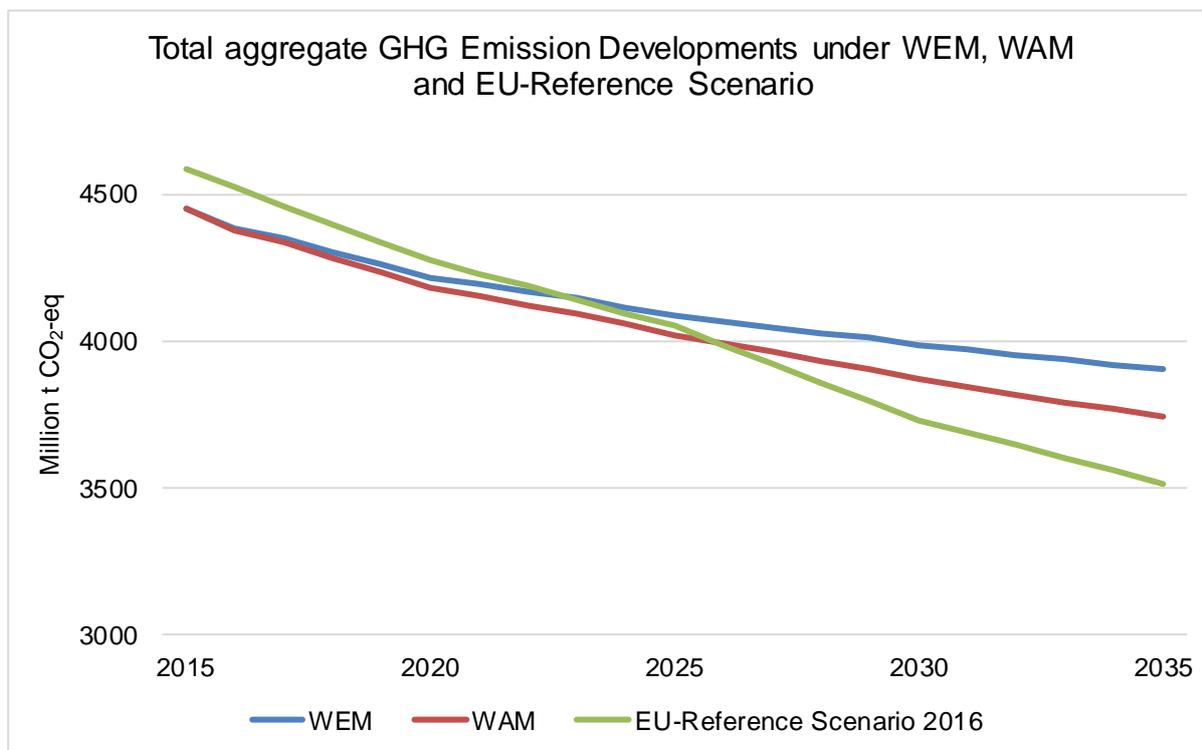


Figure 5-8 and Figure 5-9 below show a comparison of the developments per gas. The development of CO₂ emissions under the three scenarios is presented in Figure 5-8. The trends are nearly identical to the overall GHG emission trends in the three scenarios shown in Figure 5-7. Trends for CH₄, N₂O and the f-gases, which are shown for the EU Reference Scenario 2016 and the WEM scenario in Figure 5-9²⁷⁷ show limited GHG reductions. Total GHG trends in all three scenarios are clearly driven by the CO₂ trend. Trends for the other gases show strong alignment in both level and trend for the EU Reference Scenario 2015 and the WEM. CH₄ emissions under the EU Reference Scenario 2016 fall at a slightly quicker pace than under the WEM until 2020.

²⁷⁶ EEA Report No 29/2016 (2016). Trends and projections in Europe 2016 - Tracking progress towards Europe's climate and energy targets. <https://www.eea.europa.eu/publications/trends-and-projections-in-europe>

²⁷⁷ Trends for CH₄, N₂O and the f-gases are not presented for the WAM, as developments for these gases are very similar for the Wem and the WAM scenario.

Figure 5-8 EU-28 CO₂ emissions under the EU Reference Scenario 2016 and the WEM scenario (please note that the y-axis starts at 2500 million tonnes CO₂-eq)

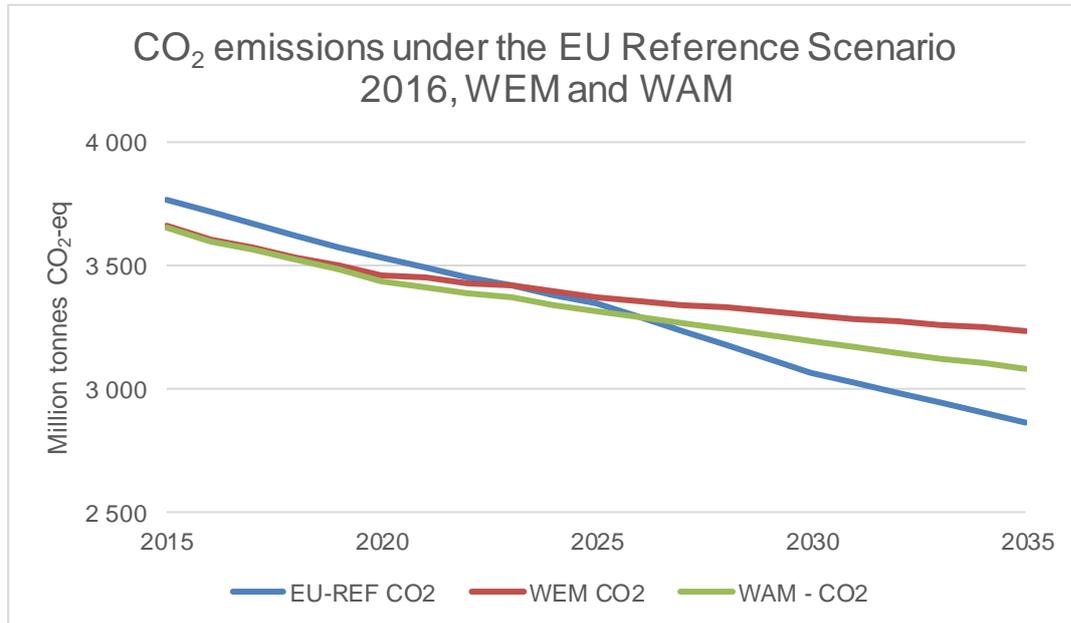
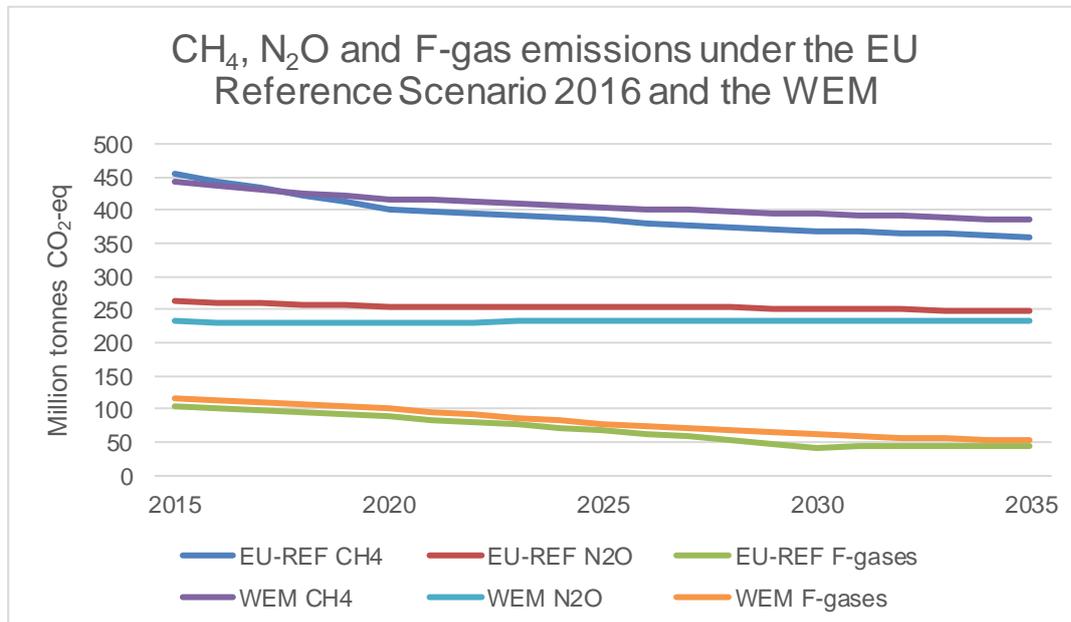


Figure 5-9 EU-28 CH₄, N₂O and f-gases under the EU Reference Scenario 2016 and the WEM scenario



The following paragraphs discuss possible reasons for the two key differences between the EU Reference Scenario 2016 and the WEM/WAM: the higher starting point and the faster pace in total GHG reduction.

Differences in the modelling approach are always likely to lead to a small level of difference in modelling results. The modelling for the EU Reference Scenario builds on a complex, highly integrated approach using a number of sub-models, while the WEM/WAM projections in many MS use a considerably less complex approach. These smaller differences might have been increased by using data from different years as the starting point for the modelling. The WEM and WAM projections build on GHG emissions levels from the most recent available national GHG inventory year (2014) as starting point. The modelling for the EU Reference Scenario was finalised roughly a year earlier than the WEM/WAM modelling and thus relies on less recent data. At the same time, GHG emissions in the EU-28 fell by 4 % in 2014 compared to 2013, a considerably larger decrease than in 2012 and 2013, where emissions fell only by 1.4 % and 2.1 % compared to the respective previous years.

The faster pace of reduction after 2020 might be attributed to a number of reasons. The EU reference scenario includes EU measures which have been adopted recently, and which might not be fully covered by all national projections, or which national projections cover in a more conservative way. This might notably be the case for revised F-gas regulation of 2014, which is expected to lead to F-gas emission reductions by 2030 of more than two thirds. For those national projections underpinning the WEM projection that focus on the 2020 time frame and project post 2020 emissions in a simplified way, effects of recent EU-regulation expected to occur only after 2020 might not be fully covered. These could include the revised Energy Performance of Buildings Directive and the CO₂ and Cars Regulation, both supposed to achieve their major emission impact post 2020.

The assumptions used by the EU Member States might also play a role. Higher assumptions for oil and ETS prices would likely lead to lower modelled emissions. Higher values for EU-28 were used for the later projection years, which is likely to lead to higher modelled emissions. Emission increases stemming from the higher GDP assumptions could potentially have outweighed reductions from higher ETS and oil prices.

When comparing the EU Reference Scenario to the WAM scenario it is important to consider that where EU MS have not submitted a WAM scenario, WEM data was used for gap-filling. This means that the resulting EU-level WAM scenario does not reflect the use of additional measures in all EU MS and therefore does not explore the full reduction potential for these additional measures.

5.4. Quantified progress to 2020 targets

For the quantification of the progress to the EU 2020 target under the UNFCCC, the development of GHG emissions is the key indicator. The Convention target of a reduction of emissions by 20 % from 1990 to 2020 refers to the emissions of the EU-28 as a whole. GHG emissions of the EU-28 are calculated as the sum of Member States' emissions. The trend in GHG emissions of the EU-28 is shown in Section 5.1 above. Considering the scope of the EU 2020 target (which excludes LULUCF, but includes international aviation) the 2015 emissions are at 22.1 % below the 1990 emission level, which means that EU-28 is well on track to reach its Convention target.

In the context of the EU's third Biennial report to the UNFCCC, reporting on progress on targets is standardized in the Common Tabular Format (CTF) Tables 4, 4a and 4b. Table 5-4 below corresponds to CTF Table 5. Tables 4a and 4b are not presented for the EU's 3BR.

This is because Table 4a provides information on land-use, land-use change and forestry, which is not included in the EU's target under the Convention. Table 4b provides detailed information on the number of ERUs, CERs and other units used. The information required for Table 4b is not available at the necessary level of detail, i.e. differentiating between the amounts of certified emission reductions (CERs) and emission reduction units (ERUs) used.

Table 5-4 EU Reporting on progress (CTF Table 4)

	Unit	Base Year	2011	2012	2013	2014	2015	Comment
Total (without LULUCF) ²⁷⁸	Mt CO ₂ eq	5 716	4 759	4 693	4 599	4 424	4 452	Total GHG including domestic and international aviation, indirect CO ₂ , excluding LULUCF and NF ₃
Contribution from LULUCF	Mt CO ₂ eq	NA	NA	NA	NA	NA	NA	Not applicable: Numbers for LULUCF are not reported because this sector is not included under the Convention target
Market-based mechanisms under the Convention ²⁷⁹	Number of units in millions / Mt CO ₂ eq	NA	254	504	133	257	23	
Other market-based mechanisms	number of units / Mt CO ₂ eq	NA	NA	NA	NA	NA	NA	Not applicable: No “other” market based mechanisms are in use.

²⁷⁸ http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/euc-2016-nir-21jun16.zip

²⁷⁹ European Environment Agency. Trends and projections in the EU ETS in 2016: The EU Emissions Trading System in numbers. 2016. <http://www.eea.europa.eu/publications/trends-and-projections-EU-ETS-2016>. This is the total number of international credits that were used/surrendered by operators under the EU ETS during the period, hence may not reflect the EU 28 as NO, IS, LI are in EU ETS.

Emissions and sinks in the LULUCF sector are not included under the Convention target; therefore, they are not included in CTF tables related to progress to the Convention target. Emissions in this sector are only accounted under Kyoto targets. In the first Kyoto commitment period the LULUCF sector has been a net sink for the EU-28 due to a total emission removal of 381 Mt CO₂-equivalent (76 Mt CO₂-equivalent per year)²⁸⁰. It is expected that the LULUCF sector continues to remain a sink for EU-28 throughout CP2.

The use of flexible mechanisms takes place on the one hand by operators in the EU ETS, on the other hand by governments for the achievement of Effort Sharing Decision targets (see section 2.2.2.3). Under the EU ETS, since 2013, it is no longer possible to track the use of flexible mechanisms directly via information on the EU Transaction Log public website because CERs and ERUs are no longer surrendered directly. Rather they are exchanged into EUAs. These exchanges will become public on installation level after three years, with the first information reflecting the use in 2013 having become available in 2016. Aggregated data are however available for the timeframe 2013-2015. The 2016 compliance assessment under the ESD indicated that EU MS had not used any CERs or ERUs for compliance in the timeframe 2013-2015.

280 EEA 2014 Progress towards 2008-2012 Kyoto targets in Europe. <http://www.eea.europa.eu/publications/progress-towards-2008-2012-kyoto>

6. PROVISION OF FINANCIAL, TECHNOLOGICAL AND CAPACITY BUILDING SUPPORT TO DEVELOPING COUNTRIES

6.1. Introduction

This chapter includes information on financial, technological and capacity-building support provided by the EU to developing countries Parties to the UNFCCC Convention²⁸¹, during the period 2015 to 2016. EU support reported here comprises funds committed by EU institutions and the European Investment Bank (EIB). It does not include contributions by individual Member States, which can be found in each Member State's respective National Communication and Biennial Report. Detailed data on the support provided in 2015 and 2016 are included in the annexed Common Tabular Format (CTF) Tables 7, 8 & 9.

The methodology used to track financial support is outlined in Section 6.2. This includes details on how support has been categorised as 'new and additional', and how the purpose of the support has been defined as either mitigation, adaptation or cross-cutting.

6.2. The EU's approach to provision of climate finance, including the provision of new and additional resources

The EU tracks the provision of its climate finance through a project-based monitoring and reporting system. The system uses OECD Development Assistance Committee (DAC) Rio Markers to categorise and track the extent to which a project is deemed to provide climate finance, alongside more than 50 additional project markers that allow for further climate finance tracking, for instance by geographical location, economic sector, financial instrument or funding source. The financial resources reported in this Biennial Report are considered 'new and additional resources', meaning that they were committed after and not included in the previous National Communication or Biennial Report (i.e. committed in either 2015 or 2016). As EU budgets are determined on an annual basis, each annual commitment cycle represents new and additional resources.

This methodology, along with the process of allocating Rio Markers to projects and apportioning the resulting climate finance, is developed in detail in Section 6.2.3 'Methodology for tracking the provision of finance, technology and capacity building support', below.

6.2.1. Addressing the needs of non-Annex I Parties

The EU, EIB and its Member States when taken as a collective are the largest contributors of climate finance to developing countries, providing € 17.6 billion (approximately USD 20.7 billion) in 2015²⁸². This figure includes climate finance sources from public budgets and other development finance institutions, € 1.5 billion from the EU budget and € 2.2 billion from the EIB²⁸³. This is up from € 14.5 billion in 2014 and € 9.5 billion in 2013²⁸⁴.

281 This includes non-Annex I countries as well as Annex-I countries with economies in transition (the Russian Federation, the Baltic States, and several Central and Eastern European States). Specifically, Annex-I countries with economies in transition included in the National Communication and Biennial Report are Belarus, Turkey, and Ukraine.

282 https://ec.europa.eu/clima/news/articles/news_2016102501_en

283 <http://www.consilium.europa.eu/en/press/press-releases/2016/10/25-climate-change-finance/>

284 https://ec.europa.eu/clima/policies/international/finance_en

The EU has established a framework of measures through which it provides climate finance to non-Annex I countries, and climate change is increasingly being integrated into the EU's broader strategy for development assistance.

In addition, as of July 2017, the EU as a collective was also the largest contributor to the Green Climate Fund (GCF) with a total of USD 4.7 billion committed (or 'signed'), accounting for almost half of the USD 10.3 billion already raised²⁸⁵.

The Paris Agreement that arose from the Paris climate conference (COP21) in December 2015 established the vision for ongoing action on climate change. Prior to that, the EU played a lead role in mobilising funding and technical assistance for developing countries to support the preparation of their Intended Nationally Determined Contributions (INDCs). Following the ratification of the agreement, the EU is committed to playing its full part in an ambitious, durable and legally binding global climate agreement.

Many developing countries stress that climate finance will be vital to enable their Nationally Determined Contributions (NDC) delivery and to increase their level of ambition in the future. The Paris Agreement's objective of 'making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development' has therefore become the foundation for the EIB's contribution to low-carbon and climate-resilient development. In the lead-up to COP21, the EIB announced an increased target of 35 % of lending to developing countries by 2020²⁸⁶.

The EU is committed to the Addis Ababa Action Agenda, which calls on developed countries to mobilise USD 100 billion of climate finance per year for developing countries by 2020. The Action Agenda includes measures to revise global finance practices and generate investment for tackling climate challenges. As part of the Paris Agreement, this goal was extended until 2025, prior to which a new goal will be set. The funding will come from a variety of public and private, bilateral and multilateral sources. The EU is calling for emerging economies to also contribute, in line with their respective capabilities and responsibilities, and has set out its strategy for mobilising more climate finance by 2020. To this end, at least 20 % of the EU budget will be spent on climate action by 2020. At least € 14 billion (an average of € 2 billion per year) will be public grants to support activities in developing countries between 2014 and 2020, and funding for international climate action will more than double (compared to the average level in 2012-2013).

The EU considers climate change a key point of engagement with developing countries, promoting discussion through the EU's Policy Dialogue fora and encouraging action through financial support. The EU recognises that action on climate change is most effective where support is designed and implemented in partnership with national governments. For this reason, the EU works closely with partner governments to strengthen their institutional capacity to develop climate policy, in line with their own national priorities.

The EU seeks to include national stakeholders in the design of bilateral support programmes so that they consider the partner country's or region's own development plans. This includes

²⁸⁵ <http://www.greenclimate.fund/how-we-work/resource-mobilization>

²⁸⁶ <http://www.eib.org/infocentre/press/releases/all/2015/2015-223-eib-sets-new-35pct-target-for-climate-lending-in-developing-countries.htm>

regional and sectoral plans such as National Adaptation Programmes of Action (NAPAs) and National Adaptation Plans (NAPs). The EU External Action Service (EEAS) develops strategy papers for countries (and regions), actions from which are implemented through yearly action plans. The EU also establishes and maintains strategic partnerships, such as the Africa-EU Strategic Partnership, and the Joint Declaration on Sustainable Energy (signed between the EU, EIB and CARIFORUM)²⁸⁷, which have sustainable development at their heart. The Pan-African Programme constitutes one of the main EU financial instruments for the implementation of the Joint Africa-EU Strategy, it has a budget of € 845 million for the period 2014-2020 funded by the EU's Development Cooperation Instrument (DCI). The EU also participates in regional processes (e.g. African Environment Ministries (AMCEN) and supports relevant regional institutions (e.g. Caribbean Community Climate Change Centre (CCCCC)).

As well as climate-specific finance, the EU understands that mainstreaming climate objectives into broader development goals will be fundamental to the transition to a low-carbon, climate-resilient world. The EU mainstreams climate change (particularly adaptation) into its own development assistance, which is distributed through multi-annual strategies and programmes which are jointly prepared by the European Action Service (EEAS) and EuropeAid. For 2013-14, the volume of EU's bilateral climate-related Official Development Assistance (ODA) had increased by more than the overall ODA volume (24 % as opposed to 1 %), which demonstrates the EU's commitment to mainstreaming climate change into its development aid. By the end of 2015, the total amount of EU's climate finance contributions of € 17.6 billion originated from a variety of sources, including public budgets and other Development Finance Institutions (DFIs). In May 2016, the DG International Cooperation & Development renewed its guidelines for integrating environment and climate change into EU international and development.

The EU has a package of instruments for the implementation of external assistance, predominantly based on three geographic and thematic instruments: DCI, European Neighbourhood and Partnership Instrument (ENPI), European Development Fund (EDF).

The DCI covers the majority of developing countries and its thematic programme on 'Global public good and challenges' has a focus on climate change. No less than 25 % of this programme will be spent on climate change and environment objectives. The DCI budget for 2014-2020 is € 19.6 billion, including € 7 billion for the thematic programmes. The ENPI supports the European Neighbourhood Policy (ENP), covering the ENP partner countries and Russia. The ENPI amongst other goals, promotes sustainable development and the UN's Millennium Development Goals, and finances actions within environmental sustainability. The European Development Fund (EDF) is the EU's main instrument for providing development aid to African, Caribbean and Pacific (ACP) countries and to overseas countries and territories (OCTs). The total financial resources of the 11th EDF amount to € 30.5 billion for the period 2014-2020. Funding for Climate Change, the Environment and Resilience increased 50 % under the 11th EDF amounting to € 475 million in the period 2014-2020.

²⁸⁷ The Joint Declaration on Sustainable Energy signed between the EU, EIB and CARIFORUM aims to reinforce cooperation in the field of sustainable energy with and support Caribbean, African and Pacific group of states in meeting their obligations stipulated in the Paris Agreement on Climate Change and the UN Sustainable Development Goals.

The EU's thematic development programmes and instruments seek to help developing countries meet the relevant Millennium Development Goals (MDGs) and subsequent Sustainable Development Goals (SDGs) by focussing on specific themes. Supplementing other EU aid, the EU launched in 2010 the MDG Initiative, targeting support specifically towards the goals on which progress was most off track in the ACP covered by the EDF. By the end of 2014, the Initiative already financed at least 68 projects in 46 countries focusing on hunger, maternal health, child mortality and water and sanitation, which are intertwined with the EU's endeavours to help developing countries fight against climate change. For examples, the EU launched the € 20 million Food Safety Enhancement Programme in Haiti in 2012, and backed with € 37 million to date the Farm Income Diversification Programme in Malawi. The EU had allocated € 1 billion to these projects.

The EU is also encouraging all countries to develop ambitious national responses to achieve the aims of the 2030 Agenda for Sustainable Development, which puts mainstreaming at the centre of its Sustainable Development Goals (SDGs). Goal 13 specifically addresses climate change, encouraging countries to 'Take urgent action to combat climate change and its impacts'. The strategic approach of the EU development policy to meeting the challenge of SDG 7 promotes sustainable growth through the energy sector by focusing on three priorities: (i) access to sustainable energy, (ii) renewable energy generation and energy efficiency and (iii) contribution to the fight against climate change and NDC implementation. These priorities are supported by three drivers: political ownership and partnerships on sustainable energy (e.g. 21 Joint Declarations), an adequate regulatory framework and governance of the energy sector and boosting investment through innovative financial instruments.

In addition to development assistance, the EU is also prioritising the integration of climate policy goals into Disaster Risk Reduction (DRR), supporting the adoption of the Sendai Framework for Disaster Risk Reduction (2015-2030) as well as the Joint Communication on a Strategic Approach to Resilience in the EU's external action. The EU's five-year Sendai Action Plan, is the basis for a disaster-risk-informed approach to policy making and resilient sustainable development. The Plan proposes activities covering risk knowledge, risk investments, disaster preparedness and resilience, using an all-of-society engagement approach. The Plan will create synergies between DRR and climate change strategy, and strengthen the capacity of cities to address disaster risks.

Furthermore, the EU places resilience as a central objective in its development and humanitarian assistance. As well as the Pilot Programme for Climate Resilience, it supports l'Alliance Globale pour l'Initiative Résilience (AGIR) in the Sahel and West Africa, which aims to foster the resilience of communities who are regularly affected by food insecurity and protracted conflicts. It also funds disaster risk reduction projects in Africa, the Caribbean and the Pacific. In 2015, the EU introduced the Resilience Marker in all the humanitarian projects it funds. This marker defines ways to reduce disaster risks and to strengthen people's coping capacities to minimise humanitarian needs. It also launched the Resilience Compendium — a collection of 29 practical examples of disaster risk reduction and resilience activities carried out by the EU, other donors, organisations and vulnerable communities. In December 2015, the European Commission released € 125 million to finance actions in countries affected by 'El Niño' in Africa, Central America and the Caribbean. The objective of this funding is to respond to existing situations of drought, but also allow for early pre-emptive action and preparedness.

Similarly, with regards to food security, the Pro-ACT ‘Pro-Resilience Actions’ is the specific DEVCO tool designed to respond – in complementarity with ECHO – to major post-food crises promoting resilience of affected communities and build capacity of public institutions, private organisations and CSO to respond to and prevent food crises (notable examples AGIR and SHARE initiatives) € 70 million available annually for PRO ACT.

The Food Security and Sustainable Agriculture (FSSA) thematic instrument under the Global Public Goods and Challenges Programme (GPGC) of the DCI contributes to this policy commitment through the component ‘Supporting the poor and food insecure to react to crises and strengthen resilience’. The indicative allocation for FSSA for the period 2014–2020 is € 525 million with an annual indicative allocation of € 75 million.

The EU acknowledges the importance of financial support for adaptation, mainstreaming adaptation into development cooperation, and aiming at balancing the support for adaptation and mitigation. In recognition of the Cancun Framework Agreement and UNFCCC Nairobi Work Programme, support for adaptation is provided through a range of channels. These include bilateral agreements, as well as a range of multilateral institutions and funds such as the Adaptation Fund and the LDC Fund, and the UNFCCC mechanisms the Global Environment Facility and the Green Climate Fund.

In parallel, the EU contributes to a number of other dedicated adaptation funds and programmes. EU support builds on available vulnerability assessments and on the needs and priorities expressed by developing countries in their national development and adaptation strategies. These strategies include National Adaptation Programs of Action, National Strategies on DRR and National Action Plans on Desertification, Land Degradation and Drought (DLDD). The EU is also a strong advocate of the move towards National Adaptation Planning or equivalent strategic processes and documents. Supported actions include, among others, diversifying livelihoods, improving access to information, enhancing coastal zone management, reducing disaster risks and promoting improved agricultural techniques such as agroforestry as well as soil and water conservation.

To scale up support for the poorest and most vulnerable, the EU has launched a new phase of the EU Global Climate Change Alliance Plus (GCCA+) flagship Initiative, with a commitment of around € 432 million for 2014-2020. Further information on this important EU programme is provided in Section 6.5.

6.2.2 Innovating in delivering support: engaging the private sector in adaptation and mitigation in developing countries

The EU is using innovative ways to deliver support which engages the private sector in adaptation and mitigation activities in developing countries. Private investment, alongside and attracted by public investment, is seen as crucial to scaling-up climate finance and closing current finance gaps. Private investors are increasingly willing to fund low-carbon investment, yet this significant potential capital remains relatively untapped. Removing barriers and improving the enabling conditions for attracting private investment in recipient countries is essential. The EU is developing public initiatives to mobilise private climate

finance directly, and to support the creation of appropriate enabling environments. € 3.7 billion is available for sustainable energy cooperation in 2014-2020

The EU supports middle range electrification projects through ElectriFI. The first call for applications generated 290 proposals requesting € 800 million to leverage for a total investment amount of € 8.5 billion for 3.7 GW renewable energy capacity in 55 countries. The second call generated 155 project proposals. In line with the Paris Agreement and the ‘gender-responsive’ approach ElectriFI supports the active role of women with initiatives such as the Gender window of ElectriFI.

The leveraging of private finance will be critical to achieving climate finance targets at the global level and the EU is prioritising actions to mobilise the private sector. Furthermore, non-annex 1 Parties need to attract additional public and private financing, to transition to a low-carbon economy and drive sustainable economic growth. The EU recognises that international climate finance should be used as a lever to incentivise climate-resilient, low-carbon investments. The EU's approach is twofold, to provide grant funding directly to the poorest and most vulnerable countries, and to use grant funding to leverage private investment, by combining grants with loans and equities from public and private sources, including bilateral and multilateral development banks.

The EU has established a number of blending facilities that combine grant funding with loans, with each facility covering different regions. Through these facilities, the EU has provided grant finance to blended projects and helped unlock investments in partner countries, by combining EU grants with public and private financing.

The key Regional Investment Facilities (blending mechanisms), have been established over the years to leverage private finance (e.g. NIF, IFCA, LAIF, AfIF, AIF, IFP). Besides traditional forms of support, the EU blending facilities mobilise additional financing from private and public sources for climate change action, complementing other aid modalities. Blending is the combination of EU grants with loans or equity from public and private financiers. EU grants can take different forms: Investment grant and interest rate subsidy, technical assistance, risk capital and guarantees. EU regional blending facilities operate in all regions of EU external cooperation and help partner countries transition to low carbon and climate resilient economies. The African Investment Facility was launched in July 2015. Newer initiatives include ARE Scale-Up (African Renewable Energy Scale-Up facility) which was launched in March 2017 by AFD Group – in partnership with the European Union – to boost private sector investment in on-grid and off-grid renewable energy production in Africa²⁸⁸ and the new External Investment Plan (EIP) to encourage investment and strengthen partnerships with countries in Africa and the EU Neighbourhood region to achieve the Sustainable Development Goals, helping to address some root causes of migration.²⁸⁹

Between 2014 and 2020 the EU expects to double the volume of grant finance to € 2 billion, aiming to mobilise projects of about € 50 billion. The majority of EU blending projects are in the energy and transport sector; climate change and environmental considerations are mainstreamed in all the blending activities.

²⁸⁸ http://www.proparco.fr/lang/en/Accueil_PROPARCO/Actus-Events-Proparco/News_PROPARCO?actuCtnId=141660

²⁸⁹ https://ec.europa.eu/europeaid/eu-external-investment-plan-factsheet_en

In addition to blending facilities, the EU has also established the Global Energy Efficiency and Renewable Energy Fund (GEEREF), an innovative Fund-of-Funds, designed to catalyse private sector capital into clean energy projects in developing countries. The fund invests in private equity funds which focus on private sector renewable energy and energy efficiency projects that also deliver a strong positive environmental and economic impact. GEEREF successfully concluded its fundraising from private sector investors in May 2015, which brought the total funds under management to € 222 million. It is estimated that over € 10 billion could be mobilised through this initiative.

Insurance coverage, is another finance model which can be harnessed to reduce the risks faced by low-income populations due to climate change. G7 leaders have agreed to increase by up to 400 million the number of people in the most vulnerable developing countries who have access to direct or indirect insurance coverage against the negative impact of climate-change-related hazards by 2020. This will build on existing risk insurance facilities such as the African Risk Capacity and the Caribbean Catastrophe Risk Insurance Facility.

The EU has also devised numerous innovative or regional initiatives for the provision of climate finance, including:

- **B4Life**²⁹⁰ — The Biodiversity for Life is a flagship initiative of the European Commission Development and Cooperation - EuropeAid, for the period 2014-2020. It responds to global threats to biodiversity as part of efforts to conserve ecosystems in the world's most deprived areas. Critical ecosystems and biodiversity hotspots, weak institutions, food insecurity and illegal wildlife trafficking will be addressed in cooperation and coordination with the EU's partners worldwide;
- **SWITCH to Green**²⁹¹ — SWITCH to Green is a flagship initiative that facilitates the transition to an inclusive green economy that generates growth, creates decent jobs, and helps reduce poverty. It links complementary programmes to improve the overall coherence, coordination and visibility of existing and future EU-funded international cooperation initiatives on green economy. Among others, it aims to strengthen the linkages between macro-level initiatives -such as the UN Partnership for Action on Green Economy (PAGE) – and micro-level interventions -such as the green business components of the SWITCH regional programmes in order to reinforce synergies and create stronger enabling environments for green economies;
- **ECCM Facility**²⁹² — The Environment & Climate Change Mainstreaming Facility aims to improve the effectiveness of EU interventions that have effects on or are affected by environment and climate change, throughout EU thematic and geographic programmes, thereby contributing to poverty eradication, sustainable development and green growth. To this end, it provides training and capacity building support to EU and partner country staff. The Facility also systematically provides inputs into the Quality Support Groups (QSG) process from an environment, climate change and biodiversity perspective in priority sectors: agriculture, economic development, energy, transport and infrastructure; and,

²⁹⁰ <https://publications.europa.eu/en/publication-detail/-/publication/2e26b18c-82a4-4275-b23f-bc1c601e2853>

²⁹¹ <http://www.switchtogreen.eu/?p=128>

²⁹² <https://europa.eu/capacity4dev/public-environment-climate/blog/eccm-facility-supporting-delegation-eu-haiti-mainstreaming-environment-and-climate-change>

- **EUROCLIMA**²⁹³ — EUROCLIMA is a regional cooperation programme between the European Union and Latin America, focused on climate change. The Programme is to facilitate the integration of climate change mitigation and adaptation strategies and measures into Latin American public development policies and plans with a view to contributing to poverty alleviation and reinforcing resilience of the region. It improves the exchange of experiences and information on climate change; helps identify and prioritise “no regrets” adaptation and mitigation measures; and reinforces countries’ food security with sustainable agriculture.

In parallel with numerous climate initiatives, the GCCA+ aims to assist developing countries to tackle climate change alongside broader development objectives. It employs a range of innovative delivery measures designed to reflect the principles of aid effectiveness established by the Paris Declaration on Aid Effectiveness and the Accra Agenda for Action. These include joint programming and financing, sector policy support programmes, climate change mainstreaming into planning and budgeting, and a focus on dialogue, institutional strengthening and capacity building.

The Forest Law Enforcement, Governance and Trade (FLEGT) takes a multidimensional approach to overcoming the complex drivers of illegal logging. The facility contributes to strengthening forest governance while encouraging sustainable economic development in timber producing countries through the review of timber legislation, promotion of legal trade, support of private-sector initiatives and encouragement of better public procurement policy.

The EU continues to support the programme to Reduce Emissions from Deforestation and forest Degradation (REDD+), including the role of conservation, sustainable management of forests and enhancement of forest carbon stocks. REDD+ aims to preserve and strengthen the role of tropical forests in mitigating and adapting to climate change, and in sustainable development.

The EIB is the largest multilateral provider of climate finance worldwide. Over the last two years, the EIB has invested over € 40 billion in climate change mitigation and adaptation projects worldwide, most of which is in the EU, but with over € 4 billion in developing countries. EIB funding acts as a catalyst to mobilise finance for climate action by encouraging others to co-finance with its long-term lending.

The EIB contributes to the EU’s climate and energy objectives by supporting a range of mitigation projects, for example in renewable energy, energy efficiency and low-carbon transport, as well as investing in adaptation measures. The EIB has a target of ensuring that at least 25 % of the bank’s activity is for climate action, and all EIB-financed projects, regardless of sector, must comply with EIB environmental standards that reflect EU climate objectives. The EIB Climate Strategy announced in September 2015 further reinforces the bank’s support for low-carbon and climate-resilient development.

²⁹³ <http://www.euroclima.org/en/euroclima>

6.2.3 Methodology for tracking the provision of finance, technology and capacity building support

Definition of climate finance: Climate finance aims at reducing emissions, and enhancing sinks of greenhouse gases and aims at reducing the vulnerability of, and maintaining and increasing the resilience of, human and ecological systems to negative climate change impacts (adapted from the UNFCCC Standing Committee on Finance’s definition of climate finance).²⁹⁴

- **Definition of mitigation activities:** An activity should be considered as climate change mitigation related if it contributes to the objective of stabilisation of GHG concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system by promoting efforts to reduce or limit GHG emissions or to enhance GHG sequestration (adapted from the operational definition and criteria for eligibility used in the OECD-DAC Policy Markers)²⁹⁵;
- **Definition of adaptation activities:** An activity should be considered as adaptation related if it intends to reduce the vulnerability of human or natural systems to the impacts of climate change and climate-related risks, by maintaining or increasing adaptive capacity and resilience. This encompasses a range of activities from information and knowledge generation, to capacity development, planning and the implementation of climate change adaptation actions (adapted from the operational definition and criteria for eligibility used in the OECD-DAC Policy Markers);
- **Definition of climate relevant technology development and transfer:** a broad set of processes covering the flows of know-how, experience and equipment for mitigating and adapting to climate change amongst different stakeholders such as governments, private sector entities, financial institutions, non-governmental organizations (NGOs) and research/education institutions. The broad and inclusive term ‘transfer’ comprises the process of learning to understand, utilize and replicate the technology, including the capacity to choose and adapt to local conditions and integrate it with indigenous technologies (adapted from the IPCC definition of climate relevant technology transfer);
- **Definition of climate relevant capacity building:** capacity-building is a process which seeks to build, develop, strengthen, enhance and improve existing scientific and technical skills, capabilities and institutions particularly in developing countries, to enable them to assess, adapt, manage and develop technologies. Capacity building must be country-driven, addressing specific needs and conditions of developing countries and reflecting their national sustainable development strategies, priorities and initiatives (adapted from the UNFCCC definition of capacity building activities).

The Rio markers are policy indicators and were not originally intended to accurately quantify climate finance. Therefore, an activity can have more than one principal or significant policy objective (i.e. it can be marked for several Rio markers; mitigation, adaptation and other Rio conventions such as Biodiversity and Desertification). The EU has adopted the following approach to ‘translate’ the Rio marked data into estimated flows of climate finance:

²⁹⁴https://unfccc.int/files/cooperation_and_support/financial_mechanism/standing_committee/application/pdf/2014_biennial_assessment_and_overview_of_climate_finance_flows_report_web.pdf

²⁹⁵ <https://www.oecd.org/dac/stats/48785310.pdf>

Table 6.1 Rio marker approach

Markers	Mitigation	Adaptation	Cross-cutting	Total
2 M & 0 A	100 %	0 %	0 %	100 %
1 M & 0 A	40 %	0 %	0 %	40 %
0 M & 2 A	0 %	100 %	0 %	100 %
0 M & 1 A	0 %	40 %	0 %	40 %
2 M & 1 A	100 %	0 %	0 %	100 %
1 M & 2 A	0 %	100 %	0 %	100 %
2 M & 2 A	0 %	0 %	100 %	100 %
1 M & 1 A	0 %	0 %	40 %	40 %

For example, if an EU commitment of € 1 million was made to a project going to a developing country Party that was marked as ‘Principal’ for mitigation (‘2 M’ in the above table) and ‘Significant’ for adaptation (‘1 A’ in the above table), then 100 % of that € 1 million would be categorised as mitigation and 0 % as adaptation.

Similarly, if the above project was not marked for mitigation but was marked as ‘Significant’ for adaptation, 40 % of that € 1 million would be categorised adaptation, and 0 % as mitigation.

This approach differs slightly from that used in the EU’s previous Biennial Report (2BR), in allowing for climate finance to be considered as cross-cutting (i.e. for projects that are equally Rio marked for mitigation and adaptation). Climate finance figures using the previous approach have been provided in a footnote to Table 6.2. The difference between the two approaches is that under the previous approach, climate finance wasn’t considered as cross-cutting, resulting in climate finance only being counted as mitigation or adaptation. For this approach, when calculating total climate finance, double counting was avoided by taking only the highest amount to be reported as ‘climate finance’ in line with OECD guidelines.

This biennial report covers support that has been committed in 2015 and 2016. A commitment requires that a final decision has been taken on the allocation of the funds to a specific project and programme. In general, disbursement will follow commitment unless exceptional circumstances arise. The EU is working towards tracking climate relevant disbursements in the near future.

The EIB’s climate relevant financial flows are tracked using the joint approach developed by the Multilateral Development Banks (MDBs) that does not use the Rio markers. In 2015, Common Principles for tracking mitigation and adaptation activities were developed together with the International Development Finance Club (IDFC), and a set of guidelines was established and applied to set a common approach for reporting on climate co-financing flows that are invested alongside MDBs’ climate finance activities. Climate co-finance is defined as the amount of financial resources contributed by external entities alongside climate finance invested by MDBs. This encompasses financial resource providers that are government or government-affiliated, as well as those that are private. The MDBs’ methodologies for climate finance tracking are aligned with the Common Principles, and are

detailed in their latest ‘Joint report on multilateral development banks’ climate finance 2016’, published in September 2017.²⁹⁶

6.3 Financial Resources

This section provides information on the total support provided through multilateral and bilateral channels.

6.3.1 Provision of financial support through multilateral channels

The EU supports a variety of global programmes and Trust Funds managed by multilateral organisations, including the UNDP, UNEP, FAO and the World Bank. The EU also provides support to the operating entities of the financial mechanism of UNFCCC, the Global Environment Facility (GEF) and the Green Climate Fund (GCF). However, the EU’s statistical system categorises all climate finance support as bilateral with multiple recipients, even where the finance is delivered through a multilateral organisation, with the exception of core contributions to the UNFCCC, which are reported in CTF Table 7(a). Therefore, all other finance provided through a multilateral organisation is reported in CTF 7(b).

6.3.2 Provision of financial support through bilateral channels

All the EU’s climate finance provided to developing country Parties to the UNFCCC (provision of financial support through bilateral channels) in 2015 and 2016 was in the form of grants, and classified as Official Development Assistance (ODA). This climate finance was marked by the Rio markers, as described in Section 6.2.3, and is summarised below by spend per year since the last National Communication, amount marked for mitigation, adaptation or cross-cutting activities, and how much of this finance went to Least Developed Countries (LDCs).

Total climate finance provided by the EU to developing country Parties to the UNFCCC in 2015 and 2016 was € 4.2 billion. Climate finance provided by the EU continued to increase in 2015 and 2016 on 2014. Of the total climate finance provided in 2015 and 2016, € 1.4 billion was marked for mitigation, € 1.7 billion for adaptation, and € 1.1 billion as cross-cutting.

Table 6.2 Provision of EU financial support in 2015-2016²⁹⁷

Figures provided are to the factor of one thousand (‘000)

	Mitigation		Adaptation		Cross-cutting		Total	
	EUR	USD	EUR	USD	EUR	USD	EUR	USD
2015	525 200	580 973	537 076	595 428	454 503	503 883	1 516 778	1 681 573
2016	891 673	986 364	1 189 718	1 316 060	648 781	717 679	2 730 172	3 020 102

²⁹⁶ <http://www.eib.org/attachments/press/2016-joint-report-on-mdbs-climate-finance.pdf>

²⁹⁷ Using the approach under the EU 2BR to calculate climate finance, the figures for 2015 and 2016 would have read as follows (in EUR, to the factor of one thousand (‘000)): 2015 (Mitigation 1 011 702, Adaptation 1 059 539, Cross-cutting 0, Total 1 516 778)

2016 (Mitigation 1 591 874, Adaptation 1 871 060, Cross-cutting 0, Total 2 730 172)

Total	1 416 873	1 567 337	1 726 794	1 911 488	1 103 284	1 221 652	4 246 950	4 701 674
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Of total climate finance provided by the EU in 2015 and 2016, at least € 1.4 billion (33 %) was provided to LDCs. The reason this reads ‘at least’ is because the EU marks its funding by country and by region, but in some cases climate finance goes to a collection of countries, and only a regional marker is used as a result, rendering it not possible to assign specific amounts to the individual countries in this regional group. However, of the total climate finance provided in 2015 and 2016 to LDCs, at least € 407 million was marked for mitigation, € 823 million for adaptation and € 143 million for cross-cutting.

Further disaggregation of the climate finance provided by the EU in 2015 and 2016 is available in [3BR] Tables 6.4 and 6.5, categorised by sector and by region.

In addition to the EU, the EIB also channels significant climate finance to developing country Parties to the UNFCCC. All EIB funds which are reported here are provided in the form of loans alongside several equity investments. In line with the MDBs’ joint approach to tracking climate finance²⁹⁸, the relevant share for mitigation or adaptation is specified for each project. The Rio markers are not applied to funding provided by the EIB.

Total climate finance provided by the EIB to developing country Parties to the UNFCCC in 2015 and 2016 was € 4.2 billion. In 2015, total climate finance provided was € 2.3 billion and in 2016, € 1.9 billion was provided. This information is provided in Table 6.3 which is based on the EIB’s established procedure for tracking its climate finance, which is based on signed finance contracts in the given financial year.

Table 6.3 Provision of EIB financial support in 2015-2016

Figures provided are to the factor of one thousand ('000)

	Mitigation		Adaptation		Total	
	EUR	USD	EUR	USD	EUR	USD
2015	2 091 721	2 318 981	184 125	204 129	2 275 845	2 523 110
2016	1 867 997	2 066 368	79 718	88 183	1 947 715	2 154 552
Total	3 959 718	4 385 349	263 843	292 313	4 223 560	4 677 662

Of total climate finance provided by the EIB in 2015, € 0.6 billion was channelled to developing countries as ODA and was € 13 million was delivered as Other Official Flows (OOF). For the remaining € 1.7 billion, this information is not available because at the time of signature, the interest rate of the loan is not known, as this is first set at disbursement. It is

²⁹⁸ See http://www.wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2015/06/16/090224b082f3a601/2_0/Rendered/PDF/20140joint0rep0nks00climate0finance.pdf.

therefore not possible to establish whether a given loan is concessional or not at the time of signature, and therefore whether it is classified as ODA or OOF, and as a result they are classified as ‘other’ in CTF Table 7(b). Once loans are classified, the data is submitted to the EU (DEVCO R1), who then submit the consolidated EU ODA/DAC data to the OECD.

Similarly, of total climate finance provided by the EIB in 2016, € 122 million are known to be channelled to developing countries as ODA and € 27 million were delivered as OOF (for € 1.8 billion, this information is not available).

For more detailed information on the all bilateral provision of support by the EU and the EIB, please see CTF Table 7(b) in the CTF Appendix.

Table 6.4 Provision of EU financial support for mitigation and adaptation by sector 2015-2016

Figures provided are to the factor of one thousand ('000)

Sector	Mitigation		Adaptation		Cross-cutting		Total		%
	EUR	USD	EUR	USD	EUR	USD	EUR	USD	
2015									
Energy	197 467	218 437	0	0	28 589	31 695	226 056	250 617	15
Transport	88 126	97 484	0	0	0	0	88 126	97 700	6
Industry	16 632	18 398	0	0	0	0	16 632	18 439	1
Agriculture	0	0	145 162	160 934	112 842	125 102	258 004	286 036	17
Forestry	35 700	39 491	0	0	2	3	35 702	39 581	2
Water & sanitation	0	0	58 736	65 118	4 400	4 878	63 136	69 996	4
Cross-cutting	18 245	20 182	97 160	107 716	190 080	210 732	305 485	338 675	20
Other	169 030	186 980	236 018	261 661	118 589	131 473	523 636	580 528	35
Total	525 200	580 973	537 076	595 428	454 503	503 883	1 516 778	1 681 573	100
2016									
Energy	429 702	475 334	0	0	20 117	22 253	449 819	497 587	16
Transport	122 040	135 000	0	0	6 800	7 522	128 840	142 522	5
Industry	30 232	33 442	0	0	0	0	30 232	33 442	1
Agriculture	7 600	8 407	431 800	477 655	192 363	212 791	631 763	698 853	23
Forestry	60 000	66 372	0	0	5 000	5 531	65 000	71 903	2
Water & sanitation	28 000	30 973	90 512	100 124	21 816	24 133	140 328	155 230	5
Cross-cutting	170 400	188 496	109 547	121 180	219 173	242 448	499 120	552 124	18
Other	43 699	48 339	557 859	617 100	183 512	203 000	785 069	868 440	29
Total	891 673	986 364	1 189 718	1 316 060	648 781	717 679	2 730 172	3 020 102	100

Table 6.5 Provision of EU financial support for mitigation and adaptation by region 2015

Figures provided are to the factor of one thousand ('000)

Region	Mitigation		Adaptation		Cross-cutting		Total		%
	EUR	USD	EUR	USD	EUR	USD	EUR	USD	
Europe	115 356	127 889	17 716	19 641	100 517	111 438	233 589	258 968	15
Africa	296 190	328 370	271 200	300 665	69 203	76 721	636 592	705 756	42
North of Sahara	0	0	0	0	45 200	50 111	45 200	50 111	
South of Sahara	234 894	260 415	240 700	266 851	24 000	26 608	499 594	553 874	
Regional	61 295	67 955	30 500	33 814	2	3	91 798	101 771	
America	1 320	1 463	108 095	119 839	20 837	23 101	130 252	144 404	9
North & Central	0	0	63 475	70 371	3 900	4 324	67 375	74 695	
South	1 320	1 463	36 120	40 044	0	0	37 440	41 508	
Regional	0	0	8 500	9 424	16 937	18 777	25 437	28 201	
Asia	37 203	41 245	53 224	59 007	100 600	111 530	191 026	211 781	13
Middle East	0	0	0	0	21 600	23 947	21 600	23 947	
South & Central	24 802	27 497	49 223	54 571	69 000	76 497	143 025	158 565	
Far East	1	1	4 000	4 435	0	0	4 001	4 436	
Regional	12 400	13 747	0	0	10 000	11 086	22 400	24 834	
Oceania	10 000	11 086	13 880	15 388	0	0	23 880	26 475	2
Bilateral unallocated	65 131	72 208	72 961	80 888	163 345	181 093	301 438	334 189	20
Total	525 200	580 973	537 076	595 428	454 503	503 883	1 516 778	1 681 573	100

Table 6.6 Provision of EU financial support for mitigation and adaptation by region 2016

Figures provided are to the factor of one thousand ('000)

Region	Mitigation		Adaptation		Cross-cutting		Total		%
	EUR	USD	EUR	USD	EUR	USD	EUR	USD	
Europe	133 672	147 867	42 856	47 407	105 411	116 605	281 939	311 880	10
Africa	608 290	672 887	828 263	916 220	221 336	244 841	1 657 889	1 833 948	61
North of Sahara	10 000	11 062	0	0	216	239	10 216	11 301	
South of Sahara	407 906	451 223	758 263	838 787	216 320	239 292	1 382 489	1 529 302	
Regional	190 384	210 602	70 000	77 434	4 800	5 310	265 184	293 345	
America	9 200	10 177	88 950	98 396	76 263	84 362	174 413	192 935	6
North & Central	9 200	10 177	46 750	51 715	12 000	13 274	67 950	75 166	
South	0	0	42 200	46 681	3 200	3 540	45 400	50 221	
Regional	0	0	0	0	61 063	67 547	61 063	67 547	
Asia	111 812	123 686	159 009	175 895	112 000	123 894	382 821	423 475	14
Middle East	28 000	30 973	8 000	8 850	20 000	22 124	56 000	61 947	
South & Central	12	13	129 009	142 709	59 000	65 265	188 021	207 988	
Far East	70 200	77 655	14 000	15 487	0	0	84 200	93 142	
Regional	13 600	15 044	8 000	8 850	33 000	36 504	54 600	60 398	
Oceania	11 800	13 053	22 740	25 155	0	0	34 540	38 208	1
Bilateral unallocated	16 899	18 693	47 900	52 987	133 771	147 977	198 570	219 657	7
Total	891 673	986 364	1 189 718	1 316 060	648 781	717 679	2 730 172	3 020 102	100

6.4 Technology development and transfer

The development and deployment of new technologies has an essential role to play in meeting global climate change objectives, as well as contributing to new jobs and sustainable economic growth. The EU is a lead player in the area of low-carbon technologies, yet while emissions are falling in Europe, they are rising in the rest of the world. By 2020, around two-thirds of the world's emissions are expected to come from developing and emerging economies. Providing developing countries with greater access to sustainable technology is therefore essential to support action to reduce greenhouse gas emissions and adapt to the adverse effects of climate change.

The EU has mainstreamed technology transfer activities into all development support. Because these activities form one component of a larger project, disaggregating the finance dedicated to these activities alone is not currently possible. This section will outline the platforms and measures the EU employs to encourage the transfer of technology, and provide case studies of relevant programmes.

The EU is already contributing significantly to the transfer of technology to developing countries by financing climate action and development projects with a technology dimension, as well as through research collaboration. The EU's joint research programmes contribute to a higher level of knowledge amongst local scientists and to the sharing of the benefits of research and development. The EU's Research Framework Programme, Horizon 2020, promotes research collaboration and the mobility of researchers between the EU and third countries, including developing countries, in areas of common interest. Similarly, the Network for the Coordination and Advancement of Sub-Saharan Africa-EU Science and Technology Cooperation (CAAST-Net)²⁹⁹ continues to provide local capacity building in scientific research, such as in its Intra-Africa Academic Mobility Scheme³⁰⁰. This year, following the publication of the 2017 Call for Proposals in January, 7 projects have been selected for funding which will offer 450 scholarship opportunities during a 5-year implementation period. This will include 273 Master students (61 %), 108 PhD candidates (24 %) and 69 academic and administrative staff members (15 %), with overall funding of close to € 10 million.

In addition, the African, Caribbean and Pacific (ACP) EU Technical Centre for Agricultural and Rural Cooperation (CTA)³⁰¹ also supports the development and enhancement of endogenous capacities and technologies of developing country Parties, combining this with facilitating innovation in the private sector. In 2017, finalists were rewarded with funding for agriculture innovations during the CTA's Pitch AgriHack!³⁰² West Africa conference in the Ivory Coast, and in 2016 the CTA worked to equip over 3 000 farmers from small-scale producers or young entrepreneurs to access and profit from domestic, regional and international markets³⁰³.

299 <https://caast-net-plus.org/tag/view/Mobility>

300 https://eacea.ec.europa.eu/intra-africa/news/Project_Selection_results_Intra_Africa_Academic_Mobility_Scheme_2017_en

301 <http://www.cta.int/en/>

302 <http://www.cta.int/en/news/agrf-2017/media-room/pitch-agrihack-winners.html>

303 <http://www.cta.int/en/article/2016-09-21/developing-the-business-of-agriculture-in-the-caribbean.html>

The EU recognises that the private sector will be critical to the successful transfer of technologies to developing countries. The private sector is able to mobilise larger amounts of capital and is also a key driver of technological innovation. The EU's Global Energy Efficiency and Renewable Energy Fund (GEEREF), for example, is designed to catalyse private sector capital into clean energy projects in developing countries. Also, the Electrification Financing Initiative (ElectriFI) that acts as a financing mechanism was created to bridge the gaps in structuring and financing, stimulate the private sector, and mobilise financiers for affordable, reliable, sustainable and modern energy in developing countries.

The EU also provides support to explore opportunities for public-private partnerships and supports innovative multi-stakeholder alliances between national or local authorities, enterprises and NGOs for skills development and the provision of basic services. These partnerships facilitate access to sustainable and affordable energy, water and agriculture. They develop synergies between public and private interests in technology transfer, and engage stakeholders in the development and diffusion of technology, particularly to and between developing countries.

Recently, DG Energy's dialogue with the private sector under the High Level Platform has passed important milestone events, such as the High Level Round Table in April 2017, which was at CEO level, and the High Level Panel during the European Development Days (EDDs) in June 2017, as well as the Green Economic Forum in Conakry in October 2017. All this is in the build-up towards the Africa- EU summit in Abidjan where the European External Investment Plan (EIP) will be presented. Also, significant efforts have been made to maintain the dialogue with the private sector in the build-up of the 5th Africa-EU Summit 2017 scheduled to take place in Abidjad, Ivory Coast, on 29-29 November 2017.

Some examples of these EU led partnerships, for example, include the SWITCH to Green Flagship initiative that provides technical assistance to a large number of EU actors (EU DG International Cooperation and Development (DEVCO), other DGs, and EU Delegations) aiming at improving coordination as well as building awareness and capacities on inclusive green economy. Also, the GCCA+ has enhanced cooperation with non-state actors and civil society organisations as well as new alliances with new stakeholders such as the private sector. The GCCA+ has also been recognised as a viable instrument for practical cooperation combining global, national and regional centres of interest. Inspired by the Covenant of Mayors Europe, the EU funded initiative the Covenant of mayors in Sub-Saharan Africa (CoM SSA) unites over 20 African cities to share knowledge and best practices and increase planning capacities to address the challenges of energy access, climate change mitigation and adaptation.

A selection of activities related to technology transfer, including success stories, are presented in Table 6.75 (adapted from Table 6 of the NC guidelines). For more detailed information, please see CTF 8. CTF 8 includes a non-exhaustive list of initiatives selected to represent technology transfer support provided by EU.

Table 6.7 Examples of activities related to technology transfer

Project/programme title: Horizon 2020			
Recipient country	Sector	Total funding	Years in operation
Global	Multisector	~€ 80 billion	2014-2020
<p>Purpose & Description:</p> <p>Horizon 2020 is the EU’s largest research and innovation programme, with ~€ 80 billion of funding, between 2014 and 2020, under three different programmes: excellent science, industrial leadership, and societal challenges (including climate change). A significant share of this funding supports research and innovation cooperation with developing countries.</p> <p>The majority of Horizon 2020 projects foster cooperation between countries, often in the form of public-private partnerships which aim to leverage public and private investments, to develop new technologies, products and services. Supporting international research and innovation is important as it not only leads to new discoveries, but also helps bring great ideas from the lab to the market. Horizon 2020 is accessible to researchers and entrepreneurs in developing countries. For the period 2014 to 2020, at least 20 % of the EU budget will be used to support climate action and the transition to a low-carbon and climate resilient world.</p>			
<p>Factors which led to the project’s success: Information unavailable.</p>			
<p>Technology transferred: Funding opportunities under Horizon 2020 are set out in multiannual work programmes. Work programmes concentrate on the following topics: future and emerging technologies; research infrastructure, including e-infrastructure; nanotechnologies, advanced materials, biotechnology and advanced manufacturing and processing; information and communication technologies; innovation in SMEs; access to risk finance; societal challenge 1 (health, demographic change and wellbeing); societal challenge 2 (food security, sustainable agriculture and forestry, marine, maritime and inland water research and the bioeconomy); societal challenge 4 (smart, green and integrated transport); societal challenge 5 (climate action, environment, resource efficiency and raw materials); and spreading excellence and widening participation.</p>			
<p>Impact on greenhouse gas emissions/sinks: Data not available</p>			
Project/programme title: Technical Assistance Facility (TAF) for the Sustainable Energy for All (SE4ALL)			
Recipient country	Sector	Total funding	Years in operation
26 countries in East Asia-Pacific, Latin America and Caribbean, South Asia and Sub-	Energy	Unknown. Budget for Western and Central Africa contract is € 22	Launched in 2013

Saharan Africa Regions		million	
<p>Purpose & Description: The EU's TAF for SE4ALL is designed to deliver high level technical assistance to partner countries, to support them in improving their policy and regulatory frameworks in order to scale-up investment in their energy sector. It supports developing countries that have highlighted energy as a national priority, and that are committed to achieving the SE4ALL objectives.</p> <p>The TAF supports partner countries on a demand basis through expert missions to increase their administrative and technical capacity, accelerate energy sector policy reform, and facilitate investment in access to energy. Technical assistance packages cover five key themes: policy reform, capacity building, investment, mobilising funds and partnerships, and industrial and technological cooperation.</p> <p>The assistance is an inclusive process, involving national stakeholders and promoting a coherent, integrated development agenda. The EU has recognised that improving the capacity of country partners is a prerequisite for the sustainable implementation of relevant policies and regulations, and for the development of the knowledge and skills required for the adoption of renewable and efficient technologies. In order to ensure an effective knowledge exchange between stakeholders, the EU through the TAF supports the establishment of regional networks, gathering professionals at the regional and national level, to work across technologies and sectors.</p> <p>Three EU Technical Assistance contracts have been signed under this Facility. The first covers Central and Western Africa, the second - Eastern and Southern Africa and the third - Asia, Neighbourhood, Latin America, Caribbean and Pacific. Projects have been carried out in 23 countries so far in Africa and Asia.</p>			
<p>Factors which led to the project's success:</p> <ol style="list-style-type: none"> 1. Capacity building: The TAF goes beyond addressing technical constraints on policy, regulation and engineering. It also focuses on capacity building, as a prerequisite for a sustainable implementation of such policies and regulations, and a necessary step in the development of knowledge and skills for the use of technologies. 2. Leveraging of funds: Funds from a diversity of sources, development banks, local and international private sector, public sources, are brought together to help bring selected sustainable energy projects to completion. 3. Industrial and technology cooperation: The TAF supports the establishment of regional networks gathering local and international professionals, at regional as well as country level, across the various technologies and sectors, to ensure a coherent and effective know-how exchange between the stakeholders. 			
<p>Technology transferred: Energy efficiency, renewable energy and universal access to modern energy services</p>			
<p>Impact on greenhouse gas emissions/sinks: Data not available</p>			

6.5 Capacity-building

Access to knowledge and technologies are not enough on their own, the right set of specific local conditions needs to be in place to attract project developers and investors. This so-called ‘enabling environment’ involves a set of interrelated conditions - legal, organisational, fiscal, informational, political, and cultural. A skilled workforce is also crucial to maintain know-how in the community. Therefore, the successful transfer of climate technologies to developing countries requires support to increase local administrative capacities. The EU works closely with governments in developing countries to reinforce administrative capacities and support the development of legal and regulatory frameworks which are conducive to mitigating and adapting to climate change.

The EU has mainstreamed capacity building activities into all development assistance, in line with the provisions of the Paris Declaration on Aid Effectiveness and the Accra Agenda for Action. Because these activities form one component of a larger project, disaggregating the finance dedicated to these activities alone is not currently possible. This section will outline the platforms and measures the EU employs to build capacity, and provide case studies of relevant programmes.

The EU’s development activities in the field of climate change are based on, and emphasize the importance of, the principles of national ownership, stakeholder participation, country driven demand, cooperation between donors and across programmes, and impact assessment and monitoring (when appropriate). Since EU support is partner country-driven, only information from partner countries, for example through their National Communications, is the best way to get a picture of capacity building support and activities and their effectiveness.

A selection of activities related to capacity building, including success stories, are presented in Table 6.6 (adapted from Table 6 of the NC guidelines). For more detailed information, please see CTF 9.

Table 6.8 Examples of activities related to capacity building

Project/programme title: Low Emission Capacity Building (LECB) Programme			
Recipient country	Sector	Total funding	Years in operation
25 participating countries	Cross-sector (energy, transport, industrial processes, waste, agriculture and LULUCF)	USD 40 million	2011-2016
Purpose & Description:			
The UNDP’s LECB Programme focuses on realising climate change mitigation and sustainable development opportunities, within the context of national priorities and			

planning processes. The programme includes 25 participating countries around the world, and provides direct technical and financial support, as well as peer-to-peer expert knowledge exchange and awareness building.

The programme aims to strengthen institutional capacities and promote integrated governance, to support the implementation of climate action. It provides tools and training, to identify and design relevant projects, as well as innovative policy and financing options. LECB builds on insights gained at the country-level, sharing this knowledge to stimulate discussion and strengthen technical capacities for the implementation of climate action around the world.

Projects are developed in a consensus-driven and inclusive manner, with the engagement of public and private stakeholders, to promote national ownership. The Global Support Team and in-country offices work with stakeholders, facilitating consultations and workshops, and establishing partnerships and networks at the country-level. All projects promote gender-sensitive approaches during project design and implementation, including within decision-making, institutional frameworks, and in strategies, outcomes and reporting.

Recently, the LECB has been leading support for activities related to the Paris Agreement. Prior to the Agreement in 2015, Regional Technical Dialogues benefitted more than 100 developing countries with guidance on INDC preparation, many of them among the poorest and most vulnerable. Furthermore, LECB has been working with countries to ensure that implementation plans for NDCs are linked with the achievement of the Sustainable Development Goals (SDGs).

The LECB Programme is implemented by UNDP, with generous funding from the European Commission, the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, and the Australian Government

Factors which led to the project's success:

1. Demand and country driven: The programme is designed to provide coordinated, expert, capacity-building support to assist participating countries in selecting the most relevant project activities to focus on. Using a menu approach, each participating country will determine, develop and execute its own project with a clear focus on one of the national priority areas.
2. Multi-stakeholder framework: The programme involves participation of two types of primary stakeholders – public sector and industry – that promotes consensus and national ownership. The public sector plays a key role in designing and implementing programmes and policies to address climate change issues. In this context, leading institutions responsible for the implementation of the programme at the national level will facilitate the necessary consultations and coordination among key stakeholders. From its inception phase, such coordination will be critical to ensure that efforts to address GHG emissions respond also to the priorities and needs of the individual sectors involved.

Technology transferred: Low emissions development

Impact on greenhouse gas emissions/sinks: No data available			
Project/programme title: Global Climate Change Alliance <i>Plus</i> (GCCA+)			
Recipient country	Sector	Total funding	Years in operation
Focus on least developed countries (LDCs) and small island developing states (SIDS) (38 countries, 51 programmes)	Cross-sector	~€ 350 million	2015-2020 (GCCA ran from 2007-2014)
Purpose & Description:			
<p>To scale up support for the poorest and most vulnerable, the EU has launched a new phase of the Global Climate Change Alliance (GCCA+), with a commitment of around € 350 million for 2014-2020. This will support least developed countries (LDCs) and small-island developing states (SIDS) in adapting to the impacts of climate change and integrating climate change resilience in their overall development planning and implementation. The new GCCA+ is sharper in focus and wider in outreach, being enhanced to better address the implementation of the Paris Agreement with a specific mitigation Facility approved in 2016. It will better address the new challenges, supporting country-driven processes, building capacities, enhancing climate and disaster risk reduction (DRR) integration into national planning and aligning development and climate change policies, including strong support to the implementation of the Paris Agreement. It will concentrate on three priority areas where the greatest impact is anticipated: (1) Mainstreaming climate change into poverty reduction and development efforts; (2) Increasing resilience to climate-related stresses and shocks; (3) Supporting formulation and implementation of concrete sectoral based adaptation and mitigation strategies and plans, including NDCs.</p> <p>The GCCA+ aims to support a country's national priorities. Interventions at country level are designed in close collaboration between EU Delegations and national governments, and they are shaped in consultation with relevant stakeholders. Implementing partners include government departments and agencies, non-governmental organisations, academic and scientific institutions, and local representations of international organisations, multilateral and bilateral development agencies.</p>			
Factors which led to the project's success:			
<ol style="list-style-type: none"> Existing funding structures: The GCCA+ funds have strengthened actions led by EU Member States (DFID, Danida, AFD, GIZ and others) and multilateral agencies, benefitting from existing structures and systems, which resulted in relatively quick results. Low transaction costs: For the Member States that have provided Fast-Track funds, the GCCA+ has provided a good opportunity to support climate action with low transaction costs. 			

3. **Effective development partnerships:** The GCCA+ responds successfully to needs at the regional level, recognising that regional-level resources and capacities, add value to national programmes and capacities. The combination of global, regional and national foci, complementing each other, adds clear value to the existing climate action landscape.
4. **Focus on vulnerable sectors:** The programme gives priority to vulnerable sectors, such as agriculture, water, forestry and natural resources in the case of LDCs and SIDS, where the effects of climate change could have critical implications for livelihoods.

Technology transferred: Climate change mainstreaming and poverty reduction, increasing resilience to climate-related stresses and shocks, and sector-based climate change adaptation and mitigation strategies.

Impact on greenhouse gas emissions/sinks: No data available

7 LIST OF ABBREVIATIONS

Abbreviation	Description
1BR	First Biennial Report
2BR	Second Biennial Report
3BR	Third Biennial Report
6NC	6th National Communication
7NC	Seventh National Communication
AAU	Assigned amount unit
AEAs	Annual Emission Allocations
AGIR	l'Alliance Globale pour l'Initiative Résilience
AR4	Fourth Assessment Report
AR5	Fifth Assessment Report
AVR	Accreditation and Verification Regulation
BR	Biennial Report
C3S	Copernicus Climate Change Service
CAMS	Copernicus Atmosphere Monitoring Service
CAP	Common Agricultural Policy
CB	Capacity Building
CCS	Carbon Capture and storage
CDM	Clean Development Mechanism
CEOS	Committee on Earth Observation Satellites
CER	Certified emission reduction
CETA	EU-Canada Comprehensive Economic and Trade Agreement
CFP	Common Fisheries Policy
CH ₄	Methane
CMEMS	Copernicus Marine Environment Monitoring Service
CO	Carbon monoxide
CO ₂	Carbon dioxide
CO ₂ e	Carbon dioxide equivalent
CoM	Covenant of Mayors
COP21	21st Conference of the Parties
CP1	First commitment period
CP2	Second commitment period
CRF	Common Reporting Format
CTF	Common tabular format
DCFTA	Deep and Comprehensive Free Trade Area
DCI	Development Cooperation Instrument
DG	Directorate-General
DG RTD	Directorate-General for Research and Innovation
DLDD	Desertification, Land Degradation and Drought
DRR	Disaster Risk Reduction
DRR	Disaster Risk Reduction
E3P	European Energy Efficiency Platform

EAFRD	European Agricultural Fund for Rural Development
EAP	Environmental Action Programme
EASME	Executive Agency for SMEs
EcAMPA	Economic assessment of GHG mitigation policy options for EU agriculture
ECCM	Environment & Climate Change Mainstreaming Facility
ECCP II	The Second European Climate Change Programme
ECMWF	European Centre for Medium range Weather Forecasting
ECU	European Currency Unit
ECVs	Atmospheric, Oceanic and Terrestrial Essential Climate Variables
EDF	European Development Fund
EEA	European Environment Agency
EEEF	European Energy Efficiency Fund
EIB	European Investment Bank
EIONET	European Environment Information and Observation Network
EIT	European Institute of Innovation & Technology
ENP	European Neighbourhood Policy
ENPI	European Neighbourhood Policy Instrument
ERA	European Research Area
ERC	European Research Council
ERDF	European Regional Development Fund
ERU	Emission reduction unit
ESA	European Space Agency
ESD	Effort Sharing Decision
ESIF	European Structural and Investment Funds
ESIF	European Structural and Investment Funds
ETC/ACM	European Topic Centre on Air Pollution and Climate Change Mitigation
EU	European union
EU ETS	EU Emission Trading System
EU NIR 2017	EU national inventory report, as submitted to the UNFCCC in 2017
EU-15	Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and United Kingdom
EU-27	EU-15 plus Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia and Slovenia
EU-28	28 Member States of the European Union. EU-27, plus Croatia
EUFIWACC	The European Financing Institutions Working Group on Adaptation to Climate Change
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites
EUR	Euro
EUSEW	EU Sustainable Energy Week
FACCE-JPI	Joint Programming Initiative on Agriculture, Food Security and Climate Change
FET	Future and Emerging Technologies
F-gases	Fluorinated greenhouse gases
FP7	EU's Seventh Framework Programme for Research and Technological Development
FRL	forest reference levels
GAEC	Good agricultural and environmental conditions
GCCA+	Global Climate Change Alliance Plus

GCF	Green Climate Fund
GCOS	Global Climate Observing System
GCOS	Global Climate Observing System
GDP	Gross Domestic Product
GEEREF	Global Energy Efficiency and Renewable Energy Fund
GEEREF	Global Energy Efficiency and Renewable Energy Fund
GEF	Global Environment Facility
GEO	Group on Earth Observation
GEOCAB	Global Earth Observations Capacity Building
GEOSS	Global Earth Observation System of Systems
GHG	Greenhouse Gas
GPGC	Global Public Goods and Challenges Programme
GVA	Gross Value Added
GWP	Global Warming Potential
HFCs	Hydrofluorocarbons
ICAP	International Carbon Action Partnership
IDFC	International Development Finance Club
IED	Industrial Emissions Directive
IPCC	Intergovernmental Panel on Climate Change
ISL	Iceland
ITL	Independent Transaction Log
JPI	Joint Programming Initiatives
JRC	Joint Research Centre
JU	The 'Fuel Cells and Hydrogen Joint Undertaking'
KIC	Knowledge and Innovation Communities
Km	Kilometre
KP	Kyoto Protocol
LCER	Long-term certified emission reduction
LDCs	Least Developed Countries
LECB	Low Emission Capacity Building Programme
LIFE	EU financial instrument for the Environment (French: L'Instrument Financier pour l'Environnement)
LULUCF	Land Use, Land-Use Change and Forestry
M&E	Monitoring and evaluation
MAC	Mobile Air Conditioning Systems
MACC-III	Monitoring Atmospheric Composition and Climate - Interim Implementation
MDBs	Multilateral Development Banks
MMR	Monitoring Mechanism Regulation
MRS	Macro-regional strategy
MS	Member State
MSCA	Marie Skłodowska-Curie Action
Mt	Megatonnes
N ₂ O	Nitrous Oxide
NAP	National Adaptation Plan

NAS	National Adaptation Strategy
NC	National Communication
NCFF	Natural Capital Financing Facility
NDC	Nationally Determined Contribution
NF ₃	Nitrogen Trifluoride
NGO	Non-Government Organisation
NIR	National Inventory Report
NMVOC	Non-methane volatile organic compound
NOAA	National Oceanographic and Atmospheric Administration
NO _x	Nitrogen oxides
ODA	Official Development Assistance
PAGE	Partnership for Action on Green Economy
PaMs	Policies and measures
PDA	Project Development Assistance
PFCs	Perfluorocarbons
PMR	World Bank Partnership for Market Readiness
PPS	Purchasing power standards
QA/QC	Quality Assurance / Quality Control
QSG	Quality Support Groups
R&I	Research and innovation
REA	Research Executive Agency
REFIT	The Regulatory Fitness and Performance programme
RES	Renewable Energy Sources
RES-E	Renewable energy sectors of electricity
RES-H&C	Renewable energy sectors of heating and cooling
RES-T	Renewable energy sectors of transport
RMU	Removal unit
RSO	Research and Systematic Observations
S&T	scientific and technological
SAR	Second Assessment Report
SDGs	Sustainable Development Goals
SDS	Sustainable Development Strategy
SE4ALL	Sustainable Energy for All
SETIS	Strategic Energy Technologies Information System
SET Plan	Strategic Energy Technology Plan
SF ₆	Sulphur Hexafluoride
SFIC	Strategic Forum for International Science and Technology Cooperation
SHERPA	Screening for High Emission Reduction Potential on Air
SIDS	Small Island Developing States
SIDS	Small Island Developing States
SITC	Standard International Trade Classification
SLR	Sea Level Rise
SMEs	Small-Medium Enterprises
SO ₂	Sulphur Dioxide

SRIA	Strategic Research and Innovation Agenda
SWD	Staff Working Document
TAF	Technical Assistance Facility
tCER	temporary certified emission reduction
TFEU	Treaty on the Functioning of the European Union
Toe	Tonnes of Oil Equivalent
TWh	Terawatt hour
UAA	Utilised agricultural area
UHI	urban heat island
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change and the Kyoto Protocol
USD	US Dollars
WAM	With Additional Measures
WEEE	Waste Electricals and Electronic Equipment
WEM	With Existing Measures
WOM	Without Measures
WRI	World Resource Institute

8 APPENDIX: CTF FOR EU 3RD BIENNIAL REPORT

Overview on CTF tables provided with the third EU Biennial Report:

CTF Table 1 (EU-28):	Emission trends
CTF Table 2 (EU-28):	Description of quantified economy-wide emission reduction target
CTF Table 3 (EU-28):	Progress in achievement of the quantified economy-wide emission reduction target: information on mitigation actions and their effects
CTF Table 4 (EU-28):	Reporting on progress
CTF Table 4(a)II (EU-28):	Progress in achievement of the quantified economy-wide emission reduction targets – further information on mitigation actions relevant to the counting of emissions and removals from the land use, land-use change and forestry sector in relation to activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol
CTF Table 4(b) (EU-28):	Reporting on progress
CTF Table 5 (EU-28):	Summary of key variables and assumptions used in the projections analysis
CTF Table 6(a)/(c) (EU-28):	Information on updated greenhouse gas projections under a ‘with measures’ scenario and under a ‘with additional measures’ scenario
CTF Table 7 (EU-28):	Provision of public financial support: summary information from 2015-2016
CTF Table 7(a) (EU-28):	Provision of public financial support: contribution through multilateral channels in 2015-2016
CTF Table 7(b) (EU-28):	Provision of public financial support: contribution through bilateral, regional and other channels in 2015-2016
CTF Table 8	Provision of technology development and transfer support in 2015-2016
CTF Table 9	Provision of capacity-building support in 2015-2016

CTF Table 1: Emission Trends (EU-28)

This table is based on the latest currently available inventory (EU inventory submission for EU-28). Table 1 consists of five parts.

Table 1 – Emission trends (summary)

GREENHOUSE GAS EMISSIONS	Base year ⁽¹⁾	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Change from base to latest reported year (%)
	CO ₂ equivalent (kt)																											
CO ₂ emissions without net CO ₂ from LULUCF	4 457 424	4 457 424	4 397 336	4 254 609	4 170 873	4 158 153	4 199 258	4 301 704	4 212 778	4 204 907	4 136 340	4 162 646	4 232 126	4 209 833	4 302 149	4 314 175	4 290 134	4 296 149	4 250 311	4 150 740	3 812 523	3 930 649	3 787 017	3 729 875	3 643 472	3 468 723	3 498 051	- 22
CO ₂ emissions with net CO ₂ from LULUCF	4 205 706	4 205 706	4 119 391	4 008 010	3 921 904	3 891 803	3 915 383	3 986 514	3 899 018	3 872 499	3 784 360	3 840 910	3 889 690	3 888 270	4 000 726	3 977 541	3 954 366	3 945 066	3 934 607	3 801 485	3 463 406	3 591 665	3 458 395	3 398 591	3 306 948	3 140 845	3 174 427	- 25
CH ₄ emissions without CH ₄ from LULUCF	728 408	728 408	708 545	689 472	680 353	663 586	662 718	659 305	646 030	630 830	618 774	606 472	599 325	585 180	576 093	557 971	546 480	535 233	526 209	515 221	502 364	492 178	482 562	476 972	465 073	458 434	456 014	- 37
CH ₄ emissions with CH ₄ from LULUCF	735 276	735 276	714 759	695 442	687 160	672 560	671 137	666 786	653 465	638 584	625 088	613 795	605 526	590 903	583 127	563 699	552 647	540 710	533 344	520 440	507 866	497 586	487 899	483 255	470 015	463 301	461 059	- 37
N ₂ O emissions without N ₂ O from LULUCF	384 989	384 989	366 387	352 211	342 413	344 641	347 618	352 837	349 841	327 838	307 253	305 220	301 646	290 705	287 861	292 603	284 912	274 639	275 193	264 704	249 510	239 234	235 068	232 257	232 685	235 047	235 992	- 39
N ₂ O emissions with N ₂ O from LULUCF	398 077	398 077	379 631	365 349	356 030	358 397	360 990	366 132	363 038	341 282	320 402	318 777	314 762	303 686	301 158	305 564	298 041	287 678	288 519	277 796	262 856	252 579	248 544	246 013	245 930	248 652	249 717	- 37
HFCs	29 125	29 125	29 148	31 574	34 497	39 139	43 734	50 933	58 792	60 440	52 104	53 224	52 527	56 296	63 056	66 939	73 273	77 666	83 839	91 069	94 211	102 223	104 679	107 945	110 212	112 695	107 611	269
PFCs	25 870	25 870	23 496	19 182	18 258	17 607	17 277	16 605	15 402	14 566	14 186	12 188	10 839	12 560	10 283	8 734	7 353	6 558	6 092	5 219	3 353	3 878	4 246	3 700	3 959	3 502	3 576	- 86
Unspecified mix of HFCs and PFCs	5 841	5 841	5 369	5 350	5 340	5 327	5 609	4 128	3 983	3 853	3 651	1 796	1 698	1 835	1 042	887	952	803	727	933	1 229	489	262	278	285	220	242	- 96
SF ₆	11 003	11 003	11 458	12 282	12 967	14 142	15 193	15 063	13 581	12 845	10 544	10 586	9 731	8 594	8 105	8 111	7 920	7 490	7 081	6 708	6 306	6 431	6 216	6 272	6 188	6 136	6 413	- 42
NF ₃	24	24	25	27	29	32	100	94	102	77	75	103	82	134	147	132	156	141	163	149	77	119	127	93	68	74	69	191
Total (without LULUCF)	5 642 685	5 642 685	5 541 764	5 364 709	5 264 731	5 242 627	5 291 507	5 400 669	5 300 508	5 255 358	5 142 927	5 152 235	5 207 975	5 165 137	5 248 736	5 249 553	5 211 180	5 198 678	5 149 616	5 034 744	4 669 573	4 775 202	4 620 177	4 557 393	4 461 943	4 284 831	4 307 968	- 24
Total (with LULUCF)	5 410 922	5 410 922	5 283 278	5 137 216	5 036 186	4 999 007	5 029 424	5 106 254	5 007 380	4 944 147	4 810 411	4 851 379	4 884 856	4 862 279	4 967 645	4 931 609	4 894 708	4 866 112	4 854 374	4 703 799	4 339 304	4 454 971	4 310 367	4 246 148	4 143 606	3 975 426	4 003 114	- 26
Total (without LULUCF, with indirect)	5 647 080	5 647 080	5 546 033	5 368 880	5 268 775	5 246 420	5 295 221	5 404 304	5 304 024	5 258 648	5 145 973	5 154 943	5 210 537	5 167 577	5 251 109	5 251 845	5 213 532	5 200 987	5 151 844	5 036 891	4 671 557	4 777 215	4 622 091	4 559 232	4 463 661	4 286 478	4 309 630	- 24
Total (with LULUCF, with indirect)	5 415 317	5 415 317	5 287 547	5 141 387	5 040 230	5 002 799	5 033 138	5 109 889	5 010 896	4 947 437	4 813 457	4 854 087	4 887 417	4 864 718	4 970 018	4 933 900	4 897 060	4 868 421	4 856 602	4 705 946	4 341 287	4 456 983	4 312 281	4 247 986	4 145 324	3 977 073	4 004 775	- 26

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year ⁽¹⁾	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Change from base to latest reported year (%)	
	CO ₂ equivalent (kt)																												
1. Energy	4 336 582	4 336 582	4 295 071	4 160 712	4 082 015	4 039 709	4 070 836	4 178 680	4 077 247	4 063 242	3 997 891	4 004 540	4 085 955	4 057 418	4 137 445	4 132 213	4 108 411	4 107 297	4 051 767	3 972 825	3 691 089	3 789 987	3 643 245	3 600 622	3 513 063	3 328 575	3 357 970	- 23	
2. Industrial processes and product use	516 886	516 886	482 850	463 719	455 016	482 490	497 210	497 979	504 186	480 082	440 621	452 491	437 129	432 855	446 472	461 455	459 954	456 600	467 314	442 554	371 142	390 008	386 676	374 198	371 567	378 031	373 937	- 28	
3. Agriculture	548 270	548 270	518 337	496 290	483 647	476 567	478 121	478 769	477 240	473 305	470 833	464 472	457 868	451 288	447 075	446 833	439 849	436 902	439 129	436 435	431 175	425 549	426 281	423 757	426 680	433 853	436 748	- 20	
4. Land use, land-use change and forestry ⁽⁵⁾	- 231 763	- 231 763	- 258 486	- 227 493	- 228 545	- 243 620	- 262 083	- 294 415	- 293 128	- 311 211	- 332 516	- 300 856	- 323 119	- 302 859	- 281 091	- 317 944	- 316 472	- 332 566	- 295 243	- 330 945	- 330 270	- 320 231	- 309 810	- 311 245	- 318 337	- 309 406	- 304 855	32	
5. Waste	240 948	240 948	245 505	243 988	244 053	243 861	245 340	245 241	241 834	238 729	233 582	230 732	227 024	223 577	217 744	209 053	202 967	197 879	191 406	182 930	176 168	169 659	163 976	158 815	150 634	144 372	139 313	- 42	
6. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0
Total (including LULUCF)⁽⁵⁾	5 410 922	5 410 922	5 283 278	5 137 216	5 036 186	4 999 007	5 029 424	5 106 254	5 007 380	4 944 147	4 810 411	4 851 379	4 884 856	4 862 279	4 967 645	4 931 609	4 894 708	4 866 112	4 854 374	4 703 799	4 339 304	4 454 971	4 310 367	4 246 148	4 143 606	3 975 426	4 003 114	- 26	

The base year column refers to 1990 as the EU's base year for the quantified economy-wide emission reduction target as reported in CTF table 2.

Table 1 - Emission trends (CO₂)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year ⁽¹⁾	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Change from base to latest reported year	
	(kt)																										%		
1. Energy	4 111 645	4 111 645	4 080 783	3 954 722	3 878 106	3 848 320	3 879 116	3 989 007	3 894 372	3 889 921	3 830 586	3 844 639	3 925 932	3 904 630	3 986 568	3 988 015	3 968 193	3 972 006	3 920 478	3 841 518	3 566 368	3 663 369	3 520 288	3 476 589	3 392 353	3 212 618	3 241 204	- 21	
A. Fuel combustion (sectoral approach)	4 082 177	4 082 177	4 052 807	3 926 359	3 849 705	3 820 196	3 849 484	3 959 197	3 864 840	3 862 594	3 804 031	3 817 408	3 899 769	3 878 035	3 959 241	3 961 891	3 940 750	3 943 549	3 892 199	3 814 239	3 540 810	3 637 328	3 494 508	3 451 560	3 365 561	3 186 608	3 214 797	- 21	
1. Energy industries	1 669 860	1 669 860	1 632 704	1 573 017	1 506 156	1 515 607	1 511 405	1 540 881	1 494 240	1 511 729	1 469 223	1 499 848	1 540 864	1 557 666	1 607 595	1 594 307	1 587 398	1 598 044	1 612 124	1 536 201	1 410 344	1 433 843	1 410 811	1 404 542	1 330 301	1 242 794	1 230 382	- 26	
2. Manufacturing industries and construction	828 874	828 874	782 215	745 811	717 373	720 734	736 504	725 295	717 226	685 390	664 665	672 336	648 797	633 224	641 231	638 602	627 149	620 040	621 821	593 038	497 096	530 739	516 904	493 014	483 066	475 389	477 018	- 42	
3. Transport	767 405	767 405	775 098	799 272	803 717	808 441	820 798	847 111	858 360	885 766	905 579	902 861	917 048	928 644	938 446	958 323	958 876	966 921	976 898	952 930	926 439	920 924	908 952	880 527	873 694	881 212	895 261	17	
4. Other sectors	793 214	793 214	843 814	791 828	808 043	761 339	767 363	834 001	783 011	768 283	754 265	732 813	784 296	749 738	762 589	760 299	756 854	748 215	670 702	722 256	698 281	743 482	649 752	666 204	671 382	580 411	605 270	- 24	
5. Other	22 825	22 825	18 976	16 431	14 416	14 075	13 414	11 909	12 004	11 427	10 298	9 550	8 764	8 762	9 380	10 360	10 472	10 328	10 654	9 814	8 650	8 340	8 088	7 273	7 119	6 802	6 866	- 70	
B. Fugitive emissions from fuels	29 468	29 468	27 976	28 363	28 402	28 124	29 633	29 810	29 532	27 327	26 556	27 232	26 163	26 596	27 328	26 123	27 443	28 457	28 279	27 279	25 558	26 042	25 780	25 029	26 792	26 009	26 408	- 10	
1. Solid fuels	7 099	7 099	5 492	5 308	4 779	3 529	4 106	3 767	4 864	2 985	3 815	4 556	3 875	4 103	4 628	3 997	3 555	4 085	3 788	3 640	2 602	3 650	3 465	3 261	3 949	3 931	4 004	- 44	
2. Oil and natural gas and other emissions from energy production	22 369	22 369	22 484	23 055	23 623	24 595	25 526	26 042	24 667	24 342	22 741	22 675	22 288	22 493	22 700	22 126	23 888	24 372	24 491	23 639	22 956	22 392	22 316	21 768	22 843	22 078	22 403	0	
C. CO ₂ transport and storage	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	0
2. Industrial processes	325 303	325 303	298 399	283 317	276 970	294 794	304 206	297 012	302 889	300 180	291 623	304 137	292 518	291 304	301 461	312 639	308 789	311 233	316 725	296 488	233 223	254 552	253 714	240 301	237 530	242 496	243 351	- 25	
A. Mineral industry	144 999	144 999	132 455	128 404	122 838	130 734	135 151	131 151	134 158	136 891	137 475	139 982	137 222	136 890	138 631	144 604	144 619	148 483	153 751	143 500	115 343	116 866	117 415	110 377	106 078	109 160	108 442	- 25	
B. Chemical industry	56 940	56 940	54 189	52 533	50 238	53 966	58 121	58 728	57 693	56 682	56 400	59 565	56 825	54 074	56 843	58 561	60 131	57 361	60 301	56 705	48 735	53 749	55 273	53 602	52 348	51 399	51 275	- 10	
C. Metal industry	109 284	109 284	98 386	88 616	90 395	97 123	97 745	93 271	97 717	93 421	85 146	91 886	86 452	88 026	93 902	96 371	92 262	93 740	91 043	84 932	59 161	72 616	70 176	65 822	68 692	71 369	73 494	- 33	
D. Non-energy products from fuels and solvent use	13 848	13 848	13 152	13 540	13 298	12 762	12 995	13 650	13 121	13 018	12 421	12 509	11 846	12 154	11 905	12 917	11 594	11 471	11 448	11 143	9 789	11 112	10 654	10 303	10 217	10 382	9 948	- 28	
E. Electronic industry																													
F. Product uses as ODS substitutes																													
G. Other product manufacture and use	135	135	138	136	121	154	141	140	133	114	118	129	114	114	114	117	117	122	128	130	126	134	128	127	131	131	131	- 3	
H. Other	96	96	80	87	80	54	53	70	66	53	64	66	59	45	66	69	65	56	54	77	69	75	69	70	65	55	61	- 37	
3. Agriculture	15 227	15 227	12 917	11 315	10 684	10 158	11 336	11 212	11 595	11 036	10 705	10 451	10 196	10 161	10 101	11 595	9 366	9 081	9 351	9 032	9 344	9 052	9 461	9 411	10 113	10 108	10 275	- 33	
A. Enteric fermentation																													
B. Manure management																													
C. Rice cultivation																													
D. Agricultural soils																													
E. Prescribed burning of savannas																													
F. Field burning of agricultural residues																													
G. Liming	11 477	11 477	9 609	8 164	7 500	7 075	8 334	8 131	8 420	7 751	7 308	7 071	6 641	6 632	6 600	6 163	5 975	5 504	5 551	5 487	5 560	5 419	5 617	5 444	6 190	6 013	5 732	- 50	
H. Urea application	3 689	3 689	3 264	3 101	3 143	3 048	2 969	3 056	3 158	3 271	3 381	3 360	3 535	3 508	3 482	3 614	3 367	3 551	3 768	3 516	3 742	3 585	3 787	3 895	3 844	4 020	4 453	21	
I. Other carbon-containing fertilizers	61	61	44	50	42	35	33	25	16	14	16	21	20	20	19	28	23	25	32	30	42	48	57	71	79	75	91	48	
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0
4. Land use, land-use change and forestry⁽²⁾	- 251 718	- 251 718	- 277 944	- 246 599	- 248 969	- 266 350	- 283 875	- 315 190	- 313 760	- 332 408	- 351 979	- 321 736	- 342 436	- 321 563	- 301 423	- 336 633	- 335 768	- 351 083	- 315 704	- 349 255	- 349 117	- 338 985	- 328 622	- 331 284	- 336 524	- 327 877	- 323 624	29	
A. Forest land	- 382 703	- 382 703	- 415 304	- 390 086	- 393 042	- 393 713	- 407 202	- 430 229	- 426 646	- 442 611	- 463 408	- 422 786	- 444 148	- 421 378	- 398 649	- 425 426	- 424 145	- 434 292	- 402 783	- 454 011	- 466 629	- 441 173	- 438 112	- 446 181	- 451 437	- 437 866	- 423 935	11	
B. Cropland	75 086	75 086	73 119	75 511	76 212	73 002	78 293	72 932	74 102	73 446	74 650	74 251	68 712	70 816	70 837	66 657	65 692	66 600	66 993	68 038	63 796	61 406	68 224	65 857	67 688	66 907	60 351	- 20	
C. Grassland	25 549	25 549	21 888	21 035	23 312	20 421	14 582	14 666	16 667	14 692	13 334	11 582	10 079	12 046	11 461	11 288	10 471	16 773	9 486	10 417	9 486	10 417	7 430	5 507	2 888	3 400	2 565	- 90	
D. Wetlands	17 930	17 930	18 007	17 404	16 767	18 141	17 735	17 666	17 699	16 108	18 774	17 419	18 460	19 524	19 491	18 898	19 885	20 526	19 309	18 972	19 309	19 200	19 522	18 759	19 766	19 240	19 455	9	
E. Settlements	36 093	36 093	38 363	37 249	40 620	38 597	39 746	37 625	38 813	39 035	40 566	39 557	39 540	40 172	41 088	43 070	43 734	45 803	47 603	48 648	49 659	48 785	48 673	48 154	47 981	48 744	46 971	30	
F. Other land	2 551	2 551	2 135	1 861	1 550	1 379	- 3	- 35	- 68	- 112	- 122	898	756	578	487	405	322	1 769	- 170	- 297	- 103	- 39	176	504	- 28	- 74	20	- 99	
G. Harvested wood products	- 26 224	- 26 224	- 16 153	- 9 574	- 14 387	- 25 212	- 28 243	- 28 778	- 35 131	- 35 748	- 37 835	- 45 022	- 37 378	- 41 822	- 47 131	- 52 053	- 52 854	- 62 230	- 63 664	- 40 297	- 25 747	- 34 751	- 32 750	- 26 721	- 23 486	- 28			

Table 1 - Emission trends (CH₄)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year ⁽¹⁾	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Change from base to latest reported year	
	(kt)																									%			
1. Energy	7 757	7 757	7 345	7 027	6 931	6 398	6 354	6 217	5 928	5 530	5 327	5 106	5 117	4 853	4 753	4 487	4 352	4 155	3 986	4 000	3 808	3 858	3 741	3 777	3 656	3 493	3 496	- 55	
A. Fuel combustion (sectoral approach)	1 300	1 300	1 314	1 211	1 239	1 129	1 120	1 175	1 107	1 041	1 015	952	947	890	930	913	931	935	952	1 006	997	1 073	980	1 041	1 048	963	986	- 24	
1. Energy industries	50	50	51	50	52	56	64	70	70	73	74	70	71	73	86	86	90	99	106	111	115	131	133	139	150	153	157	212	
2. Manufacturing industries and construction	60	60	57	57	56	58	64	65	67	69	71	76	78	80	87	95	97	84	88	86	74	81	82	85	91	84	85	43	
3. Transport	262	262	251	249	250	224	213	207	196	187	177	161	151	140	130	121	111	102	93	85	76	71	65	59	56	54	52	- 80	
4. Other sectors	916	916	944	848	877	788	777	830	771	710	692	644	645	594	625	609	630	647	662	721	730	788	699	756	749	670	690	- 25	
5. Other	12	12	10	6	4	3	2	2	2	2	2	1	3	3	3	2	3	3	2	2	2	2	1	1	1	1	2	- 85	
B. Fugitive emissions from fuels	6 457	6 457	6 031	5 817	5 692	5 269	5 234	5 042	4 821	4 489	4 312	4 154	4 170	3 963	3 824	3 575	3 422	3 220	3 034	2 994	2 811	2 785	2 760	2 736	2 609	2 530	2 510	- 61	
1. Solid fuels	3 822	3 822	3 565	3 442	3 308	2 925	2 961	2 824	2 741	2 475	2 377	2 292	2 344	2 140	2 018	1 819	1 679	1 567	1 434	1 416	1 301	1 260	1 255	1 275	1 165	1 126	1 153	- 70	
2. Oil and natural gas and other emissions from energy production	2 635	2 635	2 466	2 374	2 384	2 344	2 273	2 218	2 080	2 014	1 935	1 862	1 826	1 823	1 806	1 756	1 743	1 653	1 600	1 578	1 510	1 525	1 506	1 461	1 443	1 404	1 357	- 49	
C. CO ₂ transport and storage																													
2. Industrial processes	73	73	70	71	71	77	75	73	74	72	73	75	74	75	80	79	81	82	82	74	66	71	68	67	65	68	66	- 9	
A. Mineral industry																													
B. Chemical industry	57	57	56	58	59	63	61	60	61	59	61	63	62	62	67	66	67	66	66	61	56	61	57	56	55	58	56	- 3	
C. Metal industry	11	11	10	9	9	10	10	9	10	9	9	9	9	8	9	9	11	11	11	10	6	6	7	7	6	7	6	- 45	
D. Non-energy products from fuels and solvent use	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	- 56	
E. Electronic industry																													
F. Product uses as ODS substitutes																													
G. Other product manufacture and use	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	45	
H. Other	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	- 63	
3. Agriculture	12 239	12 239	11 671	11 282	11 002	10 859	10 800	10 805	10 677	10 596	10 515	10 365	10 223	10 078	10 058	9 931	9 860	9 814	9 882	9 774	9 730	9 543	9 499	9 450	9 418	9 572	9 667	- 21	
A. Enteric fermentation	9 869	9 869	9 455	9 082	8 834	8 711	8 651	8 652	8 524	8 444	8 377	8 229	8 121	7 970	7 924	7 827	7 788	7 744	7 785	7 752	7 682	7 590	7 513	7 498	7 534	7 616	7 689	- 22	
B. Manure management	2 172	2 172	2 033	2 001	1 978	1 962	1 966	1 956	1 969	1 966	1 963	1 966	1 963	1 963	1 981	1 958	1 925	1 923	1 924	1 873	1 879	1 782	1 808	1 761	1 704	1 778	1 794	- 17	
C. Rice cultivation	111	111	106	105	104	109	108	114	115	110	105	102	102	104	107	112	108	105	107	100	112	114	114	111	104	101	104	- 6	
D. Agricultural soils	IE.NE.NO	IE.NE.NO	IE.NE.NO	IE.NE.NO	IE.NE.NO	IE.NE.NO	IE.NE.NO	IE.NE.NO	IE.NE.NO	IE.NE.NO	IE.NE.NO	IE.NE.NO	IE.NE.NO	IE.NE.NO	IE.NE.NO	IE.NE.NO	IE.NE.NO	IE.NE.NO	IE.NE.NO	IE.NE.NO	IE.NE.NO	IE.NE.NO	IE.NE.NO	IE.NE.NO	IE.NE.NO	IE.NE.NO	IE.NE.NO	IE.NE.NO	0
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0
F. Field burning of agricultural residues	87	87	76	94	86	76	74	82	68	76	68	66	36	40	42	30	29	29	48	28	30	25	25	38	26	25	28	- 68	
G. Liming																													
H. Urea application																													
I. Other carbon-containing fertilizers																													
J. Other	0	0	0	0	0	0	0	0	0	1	1	1	2	2	3	4	10	14	18	21	26	32	40	42	50	52	52	477 864	
4. Land use, land-use change and forestry	275	275	249	239	272	359	337	299	297	310	253	293	248	229	281	229	247	219	285	209	220	216	213	251	198	195	202	- 27	
A. Forest land	155	155	138	138	160	146	127	120	137	148	123	151	122	117	148	113	128	112	151	101	105	102	99	124	93	94	100	- 35	
B. Cropland	27	27	28	27	27	27	27	27	27	27	27	26	26	26	27	26	27	27	27	27	27	28	28	28	28	28	28	2	
C. Grassland	72	72	61	58	69	71	52	51	58	66	50	65	55	48	61	54	54	52	80	54	59	54	59	71	44	48	47	- 34	
D. Wetlands	10	10	10	9	11	11	12	12	11	10	10	11	13	10	15	12	10	10	11	11	10	13	11	10	11	11	11	4	
E. Settlements	3	3	3	3	3	3	3	3	3	3	4	3	3	3	3	3	4	4	4	4	5	4	4	4	4	4	4	36	
F. Other land	7	7	9	3	3	4	9	6	2	10	4	9	6	5	11	6	12	4	1	1	4	6	4	5	7	1	3	- 59	
G. Harvested wood products																													
H. Other	IE.NE.NO	IE.NE.NO	IE.NE.NO	IE.NE.NO	IE.NE.NO	98	108	80	60	45	35	27	22	18	16	14	12	11	11	10	10	9	9	9	9	9	9	100	
5. Waste	9 067	9 067	9 256	9 199	9 210	9 211	9 280	9 278	9 162	9 035	8 836	8 713	8 558	8 401	8 152	7 822	7 566	7 358	7 098	6 760	6 491	6 215	5 995	5 786	5 463	5 205	5 012	- 45	
A. Solid waste disposal	7 665	7 665	7 893	7 861	7 896	7 943	8 000	8 013	7 925	7 814	7 645	7 533	7 458	7 308	7 049	6 724	6 501	6 304	6 069	5 770	5 525	5 230	5 010	4 813	4 484	4 220	4 022	- 48	
B. Biological treatment of solid waste	15	15	16	18	21	26	31	35	38	42	47	53	58	66	73	78	88	94	102	105	112	124	133	145	155	166	174	1 083	
C. Incineration and open burning of waste	22	22	22	22	21	20	19	19	16	16	16	16	16	16	17	17	17	17	16	16	16	16	16	16	16	16	16	- 26	
D. Waste water treatment and discharge	1 364	1 364	1 323	1 296	1 270	1 221	1 229	1 210	1 183	1 162	1 127	1 109	1 025	1 009	1 012	1 002	959	943	910	868	836	844	835	811	807	802	799	- 41	
E. Other	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	- 37	
6. Other (as specified in summary 1.A)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0	
Total CH₄ emissions without CH₄ from LULUCF	29 136	29 136	28 342	27 579	27 214	26 543	26 509	26 372	25 841	25 233	24 751	24 259	23 973	23 407	23 044	22 319	21 859	21 409	21 048	20 609	20 095	19 687	19 302	19 079	18 603	18 337	18 241	- 37	
Total CH₄ emissions with CH₄ from																													

Table 1 - Emission trends (HFCs, PFCs and SF₆)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year ⁽¹⁾	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Change from base to latest reported year	
	(kt)																									%			
Emissions of HFCs and PFCs - (kt CO₂ equivalent)	60 836	60 836	58 013	56 107	58 095	62 072	66 620	71 666	78 177	78 859	69 941	67 209	65 065	70 691	74 382	76 561	81 579	85 027	90 659	97 221	98 793	106 590	109 186	111 923	114 457	116 418	111 429	83	
Emissions of HFCs - (kt CO₂ equivalent)	29 125	29 125	29 148	31 574	34 497	39 139	43 734	50 933	58 792	60 440	52 104	53 224	52 527	56 296	63 056	66 939	73 273	77 666	83 839	91 069	94 211	102 223	104 679	107 945	110 212	112 695	107 611	269	
HFC-23	2	2	2	2	2	2	2	3	3	3	2	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	- 95
HFC-32	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	2	2	2	3	3	3	4	4	4	4	21 567 020
HFC-41	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0
HFC-43-10mee	NO,NE,IE	NO,NE,IE	NO,NE,IE	NO,NE,IE	NO,NE,IE	NO,NE,IE	NO,NE,IE	NO,NE,IE	NO,NE,IE	NO,NE,IE	NO,NE,IE	NO,NE,IE	NO,NE,IE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100
HFC-125	0	0	0	0	0	0	0	0	1	1	1	2	2	3	3	4	5	5	6	7	7	8	9	9	10	10	10	10	112 694
HFC-134	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0
HFC-134a	0	0	0	1	3	3	4	6	8	10	11	13	15	16	18	20	22	23	24	26	26	27	27	27	28	28	28	28	602 810
HFC-143	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0
HFC-143a	1	1	1	0	0	0	0	0	0	1	1	2	2	2	3	3	4	4	5	5	5	6	6	6	6	6	6	6	1 061
HFC-152	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0
HFC-152a	0	0	0	0	0	0	1	1	1	1	1	2	3	4	4	4	3	4	4	4	4	4	4	4	4	3	3	3	1 985 325
HFC-161	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0
HFC-227ea	NO,NE,IE	NO,NE,IE	NO,NE,IE	NO,NE,IE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100
HFC-236cb	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0
HFC-236ea	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0
HFC-236fa	NO	NO	NO	NO	NO	NO	NO	NO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100
HFC-245ca	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0
HFC-245fa	NO,NE,IE	NO,NE,IE	NO,NE,IE	NO,NE,IE	NO,NE,IE	NO,NE,IE	NO,NE,IE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	100
HFC-365mfc	NO,NE,IE	NO,NE,IE	NO,NE,IE	NO,NE,IE	NO,NE,IE	NO,NE,IE	NO,NE,IE	NO,NE,IE	NO,NE,IE	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	100
Unspecified mix of HFCs ⁽²⁾ - (kt CO ₂ equivalent)	2	2	4	6	37	154	250	608	1 427	1 295	1 117	913	648	478	453	485	501	553	657	752	691	674	899	957	878	784	739	30 077	
Emissions of PFCs - (kt CO₂ equivalent)	25 870	25 870	23 496	19 182	18 258	17 607	17 277	16 605	15 402	14 566	14 186	12 188	10 839	12 560	10 283	8 734	7 353	6 558	6 092	5 219	3 353	3 878	4 246	3 700	3 959	3 502	3 576	- 86	
CF ₄	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	- 88
C ₂ F ₆	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	- 94
C ₃ F ₈	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	- 16
C ₄ F ₁₀	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	- 35
i-C ₄ F ₁₀	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	- 62
C ₅ F ₁₂	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	- 100
C ₆ F ₁₄	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	- 66
C ₁₀ F ₁₈	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0
i-C ₄ F ₈	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0
Unspecified mix of PFCs ⁽²⁾ - (kt CO ₂ equivalent)	314	314	328	343	406	398	556	481	440	405	472	510	532	480	601	661	744	744	840	782	634	708	734	756	680	593	550	75	
Emissions of SF₆ - (kt CO₂ equivalent)	5 841	5 841	5 369	5 350	5 340	5 327	5 609	4 128	3 983	3 853	3 651	1 796	1 698	1 835	1 042	887	952	803	727	933	1 229	489	262	278	285	220	242	- 96	
Emissions of SF₆ - (kt CO₂ equivalent)	11 003	11 003	11 458	12 282	12 967	14 142	15 193	15 063	13 581	12 845	10 544	10 586	9 731	8 594	8 105	8 111	7 920	7 490	7 081	6 708	6 306	6 431	6 216	6 272	6 188	6 136	6 413	- 42	
SF ₆	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	- 42
Emissions of NF₃ - (kt CO₂ equivalent)	24	24	25	27	29	32	100	94	102	77	75	103	82	134	147	132	156	141	163	149	77	119	127	93	68	74	69	191	
NF ₃	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	191	

CTF Table 2: Description of quantified economy-wide emission reduction

Emission reduction target: base year and target		Comments
Base year/ base period Emission reductions target (% of base year/base period)	1990	Legally binding target trajectories for the period 2013- 2020 are enshrined in both the EU-ETS Directive (Directive 2003/87/EC and respective amendments) and the Effort Sharing Decision (Decision No 406/2009/EC). These legally binding trajectories not only result in a 20 % GHG reduction in 2020 compared to 1990 but also define the EU's annual target pathway to reduce EU GHG emissions from 2013 to 2020. The Effort Sharing Decision sets annual national emission targets for all Member States for the period 2013-2020 for those sectors not covered by the EU emissions trading system (ETS), expressed as percentage changes from 2005 levels. In March 2013, the Commission formally adopted the national annual limits throughout the period for each Member State. By 2020, the national targets will collectively deliver a reduction of around 10 % in total EU emissions from the sectors covered compared with 2005 levels. The emission reduction to be achieved from the sectors covered by the EU ETS will be 21 % below 2005 emission levels
Emission reductions target (% of 1990)	20 %	
Period for reaching target	BY-2020	

Gases and sectors covered. GWP values.				Comments
Gases covered	Covered	Base Year	GWP reference source	
CO ₂	Yes	1990	IPCC AR4	As adopted in UNFCCC reporting guidelines for national GHG inventories of Annex I Parties and as adopted under the EU Monitoring Mechanism Regulation
CH ₄	Yes	1990	IPCC AR4	As adopted in UNFCCC reporting guidelines for national GHG inventories of Annex I Parties and as adopted under the EU Monitoring Mechanism Regulation
N ₂ O	Yes	1990	IPCC AR4	As adopted in UNFCCC reporting guidelines for national GHG inventories of Annex I Parties and as adopted under the EU Monitoring Mechanism Regulation
HFCs	Yes	1990	IPCC AR4	As adopted in UNFCCC reporting guidelines for national GHG inventories of Annex I Parties and as adopted under the EU Monitoring Mechanism Regulation

Gases and sectors covered. GWP values.				
Gases covered	Covered	Base Year	GWP reference source	Comments
PFCs	Yes	1990	IPCC AR4	As adopted in UNFCCC reporting guidelines for national GHG inventories of Annex I Parties and as adopted under the EU Monitoring Mechanism Regulation
SF ₆	Yes	1990	IPCC AR4	As adopted in UNFCCC reporting guidelines for national GHG inventories of Annex I Parties and as adopted under the EU Monitoring Mechanism Regulation
NF ₃	NO		IPCC AR4	

Sectors covered	Covered	Comment:
Energy	Yes	
Transport	Yes	
Industrial processes	Yes	
Agriculture	Yes	
LULUCF	No	
Waste	Yes	
Other sectors (specify)		
Aviation in the scope of the EUETS		In principle, the EU ETS should cover CO ₂ emissions of all flights arriving at, and departing from, airports in all EU Member States, Norway, Iceland and Liechtenstein and closely related territories. However, since 2012, flights to and from aerodromes from other countries have not been included in the EU ETS. This exclusion was taken in order to facilitate negotiation of a global agreement to address aviation emissions in the forum of the International Civil Aviation Organisation (ICAO). The EU has decided on a reduced scope in the 2013–2016 period (Regulation (EU) No 421/2014 of the European Parliament and of the Council of 16 April 2014)

Role of LULUCF sector		
LULUCF in base year level and target	excluded	
Contribution of LULUCF is calculated using		

Possible scale of contributions of market-based mechanisms: Sectors covered	Comments
Possible scale of contributions of market-based mechanisms under the convention	The 2020 Climate and Energy Package allows Certified Emission Reductions (CERs) and Emission Reduction Units (ERUs) to be used for compliance purposes, subject to a number of restrictions in terms of origin and type of project and up to an established limit. In addition, the legislation foresees the possible recognition of units from new market mechanisms. Under the EU ETS the limit does not exceed 50 % of the required reduction below 2005 levels. In the sectors not covered by the ETS, annual use shall not exceed to 3 % of each Member States' non-ETS greenhouse gas emissions in 2005. A limited number of Member States may use an additional 1 %, from projects in LDCs or SIDS subject to conditions.
CERs	The use of these units under the ETS Directive and the Effort Sharing Decision is subject to the limits specified above which do not separate between CERs and ERUs, but include additional criteria for the use of CERs.
ERUs	The use of these units under the ETS Directive and the Effort Sharing Decision is subject to the limits specified above which do not separate between CERs and ERUs, but include additional criteria for the use of CERs.
AAUs	AAUs for the period 2013-2020 have not yet been determined. The EU expects to achieve its 20 % target for the period 2013-2020 with the implementation of the ETS Directive and the ESD Decision in the non-ETS sectors which do not allow the use of AAUs from non-EU Parties.
Carry-over units	The time-period of the Convention target is from 1990-2020, no carry-over units will be used to achieve the 2020 target.
Other mechanism units under the Convention (specify)	There are general provisions in place in the EU legislation that allow for the use of such units provided that the necessary legal arrangements for the creation of such units have been put in place in the EU which is not the case at the point in time of the provision of this report.

Any other information:	In December 2009, the European Council reiterated the conditional offer of the EU to move to a 30 % reduction by 2020 compared to 1990 levels as part of a global and comprehensive agreement for the period beyond 2012, provided that other developed countries commit themselves to comparable emission reductions and that developing countries contribute adequately according to their responsibilities and respective capabilities.
Possible scale of contributions of other market-based mechanisms	None

CTF Table 3: Progress in achievement of the quantified economy-wide emission reduction target: information on mitigation actions and their effects

Name of mitigation action ^a	Sectors affected ^b	GHGs affected	Objective and/or activity affected	Type of instrument ^c	Status of implementation ^d	Brief description ^e	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact (not cumulative, in kt CO ₂ eq)					Comment
									2010 ^f	2015 ^f	2020	2025 ^f	2030 ^f	
Directive 2009/29/EC and 2003/87/EC EU-Emission trading system	cross-cutting	CO ₂ , N ₂ O, PFC	Cost-efficient reduction of emissions	Regulatory	Implemented	Putting a market price to carbon and giving a financial value to each tonne of emissions saved	2005	CION/MS	NE	NE	NE	NE	NE	For 2020 the mitigation impact is estimated at 21% compared to 2005 levels. A revision has been proposed with the aim of achieving a 43 % reduction of emissions by 2030 compared to 2005 levels.
Decision No 406/2009/EC Effort Sharing Decision	cross-cutting	CO ₂ ,CH ₄ N ₂ O,HFC, PFC, SF ₆	GHG emissions reduction in sectors not included in the EU ETS.	Regulatory	Implemented	Binding GHG emissions targets for MS for the years 2013-2020 for sectors not included in the EU ETS	2013	MS need to implement national measures and policies to limit emissions from sectors covered here	NA	NE	NE	NE	NE	For 2020 the mitigation impact is estimated at 10 % compared to 2005 levels.
CCS Directive	cross-cutting	CO ₂	Geological storage of CO ₂	Regulatory	Implemented	Establishes a legal framework for the environmentally safe geological storage of CO ₂	2009	MS	NE	NE	NE	NE	NE	Further information on the CCS Directive can be found in the EU's 1st Biennial Report chapter 4.2.4
Taxation of Energy Products and Electricity	cross-cutting	CO ₂ , CH ₄ , N ₂ O	Sets minimum levels of taxation of energy products used as motor fuel or as heating fuel and for electricity	Regulatory	Implemented	The Directive covers electricity and all energy products consumed as motor fuel, heating fuel, and provides for common taxation rules and common minimum EU levels of taxation	2003	MS	NE	NE	NE	NE	NE	The current status of the revision to the Taxation of Energy Products Electricity Directive is explained in chapter 3.2 of the EU's 2nd Biennial Report. For further background information on the original directive see EU's 1st Biennial report, chapter 4.2.5
Horizon 2020	cross-cutting	Other (Not directly affected)	EU research and development programme (Horizon 2020) for 2014- 2020. Contains objective of reaching 35% climate related expenditures.	Research	Implemented	Horizon 2020 is the largest ever EU Research and Innovation programme, with nearly €80 billion of funding available over seven years (2014 to 2020)..	2014	CION/EP, MS and others	NA	NE	NE	NE	NE	The Horizon 2020 programme is explained in more detail in chapter 3.2 of the EU's 2nd Biennial report. For more information on other PaMs targeting research and observation, see the EU's 1st Biennial report, chapter 4.2.6
European Structural and Investment Funds (ESIF) and	cross-cutting	CO ₂ , CH ₄ , N ₂ O	The five ESI Funds represent the biggest EU budget (of more than €450 billion) for the implementation of the Europe 2020 strategy for smart, sustainable and inclusive growth for the 2014-2020 period.	Fiscal	Implemented	ESI Funds includes five funds: European regional development fund, European social fund, Cohesion fund, European agricultural fund for rural development, and European maritime and fisheries fund. They provide investments in, for example, climate, lowcarbon economy, environmental protection and sustainable management of natural resources, and innovation.	2014	CION/MS	NA	NE	NE	NE	NE	The European Structural and Investment Funds are explained in more detail in chapter 3.2 of the EU's 2nd Biennial report.
National Emissions Ceilings Directive (2016/2284)	cross-cutting	Atmospheric pollutants: NO _x , SO ₂ , NMVOC, NH ₃ , PM _{2.5} and CH ₄	To reduce adverse health impacts of air pollution, including reducing the cases of premature deaths per year due to air pollution by more than half.	Regulatory	Implemented	National emission reduction commitments for each Member State for 2030 (with interim targets also set for 2025) for six specific pollutants	2001	CION/MS	NE	NE	NE	NE	NE	The revised National Emissions Ceiling Directive is explained in chapter 3.2 of the EU's 2nd Biennial report. For further information on the original directive see the EU's 1st Biennial report, chapter 4.2.8

Directive 2009/28/EC on the promotion of the use of energy from renewable sources	Energy, transport	CO2	20 % share of renewable sources in EU total gross final energy consumption in 2020 (electricity, heat and transport)	Regulatory	Implemented	The Directive promotes the increase of renewables in the energy supply sector, such as the transport sector and it supports cooperation between Member States.	2010	MS	NE	NE	750 000	NE	NE	Estimated impact range: 600-900 Mt (2020). Source: Citizens' Summary of 23 January 2008 See chapter 3.3.1 of the EU's 2nd Biennial Report. A revision has been proposed to ensure that the target of at least 27% renewables in the final energy consumption in the EU by 2030 is met.
2020 Climate & Energy Package (COM(2008) 30 final)	Cross-cutting	CO2, CH4, N2O, HFC, PFC, SF6	20 % cut in greenhouse gas emissions, 20 % share of renewable energy, 20 % increase in energy efficiency	Regulatory	Implemented	The 2020 climate & energy package is a set of binding legislation to ensure that the EU meets its climate and energy targets for the year 2020.	2009	CION/MS	NA	NE	NE	NE	NE	The 2020 Climate and Energy package provides the emission reduction target. The mitigation impact results from a wide range of measures. See chapter 3.3 of the EU's 2nd Biennial Report.
2030 Framework for Climate and Energy (COM(2014) 15 final)	Cross-cutting	CO2, CH4, N2O, HFC, PFC, SF6, NF3	At least 40 % cut in greenhouse gas emissions, at least 27 % share of renewable energy, at least 27 % increase in energy efficiency	Regulatory	Adopted	It provides the framework and defines the targets to help the EU achieve a more competitive, secure and sustainable energy system and to meet its long-term 2050 greenhouse gas reductions target.	2014	CION/MS	NA	NE	NE	NE	NE	The 2030 Framework for Climate and Energy provides the emission reduction target. The mitigation impact results from a wide range of measures. As part of the Clean Energy for All Package, the Commission has proposed to set a binding EU-level energy efficiency target of 30 % by 2030. See chapter 3.3 of the EU's 2nd Biennial Report.
Energy Union Strategy (COM(2015) 80 final)	Energy	CO2	Ensure that Europe has secure, affordable and climate-friendly energy	Regulatory	Adopted	It provides the framework for supply security, a fully-integrated internal energy market, energy efficiency and greenhouse gas emission reductions in the EU energy sector.	2015	CION/MS	NA	NE	NE	NE	NE	The strategy is in line with the 2030 Framework for Climate and Energy (COM(2014) 15 final). The mitigation impact is given in the CTF table under that policy. See chapter 3.3 of the EU's 2nd Biennial Report.
Biomass Action Plan	Energy	CO2	Increase use of biomass for electricity and heat production and transport	Regulatory	Adopted	Sets out Community actions to increase the demand for biomass, improve supply, overcome technical barriers and develop research.	2005	MS	148 000	NE	NE	NE	NE	Impact includes reductions in the transport sector, SEC(2005) 1573. See chapter 3.4.2 of the EU's 2nd Biennial Report.
Directive 2010/31/EU on the energy performance of buildings	Energy	CO2	Improve the energy performance of new buildings and of existing buildings	Regulatory	Implemented	The Directive obliges Member States to set minimum standards for the energy performance of new buildings and existing buildings that are subject to major renovation work.	2012	MS	NE	NE	185 000	NE	NE	Estimated impact range: 160000-210000kt (2020). Source: SEC(2008) 2864. See chapter 3.3.2 of the EU's 2nd Biennial Report. A revision has been proposed to, amongst others, accelerate the decarbonisation of buildings by significantly increasing renovation rates
Directive 2012/27/EU on energy efficiency	Energy, Industry/industrial processes	CO2	Reduction of barriers in the energy market and avoiding market failure, increase of energy efficiency at all stages of the energy chain.	Regulatory	Adopted	The Directive establishes a common framework of measures for the promotion of energy efficiency and supports the Energy Efficiency Plan 2011.	2014	MS	NE	NE	NE	NE	NE	(impact not estimated) See chapter 3.3.2 of the EU's 2nd Biennial Report. A revision has been proposed to make the policy consistent a 30% improvement in energy efficiency by 2030
Directive 2009/125/EC establishing a framework for the setting of eco-design requirements for energy-related products	Energy	CO2	Reduce energy consumption	Regulatory	Implemented	This is the framework Directive for eco-design requirements and one of the major cornerstones of the Community Strategy on Integrated Product Policy, together with the Energy Labelling Directive.	2009	CION/MS	NE	NE	NE	NE	NE	Impact estimated separately for each product category (see related eco-design regulations below). See chapter 3.3.3 of the EU's 2nd Biennial Report.

Eco-design requirements for glandless standalone circulators and glandless circulators integrated in products (COM REG (EC) 641/2009)	Energy	CO2	Reduce energy consumption	Regulatory	Implemented	The Regulation sets minimum standards for glandless standalone circulators and circulator integrated products, including the requirement for Energy labelling (see Reg. (EC) 622/2012)	2009	CION/MS/industry	NE	NE	12 000	NE	NE	SEC(2009) 1016 final. See chapter 3.3.3 of the EU's 2nd Biennial Report.
Eco-design requirements for fluorescent lamps without integrated ballast, for high intensity discharge lamps, and for ballasts and luminaires able to operate such lamps (COM REG (EC) 245/2009 amended by COM REG (EU) 347/2010)	Energy	CO2	Reduce energy consumption	Regulatory	Implemented	The Regulation sets minimum standards for fluorescent lamps, high discharge lamps, ballasts and luminaires able to operate such lamps, including the requirement for Energy labelling. (see Reg. (EU) 874/2012)	2009	CION/MS/industry	NE	15 300	NE	NE	NE	SEC(2009) 324. See chapter 3.3.3 of the EU's 2nd Biennial Report.
Eco-design requirements for non-directional household lamps, amendment is replacing functionality requirements for lamps excluding compact fluorescent lamps and LED lamps (COM REG No 245/2009 amended by COM REG (EC) 2015/1428)	Energy	CO2	Reduce energy consumption	Regulatory	Implemented	The Regulation sets minimum standards for non-directional household lamps, including the requirement for Energy labelling (see Reg. (EU) 874/2012).	2009	CION/MS/industry	NE	NE	15 400	NE	NE	SEC(2009) 327. See chapter 3.3.3 of the EU's 2nd Biennial Report.
Eco-design requirements for household refrigerating appliances (COM REG (EC) 643/2009)	Energy	CO2	Reduce energy consumption	Regulatory	Implemented	The Regulation sets minimum standards for household refrigerating appliances, including the requirement for Energy labelling (see Reg. (EU) 1060/2010).	2009	CION/MS/industry	NE	NE	2 000	6 000	NE	SEC(2009) 1020 final. See chapter 3.3.3 of the EU's 2nd Biennial Report.
Eco-design requirements for no-load condition electric power consumption and average active efficiency of external power supplies (COM REG (EC) 278/2009)	Energy	CO2	Reduce energy consumption	Regulatory	Implemented	The Regulation sets minimum standards for no-load condition electric power consumption and average active efficiency of external power supplies; Energy labelling has not been introduced.	2009	CION/MS/industry	NE	NE	36 000	NE	NE	SEC(2009) 434. See chapter 3.3.3 of the EU's 2nd Biennial Report.
Eco-design requirements for simple set-top boxes (COM REG (EC) 107/2009)	Energy	CO2	Reduce energy consumption	Regulatory	Implemented	The Regulation sets minimum standards for simple set-top boxes; Energy labelling has not been introduced.	2009	CION/MS/industry	NE	NE	17 000	NE	NE	SEC(2009) 114 final. See chapter 3.3.3 of the EU's 2nd Biennial Report.
Eco-design requirements for standby and off mode electric power consumption of electrical and electronic household and office equipment (COM REG (EC) 1275/2008)	Energy	CO2	Reduce energy consumption	Regulatory	Implemented	The Regulation sets minimum standards for standby and off mode electric power consumption of electrical and electronic household and office equipment; Energy labelling has not been introduced.	2009	CION/MS/industry	NE	NE	14 000	NE	NE	SEC(2008) 3071. See chapter 3.3.3 of the EU's 2nd Biennial Report.
Eco-design requirements for household tumble driers (COM REG (EU) 932/2012)	Energy	CO2	Reduce energy consumption	Regulatory	Implemented	The Regulation sets minimum standards for household tumble driers, including the requirement for Energy labelling (see Reg. (EU) 392/2012)	2012	CION/MS/industry	NE	400	1 500	2 900	3 800	SWD(2012) 289. See chapter 3.3.3 of the EU's 2nd Biennial Report.
Eco-design requirements for water pumps (COM REG (EU) 547/2012)	Energy	CO2	Reduce energy consumption	Regulatory	Implemented	The Regulation sets minimum standards for water pumps; Energy labelling has not been introduced.	2012	CION/MS/industry	NE	NE	NE	NE	NE	Impact assessment shows ranges between 1200 and 2100 kt in 2020. Source: SWD(2012) 178 final. See chapter 3.3.3 of the EU's 2nd Biennial Report.
Eco-design requirements for air conditioners and comfort fans (COM REG (EU) 206/2012)	Energy	CO2	Reduce energy consumption	Regulatory	Implemented	The Regulation sets minimum standards for air conditioners and comfort fans, including the requirement for Energy labelling (see Reg. (EU) 626/2011)	2012	CION/MS/industry	NE	1 700	3 800	5 500	6 000	SWD(2012) 35 final. See chapter 3.3.3 of the EU's 2nd Biennial Report.

Eco-design requirements for industrial fans (COM REG (EU) 327/2011)	Energy	CO2	Reduce energy consumption	Regulatory	Implemented	The Regulation sets minimum standards for industrial fans; Energy labelling has not been introduced.	2011	CION/MS/industry	NE	9 600	24 800	41 600	NE	SEC(2011) 384 final. See chapter 3.3.3 of the EU's 2nd Biennial Report.
Eco-design requirements for household dishwashers (COM REG (EU) 1016/2010)	Energy	CO2	Reduce energy consumption	Regulatory	Implemented	The Regulation sets minimum standards for household dishwashers, including the requirement for Energy labelling (see Reg. (EU) 1059/2010)	2010	CION/MS/industry	NE	NE	500	1 800	NE	SEC(2010) 1356 final. See chapter 3.3.3 of the EU's 2nd Biennial Report.
Eco-design requirements for household washing machines (COM REG (EU) 1015/2010)	Energy	CO2	Reduce energy consumption	Regulatory	Implemented	The Regulation sets minimum standards for household washing machines, including the requirement for Energy labelling (see Reg. (EU) 1061/2010)	2010	CION/MS/industry	NE	NE	800	NE	NE	SEC(2010) 1354. See chapter 3.3.3 of the EU's 2nd Biennial Report.
Eco-design requirements for directional lamps, light emitting diode lamps and related equipment (COM REG No 1194/2012 amended by COM REG (EC) 2015/1428)	Energy	CO2	Reduce energy consumption	Regulatory	Implemented	The Regulation sets minimum standards for directional lamps, light emitting diode lamps and related equipment, including the requirement for Energy labelling (see Reg. (EU) 874/2012)	2013	CION/MS/industry	NE	NE	9 500	10 300	NE	SWD(2012) 0419. See chapter 3.3.3 of the EU's 2nd Biennial Report.
Eco-design requirements for space heaters and combination heaters (COM REG (EU) 813/2013)	Energy	CO2	Reduce energy consumption	Regulatory	Implemented	The Regulation aims to set minimum standards for space heaters and combination heaters.	2013	CION/MS/industry	NE	NE	110 000	NE	NE	SWD(2013) 296. See chapter 3.3.3 of the EU's 2nd Biennial Report.
Eco-design requirements for computers and computer servers (COM REG (EU) 617/2013)	Energy	CO2	Reduce energy consumption	Regulatory	Implemented	The Regulation sets minimum standards for computers and servers.	2013	CION/MS/industry	NE	NE	4 200	NE	NE	SWD(2013) 219. See chapter 3.3.3 of the EU's 2nd Biennial Report.
Eco-design requirements for vacuum cleaners (COM REG (EU) 666/2013)	Energy	CO2	Reduce energy consumption	Regulatory	Implemented	The Regulation sets minimum standards for vacuum cleaners including the requirement for energy labelling.	2013	CION/MS/industry	NE	NE	6 000	NE	NE	SWD(2013) 240. See chapter 3.3.3 of the EU's 2nd Biennial Report.
Eco-design requirements for domestic ovens, hobs and range hoods (COM REG (EU) 66/2014)	Energy	CO2	Reduce energy consumption	Regulatory	Implemented	The Regulation sets minimum standards for domestic ovens, hobs and range hoods including the requirement for energy labelling.	2014	CION/MS/industry	NE	NE	1 200	NE	2 600	SWD(2014) 3. See chapter 3.3.3 of the EU's 2nd Biennial Report.
Eco-design requirements for small, medium and large power transformers (COM REG (EU) 548/2014)	Energy	CO2	Reduce energy consumption	Regulatory	Implemented	The Regulation sets minimum standards for power transformers.	2014	CION/MS/industry	NE	NE	NE	4 000	NE	SWD(2014) 161. See chapter 3.3.3 of the EU's 2nd Biennial Report.
Eco-design requirements for ventilator units (COM REG (EU) 1253/2014)	Energy	CO2	Reduce energy consumption	Regulatory	Implemented	The Regulation sets minimum standards for ventilators including the requirement for energy labelling.	2014	CION/MS/industry	NE	NE	NE	NE	80 000	SWD(2014) 223. See chapter 3.3.3 of the EU's 2nd Biennial Report.
Eco-design requirements for television and networked standby losses (COM REG (EU) 801/2013)	Energy	CO2	Reduce energy consumption	Regulatory	Implemented	The Regulation sets minimum standards for television, including the requirement for energy labelling.	2013	CION/MS/industry	NE	NE	11 700	NE	NE	SWD(2013) 305. See chapter 3.3.3 of the EU's 2nd Biennial Report.
Eco-design requirements for water heaters and hot water storage tanks (COM REG (EU) 814/2013)	Energy	CO2	Reduce energy consumption	Regulatory	Implemented	The Regulation sets minimum standards for water heaters and hot water storage tanks, including the requirement for energy labelling.	2013	CION/MS/industry	NE	NE	20 000	NE	NE	SWD (2013) 294. See chapter 3.3.3 of the EU's 2nd Biennial Report.
Eco-design requirements for electric motors (COM REG (EU) 4/2014; amendment of COM REG (EC) 640/2009)	Energy	CO2	Reduce energy consumption	Regulatory	Implemented	The Regulation sets minimum standards for electric motors, including the requirement for energy labelling	2013	CION/MS/industry	NE	NE	64 000	94 000	NE	SEC(2009) 1013 final. See chapter 3.3.3 of the EU's 2nd Biennial Report.
Voluntary eco-design scheme for complex set-top boxes	Energy	CO2	Reduce energy consumption	Voluntary agreement	Implemented	Voluntary agreement on energy consumption targets for set-top boxes without Energy labelling.	2010	CION/MS/industry	NE	NE	NE	NE	NE	Cumulative impact 2020: 21000kt, SWD(2012) 391 final. See chapter 3.3.3 of the EU's 2nd Biennial Report.
Voluntary eco- design scheme for imaging equipment	Energy	CO2	Reduce energy consumption	Voluntary agreement	Implemented	Voluntary agreement on energy consumption targets for imaging equipment without Energy labelling.	2011	CION/MS/industry	NE	NE	10 200	NE	NE	SWD(2013) 15 final. See chapter 3.3.3 of the EU's 2nd Biennial Report.

Regulation (EU) 2017/1369 of the European Parliament and of the Council of 4 July 2017 setting a framework for energy labelling and repealing Directive 2010/30/EU	Energy	CO2	Help consumers to identify energy-saving products.	Regulatory	Implemented	This Regulation lays down a framework on the indication by labelling and standard product information of the consumption of energy and other resources by energy-related products during use and supplementary information concerning energy-related products in order to allow customers to choose more efficient products	2017	CION/MS	NE	NE	NE	NE	NE	(impact not estimated) See chapter 3.3.3 of the EU's 2nd Biennial Report.	
Green Public Procurement	Energy	CO2	Increase the share of efficient and environmentally friendly technologies, products, services in the public sector	Voluntary agreement	Implemented	Increase the share of efficient and environmentally friendly technologies, products, services in the public sector	2004	MS	35 000	NE	NE	NE	NE	Estimated impact range: 25000-45000kt (2010) Source: Second ECCP Progress Report (EU 15 only). See chapter 3.3.3 of the EU's 2nd Biennial Report.	
Energy Star Programme	Energy	CO2	Promotion of less energy consuming office appliances	Voluntary agreement	Implemented	The label shall help consumers to identify low energy consumption products.	2006	MS		NE	NE	NE	NE	(impact not estimated) See chapter 3.3.3 of the EU's 2nd Biennial Report.	
EU Project Development Assistance (PDA) Facilities	Energy	CO2	Support of energy efficiency investment projects	Economic	Implemented	It provides the grant support for project promoters to develop and launch their energy efficiency investment projects and programmes.	2014	CION/industry		NE	NE	NE	NE	(impact not estimated) See chapter 3.3.4 of the EU's 2nd Biennial Report.	
European Energy Efficiency Fund (EEEF)	Energy	CO2	Support private public partnership investments in energy efficiency, renewable energy and GHG emission reductions.	Economic	Implemented	It is stocked with 265 million EUR for supporting private public partnerships investing in energy efficiency, renewable energy and GHG emission reductions.	2014	CION/industry		NE	NE	NE	NE	(impact not estimated) See chapter 3.3.4 of the EU's 2nd Biennial Report.	
Motor Challenge Programme	Energy	CO2	Improve the energy efficiency of their electric Motor Driven Systems	Voluntary	Implemented	Companies receive aid, advice and technical assistance to undertake specific measures to reduce energy consumption.	2003	Industry		NE	NE	NE	NE	(impact not estimated) See chapter 3.3.4 of the EU's 2nd Biennial Report.	
Strategic Energy Technology Plan COM(2009) 519 final	Energy	CO2	Support introduction of low carbon technologies	Regulatory	Implemented	The plan comprises measures relating to planning, implementation, resources and international cooperation in the field of energy technology	2009	CION		NE	NE	NE	NE	(impact not estimated) See chapter 3.3.4 of the EU's 2nd Biennial Report.	
New integrated Covenant of Mayors for climate and energy	Energy	CO2	Support local authorities to deploy sustainable energy policies and cut GHG emissions.	Voluntary Agreement	Implemented	In order to translate their political commitment into specific measures and projects, Covenant signatories undertake to prepare and submit a Sustainable Energy Action Plan (SEAP). In 2015, the covenant was extended to the 2030 horizon and adaptation and the international dimension were included.	2008	Local governments		NE	NE	190 000	NE	NE	Impact compared to base year 1990. Source: "The Covenant of Mayors in Figures - 6 year Assessment" by JRC (2014). See chapter 3.3.5 of the EU's 2nd Biennial Report.
Accelerating Clean Energy Innovation (COM 2016) 63	Energy	CO2	Research and Innovation part of the Clean Energy for All European package. It recognizes the central role played by innovation in the energy transition and the importance of a regulatory framework that is conducive to it..	Regulatory	Adopted	This Communication details a set of 20 different actions to boost research and innovation in clean energy solutions and to bring results to the market quickly and successfully.	2016	CION		NE	NE	NE	NE	The communication is part of the enabling framework for the 2030 Climate and Energy targets (COM(2014) 15 final). It is in line with EU's domestic and international climate and energy objectives.	
CO2 from cars (Regulation 443/2009)	Transport	CO2	130 grams of CO2 per kilometre (g/km) by 2015 and 95g/km by 2020.	Regulatory	Implemented	The Regulation is setting emission performance standards for new passenger cars as part of the Community's integrated approach to reduce CO2 emissions from light-duty vehicles	2009	MS		NE	NE	NE	NE	See chapter 3.4.1 of the EU's 2nd Biennial Report.	
CO2 from vans (Regulation 510/2011)	Transport	CO2	175 grams of CO2 per kilometre (g/km) by 2017 and 147g/km by 2020.	Regulatory	Implemented	The Regulation is similar to the one for new cars and sets CO2 emission targets for new vans sold on the EU market.	2011	MS		NE	NE	NE	NE	See chapter 3.4.1 of the EU's 2nd Biennial Report.	

Strategy for reducing Heavy-Duty Vehicles' fuel consumption and CO2 emissions	Transport	CO2	Curb Heavy Duty Vehicles' CO2 emissions in a cost-efficient and proportionate way	Regulatory	Adopted	The Strategy addresses modal shift, measures to reduce fuel GHG intensity, development and rolling out of vehicles with a lower carbon footprint and vehicle fleet operation.	2011	MS	NE	NE	NE	NE	NE	(impact not estimated) See chapter 3.4 of the EU's 2nd Biennial Report. A new regulation has been proposed to monitor and report CO2 emissions from new HDVs subject to the certification procedure (COM (2017) 279)
Directive 1999/94/EC on Car Labelling	Transport	CO2	Raise consumer awareness on fuel use and CO2 emissions of new passenger cars	Regulatory	Implemented	The Directive requires that information relating to the fuel economy and CO2 emissions of new passenger cars is consistently made available to consumers.	2000	MS, industry	NE	NE	NE	NE	NE	(impact not estimated). See chapter 3.4.1 of the EU's 2nd Biennial Report.
Directive 2009/28/EC on the promotion of the use of energy from renewable sources (Transport sector)	Transport	CO2	By 2020, the share of renewable energy shall amount to 10 % of fuels consumed in the transport sector	Regulatory	Implemented	The Directive sets a number of sustainability criteria that must be met for biofuels and bioliquids to count towards the target, including a minimum threshold of GHG savings for biofuels	2010	MS	NE	NE	NE	NE	NE	(impact not estimated for transport sector). See chapter 3.4.2 of the EU's 2nd Biennial Report. A revision has been proposed to ensure that the target of at least 27% renewables in the final energy consumption in the EU by 2030 is met.
Directive 2009/30/EC on the specification of petrol, diesel and gas-oil and introducing a mechanism to monitor and reduce greenhouse gas emissions, including amendment on indirect land use changes	Transport	CO2	Reduce the greenhouse gas intensity of fuels used in road transport by 6% in 2020 and reduce GHG emissions from indirect land-use change	Regulatory	Implemented	The reduction shall be obtained through the use of biofuels, alternative fuels or reductions in flaring and venting. The Directive applies to all petrol, diesel and biofuels used in road transport, as well as to gas oil used in non-road- mobile machinery. The EU agreed in April 2015 to amend both the Fuel Quality Directive and the transport-related section of the Renewable Energy Directive in order to limit negative effects of indirect land use changes (ILUC)	2009	MS	NE	NE	48 000	NE	NE	SWD(2012) 343 final. This figure only includes emission reductions in the transport sector. See chapter 3.4.2 of the EU's 2nd Biennial Report.
General Safety Regulation (EC) 661/2009 and Tyre Labelling and Minimum Rolling Resistance (EC) 1222/2009	Transport	CO2	Enhance safety of motor vehicles, increase fuel efficiency of motor vehicles and tyres, reduce noise emissions of tyres.	Regulatory	Implemented	The regulation integrates environmental and safety requirements for type approval of vehicles and tyres. It applies to vehicles of passenger transport (category M), transportation of goods (category N) and trailers (category O).	2009	Industry	NE	NE	2 750	NE	NE	Estimated impact range: 1500-5000 kt. Source: SEC(2008)2860. See chapter 3.4.1 of the EU's 2nd Biennial Report.
Infrastructure charging for heavy goods vehicles (1999/62/EC, amended by 2006/38/EC and 2011/76/EU)	Transport	CO2	Better functioning of the internal market and reduction of congestion, noise and air pollution	regulatory	Implemented	The Directive stipulates rules how and to what extent the cost of constructing, operating and developing infrastructure can be borne (through tolls and vignettes) by road users.	1999	MS	NE	NE	NE	NE	NE	Estimated impact according to the evaluation study: a decrease of 1.7% in CO2 emissions from the road sector in the EU relative to the baseline. Source: SWD(2016) 244. See chapter 3.4.3 of the EU's 2nd Biennial Report. A new regulation has been proposed to simplify the terms of the existing legislation, include other vehicle types and ensure the road charges reflect CO2 emissions also. Source: COM(2017)0275 final

Directive 2014/94/EU on Deployment of Alternative Fuels Infrastructure	Transport	CO2	Reduce CO2 emissions through shift of fuel type	regulatory	Implemented	The Directive requires Member States to adopt national policy frameworks for the market development of alternative fuels and their infrastructure, and sets binding targets for the build-up of alternative fuel infrastructure.	2014	MS	NE	NE	2 850	NE	78 500	Estimated range 2020: 2500 to 3200 relative to baseline 2030: 76000 to 81000 relative to baseline SWD (2013) 5 final. See chapter 3.4.3 of the EU's 2nd Biennial Report. An action plan has been proposed that includes several possible actions that would increase the market development of alternative fuels. These include: use of natural gas for maritime and inland-waterways and for some road applications, accelerating the development of advanced biofuels, and the development of hydrogen and electric capacity for road vehicles.
Clean vehicles Directive (2009/33/EC)	Transport	CO2	Reduce CO2 emissions through procurement of green vehicles	regulatory	implemented	The Directive requires that energy and environmental impacts linked to the operation of vehicles over their whole lifetime, including CO2 emissions, are taken into account in public procurement decisions.	2010	MS	NE	NE	NE	NE	NE	See chapter 3.4.4 of the EU's 2nd Biennial Report. Estimated impact: 54 to 676 thousand tonnes of CO2 avoided annually. Source: Ricardo Energy and Environment. 2015. Ex-post Evaluation of Directive 2009/33/EC on the promotion of clean and energy efficient road transport vehicles. Study contract no. MOVE/A3/19-2013 Lot No 5. A consultation has been launched on a proposed revision to the directive.
White Paper: Roadmap to a Single European Transport Area COM(2011) 144 final	Transport	CO2	Create a competitive and efficient internal EU transport system, cut transport emissions by 60% by 2050.	Regulatory	adopted	The 2011 White Paper, which forms an integral part of the "Resource Efficiency" initiative of the Commission, defines a long-term strategy to achieve a competitive and resource efficient transport system.	2011	CION	NE	NE	84 215	NE	175 320	SEC(2011) 358 final. See chapter 3.4 of the EU's 2nd Biennial Report. Estimated impact range - 2020: 60725 to 107705 kt CO2-eq relative to the baseline 2030: 118200 to 232440 kt CO2-eq relative to the baseline
Integrating maritime transport emissions in the EU's greenhouse gas reduction policies (COM(2013) 479 final and Regulation (EU) 2015/757)	Transport	CO2	Include GHG emissions from maritime transport in the EU's emission reduction policy.	Regulatory	adopted	The Strategy for maritime transport proposes an MRV system, reduction targets and further measures, including market-based instruments. The Regulation establishes an EU- wide MRV system for large ships.	2013	CION	NE	NE	NE	NE	4 400	SWD(2013) 237 final/2. See chapter 3.4.4 of the EU's 2nd Biennial Report.
F-Gas Regulation (EU) No 517/2014	Industry/industrial processes	HFCs, PFCs, SF6	Reduce consumption and use of F-gases	Regulatory	Implemented	The Regulation prescribes a cap and subsequent reduction of HFCs that can be placed on the EU market ("phase-down"). It also includes a number of bans.	2015	CION, MS	NE	NE	NE	NE	72 000	SWD(2012) 363. See chapter 3.5.1 of the EU's 2nd Biennial Report.

European Directive on mobile air-conditioning systems (MACs) (2006/40/EC)	Industry/industrial Processes	HFCs	Reduce use and consumption of F-gases	Regulatory	Implemented	The Directive lays down the requirements for the EC type approval or national type-approval of vehicles as regards emissions from, and the safe functioning of, air-conditioning systems.	2006	CION, MS, industry	NE	3 000	13 000	NE	NE	COM (2011) 581 final. See chapter 3.5.2 of the EU's 2nd Biennial Report.
Industrial Emissions Directive (2010/75/EU)	Industry/industrial processes	CO2	Reduction of harmful industrial emissions across the EU	Regulatory	Implemented	The Directive is a recast of existing legislation aiming at achieving benefits to the environment and human health by reducing polluting emissions as well as waste from industrial and agricultural installations in particular through Best Available Techniques (BAT).	2011	CION, MS	NE	NE	NE	NE	NE	(impact not estimated). See chapter 3.5.3 of the EU's 2nd Biennial Report.
Regulation (EU) No 1305/2013 on support for rural development by the European Agricultural Fund for Rural Development	Agriculture	CO2, CH4, N2O	Ensure sustainable agriculture	Regulatory, economic, information	Implemented	The Regulation foresees that Member States draw up and co-finance multiannual rural development programmes. These programmes have to meet the three strategic objectives for 2014 – 2020, including sustainability and climate action.	2014	CION/MS	NE	NE	NE	NE	NE	(impact not estimated). See chapter 3.6.1 of the EU's 2nd Biennial Report.
Action Plan for the future of Organic Production (COM(2014) 179 final), Proposal for a Regulation on Organic Production and labelling of organic products (COM(2014) 180 final)	Agriculture	CO2, CH4, N2O	Support growth in the organic production sector	Regulatory	Adopted	The Action Plan defines the strategy for organic production, controls and trade for the forthcoming period, by laying down 18 concrete actions, considering EU instruments, consumer awareness, research, monitoring, certification and trade with third countries. The proposal for a Regulation lays down principles for organic production and rules for production, labelling, certification and trading.	2015	CION/MS	NE	NE	NE	NE	NE	(impact not estimated). See chapter 3.6.2 of the EU's 2nd Biennial Report.
Soil Thematic Strategy (COM(2006) 231)	Agriculture, LULUCF	CO2	Protect soil as carbon pool	Information, education, research, regulatory	Adopted	The Strategy tackles the full range of threats associated with soil degradation and creates a common framework for the protection of soil	2006	CION/MS	NE	NE	NE	NE	NE	(impact not estimated). See chapter 3.6.2 of the EU's 2nd Biennial Report.
Nitrates Directive (91/676/EEC)	Agriculture	N2O	Prevent water pollution	Regulatory	Implemented	The Directive contains actions and measures to be elaborated by the Member States, such as monitoring of waters, identification of nitrates vulnerable zones (NZV), establishment of Codes of Good Agricultural Practices (CGAP) and implementation of actions plans.	1991	CION/MS	NE	NE	NE	NE	NE	(impact not estimated). See chapter 3.6.2 of the EU's 2nd Biennial Report.
LULUCF accounting (LULUCF Decision 529/2013/EU)	LULUCF	CO2	Robust accounting of LULUCF activities across Europe	Regulatory	Implemented	Provides the basis for a formal inclusion of the LULUCF sector and ensures a harmonized legal framework allowing the collection of reliable data by robust accounting and reporting in a standardised way.	2013	CION	NE	NE	NE	NE	NE	(impact not estimated). See chapter 3.7.1 of the EU's 2nd Biennial Report.
Waste Framework Directive (2008/98/EC)	Waste, Energy, Industry/industrial Processes	CH4, CO2	Promote prevention and recycling of waste	Regulatory	Implemented	The Directive is a legal framework for the management of waste to cope with the challenge of decoupling economic growth from waste generation and promoting strict hierarchy of intervention for waste prevention and management. It has been amended in 2006 and 2008.	2008	CION/MS	NE	NE	40 100	NE	NE	Consultancy report. See chapter 3.8.1 of the EU's 2nd Biennial Report.
Landfill Directive (1999/31/EC)	Waste, Energy	CH4	Prevent or reduce as far as possible negative effects on the environment resulting from landfilling	regulatory	Implemented	The Landfill Directive defines the different categories of waste (municipal waste, hazardous waste, non-hazardous waste and inert waste) and applies to all landfills, defined as waste disposal sites for the deposit of waste onto or into land.	1999	CION/MS	48 000	NE	44 000	NE	NE	2010 impact compared to 1995 levels, 2020 impact compared to 2008 levels (if all MS fully meet the targets: 62000kt in 2020). Source: EEA report. See chapter 3.8.2 of the EU's 2nd Biennial Report.

EU policies targeting waste streams	Waste, energy	CO2, CH4	Conservation of resources	regulatory	Implemented	These policy group targets different waste streams to promote recycling, re-use and waste recovery.	1994	CION/MS	NE	NE	NE	NE	NE	(impact not estimated). See chapter 3.8.4 of the EU's 2nd Biennial Report.
Management of biodegradable waste (COM/2008/0811 final)	Waste, Energy	CO2, CH4	Make us of bio-waste as energy or material source	Regulatory	Adopted	The CION published a Green Paper on the Management of biodegradable waste to use the potential of bio-waste. Currently the MS follow different strategies to manage their bio-waste. A binding target is under discussion .	2008	CION/MS	NE	NE	NE	NE	NE	Reduction potential ranges between 1500 and 6000 kt CO2eq in 2020, depending on the target. Source: Feasibility assessment. See chapter 3.8.3 of the EU's 2nd Biennial Report.
Urban Waste Water Treatment Directive (91/271/EEC)	Waste	N2O, CH4	Protect the environment from the adverse effects of urban & industrial waste water discharges	Regulatory	Implemented	The Directive concerns the collection, treatment and discharge of urban waste water and the treatment and discharge of waste water from certain industrial sectors.	1991	CION/MS	NE	NE	NE	NE	NE	(impact not estimated). See chapter 3.8.5 of the EU's 2nd Biennial Report.
Commission Regulation (EU) 2016/2281 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for air heating products, cooling products and high temperature process chillers	Energy	CO2	Increase security of energy supply and abate emissions of greenhouse gases.	Regulatory	Implemented	The Regulation sets minimum standards for air heating products, cooling products and high temperature process chillers, with no requirement for Energy labelling	2016	CION/MS/ industry	NE	NE	0	NE	0	See Chapter 4.3.1.3 of the EU's 3rd Biennial Report. Impacts taken from SWD(2016) 422. The average of the 3 sub-options has been used to calculate the mitigation impact.
Commission Regulation (EU) 2015/1189 of 28 April 2015 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for solid fuel boilers	Energy	CO2	Reduce energy consumption	Regulatory	Implemented	The Regulation sets minimum standards for solid fuel boilers, including the requirement for Energy labelling (see Reg. (EU) 2015/1187)	2015	CION/MS/ industry	NE	NE	0	NE	0	See Chapter 4.3.1.3 of the EU's 3rd Biennial Report. Impacts taken from SWD(2015) 92 final. The average of these 4 sub-options has been used to calculate the mitigation impact
Commission Regulation (EU) 2015/1188 of 28 April 2015 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for local space heaters	Energy	CO2	Reduce energy consumption	Regulatory	Implemented	The Regulation sets minimum standards for local space heaters, including the requirement for Energy labelling (see Reg. (EU) 2015/1186)	2015	CION/MS/ industry	NE	NE	0	NE	0	See Chapter 4.3.1.3 of the EU's 3rd Biennial Report. Impacts taken from SWD(2015) 90 final. The average of these 5 sub options has been used to calculate the mitigation impact
Commission Regulation (EU) 2015/1095 of 5 May 2015 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for professional refrigerated storage cabinets, blast cabinets, condensing units and process chillers	Energy	CO2	Reduce energy consumption	Regulatory	Implemented	The Regulation sets minimum standards for professional refrigerated storage cabinets, blast cabinets, condensing units and process chillers including the requirement for Energy labelling (see Reg. (EU) 2015/1094)	2015	CION/MS/ industry	NE	NE	NE	NE	NE	See Chapter 4.3.1.3 of the EU's 3rd Biennial Report. See SWD(2015) 97 final for details of impact. Impact is expressed as Total Equivalent Warming Impact, with a saving of 3,900 kt The estimate is based on the preferred sub-option (Option G)
Voluntary Industry Agreement to improve the energy consumption of games consoles within the EU (version 1.0)	Energy	CO2	Reduce energy consumption	Voluntary agreement	Implemented	Voluntary agreement on energy consumption targets for games consoles with no requirement for energy labelling.	2015	CION/MS/ industry	NE	NE	0	NE	0	See See Chapter 4.3.1.3 of the EU's 3rd Biennial Report. Impacts taken from SWD(2015) 88. Estimate is based on the preferred sub-option (Option 2)

Regulation of the European Parliament and of the Council on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 for a resilient Energy Union	cross-cutting	CO2,CH4 N2O,HFC, PFC, SF6	To achieve a 30% reduction in GHG emissions in the non-ETS sectors compared to 2005 in way that is fair, cost efficient, and ensure environmental integrity	Regulatory	Planned	Setting out binding annual greenhouse gas emission targets for Member States for the period 2021–2030	2021	MS need to implement national measures and policies to limit emissions from sectors covered here	NE	NE	NE	NE	NE	See Chapter 4.2.2 of the EU's 3rd Biennial Report. See SWD (2016) 0247 final for details on impacts. All policy options deliver the same emissions reductions, equivalent to a 30% reduction in GHG emission in non-ETS sectors, relative to 2005 levels.
Proposal to integrate greenhouse gas emissions and removals from land use, land use-change and forestry (LULUCF) into the 2030 climate and energy framework	LULUCF	CO2	To provide Member States with a framework to incentivise more climate-friendly land use, without imposing new restrictions or red tape on individual actors	Regulatory	Planned	The proposal sets a binding commitment for each Member State to ensure that accounted emissions from land use are entirely compensated by an equivalent removal of CO ₂ from the atmosphere through action in the sector, what is known as the "no debit rule."	2021	MS need to ensure that accounted emissions from land use are entirely compensated by an equivalent removal of CO ₂ from the atmosphere through action in the sector	NE	NE	NE	NE	NE	See Chapter 4.3.5 of the EU's 3rd Biennial Report. See SWD (2016) 0249 final for details on impacts. All policy options deliver the same emissions reductions, contributing to the 2030 target.
Proposal for a Directive of the European Parliament and of the Council on common rules for the internal market in electricity (recast) Proposal for a Regulation of the European Parliament and of the Council on the electricity market (recast) Proposal for a Regulation of the European Parliament and of the Council establishing a European Union Agency for the Cooperation of Energy Regulators (recast) Proposal for a Regulation of the European Parliament and of the Council on risk preparedness in the electricity sector	Energy	CO2	Develop secure and competitive energy supplies and building on the EU's 2030 climate commitments reaffirmed in Paris last year	Regulatory	Planned	Regarding the need to adapt the market design to the increasing share of variable decentralised generation and technological developments. The proposal explores various options for increasing the uptake of demand response on the basis of smart meter roll-out and uptake of dynamic price contracts		CION/MS/ industry	NA	NA	NE	NE	NE	See SWD(2016) 410 final for details (impact not estimated). See Chapter 4.3.1.3 of the EU's 3rd Biennial Report.
EU heating and cooling strategy	Energy	CO2, CH4, N2O, HFCs	Reduce energy consumption in buildings and industry	Regulatory	Adopted	A strategy working to decarbonise buildings, and improve energy efficiency in industry. The strategy groups a series of existing policies and measures.	2016	CION/EU/MS	NA	NA	NE	NE	NE	(impact not estimated) SWD(2016) 24 final. See Chapter 4.3.1.2 of the EU's 3rd Biennial Report.
European Strategy for Low-Emission Mobility	Transport	CO2, CH4, N2O	Reduce GHG emissions associated with transport	Regulatory	Adopted	A strategy to deliver low emission mobility, based on an action plan for low emission mobility based around the following themes: Optimising the transport system and improving its efficiency; Scaling up the use of low-emission alternative energy sources; Moving towards zero-emission vehicles; Horizontal enablers to support low emissions mobility	2016	CION	NA	NA	NE	NE	82 600	(impact not estimated) SWD(2016) 244 final. See Chapters 4.3.2.3 and 4.3.3 of the EU's 3rd Biennial Report. Estimated range for 2030: 59100 to 106100 kt CO ₂ relative to the baseline
EU action plan for the Circular Economy	Energy, Waste	CO2, N2O, CH4	Reduce GHG intensity of production of goods	Regulatory	Adopted	Establishes a concrete and ambitious programme of action, with measures covering the whole cycle: from production and consumption to waste management and the market for secondary raw materials.	2015	CION/EU/MS	NA	NA	NE	NE	NE	(impact not estimated) Source: COM(2015) 614 Final. See Chapter 4.3.6.1 of the EU's 3rd Biennial Report.

Communication on waste-to-energy processes and their role in the circular economy	Energy, Waste	CO ₂ , N ₂ O, CH ₄	Decarbonise electricity production	Information	Adopted	The main aim of this communication is to ensure that the recovery of energy from waste in the EU supports the objectives of the circular economy action plan and is firmly guided by the EU waste hierarchy. The communication also examines how the role of waste-to-energy processes can be optimised to play a part in meeting the objectives set out in the Energy Union Strategy and in the Paris Agreement.	2017	CION/EU/MS	NA	NA	NA	NA	NA	(impact not estimated) Source: COM(2017) 34 final. See Chapter 4.3.6.1 of the EU's 3rd Biennial Report.
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CTF Table 4: Report on progress

	Unit	Base Year	2011	2012	2013	2014	2015	Comment
Total (without LULUCF) ³⁰⁴	Mt CO ₂ eq	5 716	4 759	4 693	4 599	4 424	4 452	Total GHG including domestic and international aviation, indirect CO ₂ , excluding LULUCF and NF ₃
Contribution from LULUCF	Mt CO ₂ eq	NA	NA	NA	NA	NA	NA	Not applicable: Numbers for LULUCF are not reported because this sector is not included under the Convention target
Market-based mechanisms under the Convention ³⁰⁵	Number of units in millions / Mt CO ₂ eq	NA	254	504	133	257	23	
Other market-based mechanisms	number of units / Mt CO ₂ eq	NA	NA	NA	NA	NA	NA	Not applicable: No “other” market based mechanisms are in use.

1. This includes total GHG emissions for CO₂, CH₄, N₂O, HFCs, PFCs and SF₆, with the exception of NF₃, including domestic and international aviation, but excluding LULUCF.
2. Numbers for LULUCF are not included as this sector is not included under the Convention target of the EU
3. No “other” market-based mechanisms are in use

³⁰⁴ http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/euc-2016-nir-21jun16.zip

³⁰⁵ European Environment Agency. Trends and projections in the EU ETS in 2016: The EU Emissions Trading System in numbers. 2016. <http://www.eea.europa.eu/publications/trends-and-projections-EU-ETS-2016>

CTF Table 5: Summary of key variables and assumptions used in the projections analysis

Key assumptions	underlying Unit	Historical						Projected			
		1990	1995	2000	2005	2010	2015	2020	2025	2030	2035
Population	Million							514.2	518.3	521.4	524.3
International oil price	EUR (/2013)/GJ							16.1	19.2	22.2	23.1
International gas price	EUR (/2013)/GJ							7.5	8.5	9.5	10.2
International coal price	EUR (/2013)/GJ							2.3	2.8	3.4	3.5
GDP	Bio. EUR (2013)							14 806	15 505	17 817	19 597
EU ETS Carbon price	EUR(2013/ tCO ₂)							13.0	22.0	35.9	43.4

EU-28 key parameters have been derived as weighted averages or sums of the values of projection key parameters as reported by Members States under the Monitoring Mechanism Regulation in 2015

CTF Table 6 (a): Information on updated greenhouse gas projections under a ‘with measures’ scenario

	GHG emissions (kt CO ₂ eq)									
	Base Year	1995	2000	2005	2010	2015	2020	2025	2030	2035
By sector										
Energy	3 554 774	3 233 371	3 086 528	3 137 714	2 858 680	2 452 082	2 255 541	2 162 809	2 069 293	1 984 195
Transport	781 808	837 465	918 012	970 697	931 307	905 888	889 971	881 516	886 373	888 836
Industry/industrial processes	516 886	497 210	452 491	459 954	390 008	373 937	373 009	353 383	339 655	335 849
Agriculture	548 270	478 121	464 472	439 849	425 549	436 748	431 482	431 312	430 503	429 728
Waste management/waste	240 948	245 340	230 732	202 967	169 659	139 313	117 675	105 801	99 034	91 418
By gas										
CO ₂ emissions excluding net CO ₂ from LULUCF	4 526 071	4 284 611	4 277 492	4 420 621	4 061 751	3 638 953	3 462 842	3 374 349	3 298 603	3 230 611
CH ₄ emissions excluding CH ₄ from LULUCF	728 435	662 743	606 498	546 505	492 201	456 039	417 522	404 772	394 804	385 630
N ₂ O emissions excluding N ₂ O from LULUCF	385 600	348 379	306 251	286 082	240 412	237 248	231 159	232 452	233 194	233 198
HFCs	34 966	49 343	55 020	74 226	102 712	107 853	90 915	68 806	54 038	44 645
PFCs	25 870	17 277	12 188	7 353	3 878	3 576	3 431	3 408	3 387	3 375
SF ₆	11 003	15 193	10 586	7 920	6 431	6 413	7 006	5 260	3 605	3 539
Other (NF ₃)	24	100	103	156	119	69	86	97	107	117
Memo items										
<i>Memo item: international aviation</i>	69 284	86 138	115 904	131 682	132 303	142 182	145 282	154 323	162 879	171 089
<i>Memo item: international navigation</i>	110 275	110 793	134 660	160 967	158 662	134 806	170 962	180 622	189 826	198 556
Total GHG emissions (excl. LULUCF and indirect CO₂³⁰⁶; incl. international aviation)	5 711 969	5 377 645	5 268 139	5 342 862	4 907 505	4 450 151	4 212 961	4 089 144	3 987 737	3 901 114

³⁰⁶ Historical GHG emissions presented in this table do not include indirect CO₂. This is done for reasons of time series consistency with projected GHG emissions. The MMR does not require the reporting of indirect CO₂ for EU Member State projections and the projections presented in this report do therefore not include indirect CO₂.

Note: The EU's greenhouse gas projection is the result of an aggregation of Member States individual GHG projections.

CTF Table 6 (c): Information on updated greenhouse gas projections under a ‘with additional measures’ scenario

	GHG emissions (kt CO ₂ eq)									
	Base year	1995	2000	2005	2010	2015	2020	2025	2030	2035
By sector										
Energy	3 554 774	3 233 371	3 086 528	3 137 714	2 858 680	2 452 082	2 235 680	2 118 590	1 990 351	1 875 124
Transport	781 808	837 465	918 012	970 697	931 307	905 888	881 280	865 983	859 180	849 083
Industry/industrial processes	516 886	497 210	452 491	459 954	390 008	373 937	372 052	349 866	337 448	334 114
Agriculture	548 270	478 121	464 472	439 849	425 549	436 748	427 764	427 020	425 290	423 896
Waste management/waste	240 948	245 340	230 732	202 967	169 659	139 313	117 024	104 087	96 463	87 687
By gas										
CO ₂ emissions excluding net CO ₂ from LULUCF	4 526 071	4 284 611	4 277 492	4 420 621	4 061 751	3 638 953	3 434 621	3 314 559	3 192 949	3 082 608
CH ₄ emissions excluding CH ₄ from LULUCF	728 435	662 743	606 498	546 505	492 201	456 039	415 431	401 515	390 177	379 386
N ₂ O emissions excluding N ₂ O from LULUCF	385 600	348 379	306 251	286 082	240 412	237 248	228 454	229 447	229 240	228 604
HFCs	34 966	49 343	55 020	74 226	102 712	107 853	90 427	65 950	52 524	43 745
PFCs	25 870	17 277	12 188	7 353	3 878	3 576	3 431	3 409	3 387	3 374
SF ₆	11 003	15 193	10 586	7 920	6 431	6 413	7 006	5 262	3 600	3 529
Other (NF ₃)	24	100	103	156	119	69	86	97	107	116
Memo items										
<i>Memo item: international aviation</i>	69 284	86 138	115 904	131 682	132 303	142 182	145 657	154 693	163 251	171 459
<i>Memo item: international navigation</i>	110 275	110 793	134 660	160 967	158 662	134 806	151 106	158 890	166 694	174 424
Total GHG emissions (excl. LULUCF and indirect CO₂³⁰⁷; incl. international aviation)	5 711 969	5 377 645	5 268 139	5 342 862	4 907 505	4 450 151	4 179 457	4 020 239	3 871 984	3 741 363

307 Historical GHG emissions presented in this table do not include indirect CO₂. This is done for reasons of time series consistency with projected GHG emissions. The MMR does not require the reporting of indirect CO₂ for EU Member State projections and the projections presented in this report do therefore not include indirect CO₂.

Note: The EU's greenhouse gas projection is the result of an aggregation of Member States individual GHG projections.

CTF Table 7: Provision of public financial support: summary information in 2015 and 2016

Allocation channels	Year									
	European euro - EUR					USD ^a				
	Core/ general ^{b, 1}	Climate-specific ²				Core/ general	Climate-specific ²			
Mitigation ^c		Adaptation ^c	Cross-cutting ^c	Other ^{c,d}	Mitigation		Adaptation	Cross-cutting	Other	
2015										
Total contributions through multilateral channels:	393,340.00					436,075.39				
Multilateral climate change funds ^e										
Other multilateral climate change funds ^f										
Multilateral financial institutions, including regional development banks										
Specialized United Nations bodies	393,340.00					436,075.39				
Total contributions through bilateral, regional and other channels		2,616,920,227.16	721,200,785.02	454,502,528.00			2,901,241,936.98	799,557,411.29	503,883,068.71	
Total climate specific by funding type (total for mitigation, adaptation, crosscutting, other)		2,616,920,227.16	721,200,785.02	454,502,528.00			2,901,241,936.98	799,557,411.29	503,883,068.71	
Total			3,792,623,540.18					4,204,682,416.98		
2016										
Total contributions through multilateral channels:	404,710.00					447,690.00				
Multilateral climate change funds ^e										
Other multilateral climate change funds ^f										
Multilateral financial institutions, including regional development banks										
Specialized United Nations bodies	404,710.00					447,690.00				
Total contributions through bilateral, regional and other channels		2,759,669,866.79	1,269,436,331.00	648,781,392.00			3,052,732,153.51	1,404,243,728.96	717,678,530.97	
Total climate specific by funding type (total for mitigation, adaptation, crosscutting, other)		2,759,669,866.79	1,269,436,331.00	648,781,392.00			3,052,732,153.51	1,404,243,728.96	717,678,530.97	
Total			4,677,887,589.79					5,174,654,413.44		

^a Please provide exchange rate

^b This refers to support to multilateral institutions that Parties cannot specify as climate-specific.

^c These categories should be mutually exclusive

^d Please specify

^e Multilateral climate change funds: Global Environment Facility, Least Developed Countries Fund, Special Climate Change Fund, Adaptation Fund, Green Climate Fund and the Trust Fund for Supplementary

^f Not listed under e)

CTF Table 7(a): Provision of public financial support: contribution through multilateral channels in 2015

Donor funding	Total amount				Status: disbursed, committed ^{b,3}	Funding source: ODA, OOF, Other ⁴	Financial instrument: grant, concessional loan, non-concessional loan, equity, other ⁵	Type of support: Mitigation, adaptation, crosscutting, other ^{c,6}	Sector ^{d,7}
	Core/general ^{a,1}		Climate-specific ²						
	European euro - EUR	USD	European euro - EUR	USD					
Multilateral climate change funds									
1. Global Environment Facility									
2. Least Developed Countries Fund									
3. Special Climate Change Fund									
4. Adaptation Fund									
5. Green Climate Fund									
6. UNFCCC Trust Fund for Supplementary Activities									
7. Other multilateral climate change funds									
Multilateral financial institutions, including regional development banks									
1. World Bank									
2. International Finance Corporation									
3. African Development Bank									
4. Asian Development Bank									
5. European Bank for Reconstruction and Development									
6. Inter-American Development Bank									
7. Other									
Specialized United Nations bodies									
1. United Nations Development Programme									
2. United Nations Environment Programme									
3. Other									
3.1 UNFCCC	393,340.00	436,075.39			Disbursed	ODA	Grant	Other	Other
Total contributions through multilateral channels	393,340.00	436,075.39							

Abbreviations: ODA = official development assistance, OOF = other official flows.

^a This refers to support to multilateral institutions that Parties cannot specify as climate-specific.

^b In the context of the MMR, the term "provided" equals "disbursed".

^c These categories should be mutually exclusive

^d See the OECD purpose codes at <http://www.oecd.org/investment/stats/dacandcrscodelists.htm>. Codes include energy, transport, industry, agriculture, forestry, water and sanitation etc.

CTF Table 7(a): Provision of public financial support: contribution through multilateral channels in 2016

Donor funding	Total amount				Status: disbursed, committed ^{b,3}	Funding source: ODA, OOF, Other ⁴	Financial instrument: grant, concessional loan, non-concessional loan, equity, other ⁵	Type of support: Mitigation, adaptation, crosscutting, other ⁶	Sector ^{d,7}
	Core/general ^{a,1}		Climate-specific ²						
	European euro - EUR	National currency	European euro - EUR	National currency					
Multilateral climate change funds									
1. Global Environment Facility									
2. Least Developed Countries Fund									
3. Special Climate Change Fund									
4. Adaptation Fund									
5. Green Climate Fund									
6. UNFCCC Trust Fund for Supplementary Activities									
7. Other multilateral climate change funds									
Multilateral financial institutions, including regional development banks									
1. World Bank									
2. International Finance Corporation									
3. African Development Bank									
4. Asian Development Bank									
5. European Bank for Reconstruction and Development									
6. Inter-American Development Bank									
7. Other									
Specialized United Nations bodies									
1. United Nations Development Programme									
2. United Nations Environment Programme									
3. Other									
3.1 UNFCCC	404,710.00	447,690.00			Disbursed	ODA	Grant	Other	Other
Total contributions through multilateral channels	404,710.00	447,690.00							

Abbreviations: ODA = official development assistance, OOF = other official flows.

^a This refers to support to multilateral institutions that Parties cannot specify as climate-specific.

^b In the context of the MMR, the term "provided" equals "disbursed".

^c These categories should be mutually exclusive

^d See the OECD purpose codes at <http://www.oecd.org/investment/stats/dacandcrscodelists.htm>. Codes include energy, transport, industry, agriculture, forestry, water and sanitation etc.

CTF Table 7(b): Provision of public financial support: contribution through bilateral, regional and other channels in 2015

	Total amount								
	European euro - EUR	USD							
<i>Recipient country/ region/project/ programme</i>	<i>European euro - EUR</i>	<i>USD</i>	<i>Status:</i>	<i>Funding source:</i>	<i>Financial instrument:</i>	<i>Type of support:</i>	<i>Sector^{b, 7}</i>	<i>Additional information^c</i>	
Africa, regional / Africa - Regional	57 875 240.00	64 163 237.25	Committed	ODA	Grant	Mitigation	Energy	Delivering access to modern, affordable and sustainable energy	
Africa, regional / Africa - Regional	2 424.00	2 687.36	Committed	ODA	Grant	Cross-cutting	Forestry	GHANA: Supporting the integration of legal and legitimate domestic timber markets into Voluntary Partnership Agreements	
Africa, regional / Africa - Regional	3 420 000.00	3 791 574.28	Committed	ODA	Grant	Mitigation	Other	Africa LEDS project	
Africa, regional / Africa - Regional	26 500 000.00	29 379 157.43	Committed	ODA	Grant	Adaptation	Other	GMES and Africa Support Programme	
Africa, regional / Africa - Regional	2 000 000.00	2 217 294.90	Committed	ODA	Grant	Adaptation	Water and sanitation	Contribution to the Trust Fund "Cooperation in International Waters in Africa (CIWA)"	
Africa, regional / Africa - Regional	2 000 000.00	2 217 294.90	Committed	ODA	Grant	Adaptation	Water and sanitation	NEPAD African Network of Centres of Excellence on Water Sciences and Technology (Phase II)	
America, regional / America - Regional	8 500 000.00	9 423 503.33	Committed	ODA	Grant	Adaptation	Other	Contributing to preserving marine and coastal biodiversity in the Caribbean Sea basin	
America, regional / America - Regional	16 937 096.00	18 777 268.29	Committed	ODA	Grant	Cross-cutting	Cross-cutting	Latin American Investment Facility 2014 LAIF	
Asia, regional / Asia - Regional	12 400 000.00	13 747 228.38	Committed	ODA	Grant	Mitigation	Cross-cutting	Asian Investment Facility	
Asia, regional / Asia - Regional	10 000 000.00	11 086 474.50	Committed	ODA	Grant	Cross-cutting	Cross-cutting	Asian Investment Facility	
Azerbaijan / Asia - South and central	5 400 000.00	5 986 696.23	Committed	ODA	Grant	Cross-cutting	Agriculture	Integrated Regional Development of Azerbaijan (IRDA)	
Bangladesh / Asia - South and central	3 220 000.00	3 569 844.79	Committed	ODA	Grant	Adaptation	Other	Food and Nutrition Security Programme for Bangladesh 2015	
Bangladesh / Asia - South and central	8 000 000.00	8 869 179.60	Committed	ODA	Grant	Adaptation	Other	GCCA+ Support for enhancing communities' resilience to climate change and related disasters	
Belarus / Europe	136.00	150.78	Committed	ODA	Grant	Cross-cutting	Energy	Braslau district the first climate neutral municipality in Belarus	
Belarus / Europe	244.00	270.51	Committed	ODA	Grant	Cross-cutting	Energy	PubLiCity: Energy Efficient Modernization of Public Lighting in the City of Polotsk	
Belarus / Europe	14 500 000.00	16 075 388.03	Committed	ODA	Grant	Mitigation	Other	Strengthening Air Quality and Environmental Management in Belarus (SAQEM)	
Belarus / Europe	270.00	299.33	Committed	ODA	Grant	Mitigation	Water and sanitation	System of Automation for Vision of Energy and Water SAVE WATER	
Benin / Africa - South of Sahara	7 200 000.00	7 982 261.64	Committed	ODA	Grant	Mitigation	Energy	Strengthening the Capacities of the Energy Sector in Benin	
Bolivia / America - South	20 000 000.00	22 172 949.00	Committed	ODA	Grant	Adaptation	Agriculture	Strengthening of family agriculture and food sovereignty in areas where people are expelled from coca production areas in B	
Central Asia, regional / Asia - South and central	20 000 000.00	22 172 949.00	Committed	ODA	Grant	Mitigation	Energy	Investment Facility for Central Asia 2015 (IFCA)	
Central Asia, regional / Asia - South and central	16 000 000.00	17 738 359.20	Committed	ODA	Grant	Cross-cutting	Cross-cutting	Investment Facility for Central Asia 2015bis (IFCA)	
Central Asia, regional / Asia - South and central	2 000 000.00	2 217 294.90	Committed	ODA	Grant	Cross-cutting	Water and sanitation	EU – CA Water and Environmental Platform Phase II	

Chad / Africa - South of Sahara	20 000 000.00	22 172 949.00	Committed	ODA	Grant	Adaptation	Agriculture	Structuring Support Program for Pastoral Development (PASTOR (Chad))
Colombia / America - South	8 320 000.00	9 223 946.78	Committed	ODA	Grant	Adaptation	Other	Sector Reform Contract for Local Sustainable Development in Colombia
Côte d'Ivoire / Africa - South of Sahara	28 294 000.00	31 368 070.95	Committed	ODA	Grant	Mitigation	Energy	Project to improve access to energy (ENERGOS)
Democratic Republic of the Congo / Africa - South of Sahara	120 000 000.00	133 037 694.01	Committed	ODA	Grant	Mitigation	Other	Sustainable Environmental and Sustainable Agriculture Support Project to Maintain Priority Biological Sites in the DRC
Developing countries, unspecified / Bilateral unallocated	3 558 804.00	3 945 458.98	Committed	ODA	Grant	Adaptation	Agriculture	FIRST : Food security Impact, Resilience, Sustainability, Transformation
Developing countries, unspecified / Bilateral unallocated	22 242 000.00	24 658 536.59	Committed	ODA	Grant	Cross-cutting	Agriculture	Inclusive and sustainable value chains and food fortification
Developing countries, unspecified / Bilateral unallocated	6 400 000.00	7 095 343.68	Committed	ODA	Grant	Adaptation	Agriculture	Work Programme 2016 for the Technical Centre for Agricultural and rural Cooperation (CTA) ACP EU Institution
Developing countries, unspecified / Bilateral unallocated	5 000 000.00	5 543 237.25	Committed	ODA	Grant	Adaptation	Other	Annual Action Programme 2015 for the Instrument contributing to Stability and Peace to be financed under budget line 21 05 01 of the gener
Developing countries, unspecified / Bilateral unallocated	20 000 000.00	22 172 949.00	Committed	OOF	Grant	Adaptation	Other	Annual Action Programme 2015 Instrument contributing to Stability and Peace
Developing countries, unspecified / Bilateral unallocated	25 600 000.00	28 381 374.72	Committed	ODA	Grant	Adaptation	Other	PRO Resilience Action 2015
Developing countries, unspecified / Bilateral unallocated	6 000 000.00	6 651 884.70	Committed	ODA	Grant	Adaptation	Other	Global Partnership on Disaster Risk Financing Analytics (DRFA)
Developing countries, unspecified / Bilateral unallocated	2 400 000.00	2 660 753.88	Committed	ODA	Grant	Adaptation	Other	Making cities sustainable and resilient : Implementing the Sendai framework for DRR 2015 2030 at the local level
Developing countries, unspecified / Bilateral unallocated	2 548.00	2 824.83	Committed	ODA	Grant	Adaptation	Other	Programme for the Prevention, Preparedness and Response to man made and natural Disasters (PPRD East)
Developing countries, unspecified / Bilateral unallocated	10 000 000.00	11 086 474.50	Committed	ODA	Grant	Mitigation	Energy	Covenant of mayors in Sub Saharan Africa. Phase I
Developing countries, unspecified / Bilateral unallocated	3 500 000.00	3 880 266.08	Committed	ODA	Grant	Mitigation	Forestry	Improving global forest management through improved global forest information
Developing countries, unspecified / Bilateral unallocated	27 000 000.00	29 933 481.15	Committed	ODA	Grant	Mitigation	Forestry	Non State Actors Participation in Forest Governance, Forest Law Enforcement Governance and Trade and Reduction Emission from Forest Degrad
Developing countries, unspecified / Bilateral unallocated	3 000 000.00	3 325 942.35	Committed	ODA	Grant	Mitigation	Other	Creating enabling conditions for the transformation towards an inclusive green economy
Developing countries, unspecified / Bilateral unallocated	8 000 000.00	8 869 179.60	Committed	ODA	Grant	Mitigation	Other	Partnership for Action on Green Economy
Developing countries, unspecified / Bilateral unallocated	423 608.00	469 631.93	Committed	ODA	Grant	Cross-cutting	Other	Support Measures for GPGC environment and climate change 2015
Developing countries, unspecified / Bilateral	850.00	942.35	Committed	ODA	Grant	Cross-cutting	Other	Support to 5th IPCC report

unallocated								
Developing countries, unspecified / Bilateral unallocated	7 000 000.00	7 760 532.15	Committed	ODA	Grant	Cross-cutting	Other	Support to Climate Technology Transfer Services and Partnerships
Developing countries, unspecified / Bilateral unallocated	8 000 000.00	8 869 179.60	Committed	ODA	Grant	Cross-cutting	Other	Support to Developing Countries for innovative Climate Finance
Developing countries, unspecified / Bilateral unallocated	4 400 000.00	4 878 048.78	Committed	ODA	Grant	Cross-cutting	Other	Support to developing countries in UNFCCC
Developing countries, unspecified / Bilateral unallocated	5 000 000.00	5 543 237.25	Committed	ODA	Grant	Mitigation	Other	Support to Developing Countries on Intended Nationally Determined Contributions (INDC) on Climate Change
Developing countries, unspecified / Bilateral unallocated	600 000.00	665 188.47	Committed	ODA	Grant	Mitigation	Other	Support to Montreal Protocol
Developing countries, unspecified / Bilateral unallocated	400 000.00	443 458.98	Committed	ODA	Grant	Mitigation	Other	Support to Rabat INDC Forum
Developing countries, unspecified / Bilateral unallocated	94 190.00	104 423.50	Committed	ODA	Grant	Mitigation	Other	Support to UNEP Trust Fund for the Montreal Protocol
Developing countries, unspecified / Bilateral unallocated	13 280.00	14 722.84	Committed	ODA	Grant	Mitigation	Other	Support to UNEP Trust Fund for Vienna Convention
Developing countries, unspecified / Bilateral unallocated	600 000.00	665 188.47	Committed	ODA	Grant	Cross-cutting	Other	Support to UNFCCC
Developing countries, unspecified / Bilateral unallocated	73 580.00	81 574.28	Committed	ODA	Grant	Cross-cutting	Other	Support to UNFCCC
Developing countries, unspecified / Bilateral unallocated	3 000 000.00	3 325 942.35	Committed	ODA	Grant	Mitigation	Other	The Global Automotive Fuel Economy Campaign of the Partnership for Clean Fuels and Vehicles the Global Fuel Economy Initiative (GFEI)
Developing countries, unspecified / Bilateral unallocated	589 400.00	653 436.81	Committed	ODA	Grant	Cross-cutting	Other	Secretariat Général de l'Union pour la Méditerranée.
Developing countries, unspecified / Bilateral unallocated	42 216 000.00	46 802 660.75	Committed	ODA	Grant	Cross-cutting	Cross-cutting	Contribution 2015 to the NIF (Neighbourhood Investment Facility) for the EAST
Developing countries, unspecified / Bilateral unallocated	75 800 000.00	84 035 476.72	Committed	ODA	Grant	Cross-cutting	Cross-cutting	Contribution 2015 to the NIF (Neighbourhood Investment Facility) for the SOUTH
Developing countries, unspecified / Bilateral unallocated	23 830.00	26 419.07	Committed	ODA	Grant	Mitigation	Cross-cutting	Non substantial modifications of Commission Implementing Decision C(2013)5300 on the ENPI East Regional Action Programme 2013
Developing countries, unspecified / Bilateral unallocated	4 500 000.00	4 988 913.53	Committed	ODA	Grant	Mitigation	Cross-cutting	Regional Programme in the Eastern Neighbourhood in support of the Eastern Partnership Flagship Initiative on Sustainable Municipal Develop
Developing countries, unspecified / Bilateral unallocated	4 000 000.00	4 434 589.80	Committed	ODA	Grant	Adaptation	Water and sanitation	European Water Initiative Plus for Eastern Partnership
Developing countries, unspecified / Bilateral unallocated	2 000 000.00	2 217 294.90	Committed	ODA	Grant	Cross-cutting	Water and sanitation	The Nexus Dialogues (Phase I)

Djibouti / Africa - South of Sahara	17 000 000.00	18 847 006.65	Committed	ODA	Grant	Adaptation	Water and sanitation	Production Drinking Water by Desalination and Renewable Energy (PEPER) Component
Dominican Republic / America - North & Central	1 900 000.00	2 106 430.16	Committed	ODA	Grant	Cross-cutting	Other	Technical Cooperation Facility I
Dominican Republic / America - North & Central	1 800 000.00	1 995 565.41	Committed	ODA	Grant	Adaptation	Cross-cutting	Dominican Republic component of the Central America Coffee rust integral management programme (PROCAGICA RD)
Egypt / Africa - North of Sahara	100.00	110.86	Committed	ODA	Grant	Cross-cutting	Agriculture	Technical Assistance to the Support to Rural Development Programme
Egypt / Africa - North of Sahara	3 200 000.00	3 547 671.84	Committed	ODA	Grant	Cross-cutting	Energy	Fostering Reforms in the Egyptian renewable Energy and Water Sectors through Capacity Building
Egypt / Africa - North of Sahara	208.00	230.60	Committed	ODA	Grant	Cross-cutting	Cross-cutting	Dummy Contract for Late Payment Interests for invoice ENPI/2014/ 039 899 : Grant contract ENPI/2012/307 756
Ethiopia / Africa - South of Sahara	18 000 000.00	19 955 654.10	Committed	ODA	Grant	Cross-cutting	Agriculture	Support to Agricultural Growth Program Phase II & Complementary Action to Promote Nutrition into the Agricultural Growth Program Phase II
Ethiopia / Africa - South of Sahara	20 000 000.00	22 172 949.00	Committed	ODA	Grant	Adaptation	Agriculture	Support to the Sustainable Land Management (SLM Phase II) of Ethiopia
Ethiopia / Africa - South of Sahara	20 000 000.00	22 172 949.00	Committed	ODA	Grant	Adaptation	Other	Support to the Productive Safety Net Programme IV of Ethiopia (PSNP IV)
Ethiopia / Africa - South of Sahara	21 000 000.00	23 281 596.45	Committed	ODA	Grant	Mitigation	Energy	Biogas Dissemination Scale Up Project – NBPE+
Ethiopia / Africa - South of Sahara	9 000 000.00	9 977 827.05	Committed	ODA	Grant	Mitigation	Energy	Upscaling EnDEV Ethiopia Access to Energy Through Off grid Renewable Energy Solutions
Europe, regional / Europe	1 500 000.00	1 662 971.18	Committed	ODA	Grant	Cross-cutting	Energy	Additional contribution to the project Cleaner and Energy Saving Mediterranean Cities (CESMED)
Europe, regional / Europe	1 335 916.00	1 481 059.87	Committed	ODA	Grant	Mitigation	Energy	Contribution of the EU to the budget of international organisation in the area of Energy
Europe, regional / Europe	5 883 268.00	6 522 470.07	Committed	ODA	Grant	Cross-cutting	Energy	Energy Policy in Eastern Partnership countries and Central Asia
Europe, regional / Europe	2 312.00	2 563.19	Committed	ODA	Grant	Mitigation	Energy	INOGATE Technical Secretariat and Integrated Programme in support of the Baku Initiative and the Eastern Partnership energy objectives
Europe, regional / Europe	120 000.00	133 037.69	Committed	ODA	Grant	Mitigation	Energy	Supporting Participation of Eastern Partnership and Central Asian Cities in the Covenant of Mayors Non substantial modification of Commi
Europe, regional / Europe	590.00	654.10	Committed	ODA	Grant	Cross-cutting	Other	Dummy contract for payment of late payment interests related to Contract 301 624 (invoice 2014/037 281&2014/037 284 cancelled for technica
Europe, regional / Europe	324.00	359.20	Committed	ODA	Grant	Cross-cutting	Other	Climate Forum East II
Europe, regional / Europe	527 188.00	584 465.63	Committed	ODA	Grant	Cross-cutting	Cross-cutting	ENI CBC 2014 2020 / Estonia Russia
Europe, regional / Europe	2 319 596.00	2 571 614.19	Committed	ODA	Grant	Cross-cutting	Cross-cutting	ENI CBC 2014 2020 / Hungary Slovakia Romania Ukraine
Europe, regional / Europe	1 046 216.00	1 159 884.70	Committed	ODA	Grant	Cross-cutting	Cross-cutting	ENI CBC 2014 2020 / Italy Tunisia
Europe, regional / Europe	497 940.00	552 039.91	Committed	ODA	Grant	Cross-cutting	Cross-cutting	ENI CBC 2014 2020 / Latvia Russia
Europe, regional / Europe	1 133 788.00	1 256 971.18	Committed	ODA	Grant	Cross-cutting	Cross-cutting	ENI CBC 2014 2020 / South East Finland Russia
Europe, regional / Europe	680 000.00	753 880.27	Committed	ODA	Grant	Adaptation	Cross-cutting	IPA II Cross Border Co operation Action Programme Montenegro Albania for the years 2015 2017 (2015 allocation)
Europe, regional / Europe	1 728.00	1 915.74	Committed	ODA	Grant	Mitigation	Transport	TRACECA Transport Dialogue and Networks Interoperability II
Europe, regional / Europe	400 000.00	443 458.98	Committed	ODA	Grant	Cross-cutting	Water and sanitation	Environmental Protection of International River Basins (EPIRB) Non substantial modification of Commission Implementing Decision C(2010)

Far East Asia, regional / Asia - Far east	4 000 000.00	4 434 589.80	Committed	ODA	Grant	Adaptation	Other	Biodiversity Conservation and Protected Area Management in ASEAN
Former Yugoslav Republic of Macedonia / Europe	2 000 000.00	2 217 294.90	Committed	ODA	Grant	Cross-cutting	Agriculture	Rural development programme
Former Yugoslav Republic of Macedonia / Europe	2 000 000.00	2 217 294.90	Committed	ODA	Grant	Cross-cutting	Agriculture	Rural development programme
Georgia / Asia - South and central	3 364.00	3 729.49	Committed	ODA	Grant	Adaptation	Agriculture	Improving Regional Food Security through National Strategies and Small Holder Production in the South Caucasus
Georgia / Asia - South and central	5 600 000.00	6 208 425.72	Committed	ODA	Grant	Cross-cutting	Other	Support to Implementation of EU Georgia Agreements
Georgia / Asia - South and central	20 000 000.00	22 172 949.00	Committed	ODA	Grant	Cross-cutting	Cross-cutting	ENPARD II (European Neighbourhood Programme for Agriculture and Rural Development in Georgia, phase II)
Georgia / Asia - South and central	772.00	855.88	Committed	ODA	Grant	Mitigation	Cross-cutting	Retrofitting 3 kindergartens in Rustavi City in order to achieve high energy efficiency standards and greenhouse emission reduction
Guinea-Bissau / Africa - South of Sahara	4 000 000.00	4 434 589.80	Committed	ODA	Grant	Cross-cutting	Other	Global Climate Change Alliance + initiative in Guinea Bissau
Guinea-Bissau / Africa - South of Sahara	4 400 000.00	4 878 048.78	Committed	ODA	Grant	Adaptation	Cross-cutting	Integrated Collective and Territorial Actions for the Valorization of Agriculture
Honduras / America - North & Central	12 000 000.00	13 303 769.40	Committed	ODA	Grant	Adaptation	Agriculture	Sector Reform Contract for Food Security and Nutrition – EUROSAN BUDGET
Indonesia / Asia - Far east	456.00	505.54	Committed	ODA	Grant	Adaptation	Other	Technical Assistance Services for EU Indonesia Trade Cooperation Facility (TCF)
Jordan / Asia - Middle east	18 000 000.00	19 955 654.10	Committed	ODA	Grant	Cross-cutting	Energy	Renewable Energy and Energy Efficiency Programme in Jordan REEE II
Kenya / Africa - South of Sahara	30 000 000.00	33 259 423.50	Committed	ODA	Grant	Adaptation	Other	Support to EDE Pillars 5&6 (drought management and coordination)
Kenya / Africa - South of Sahara	8 000 000.00	8 869 179.60	Committed	ODA	Grant	Mitigation	Transport	Contribution to the African Investment Facility to support the Kenya Energy and Transport sectors
Kenya / Africa - South of Sahara	8 000 000.00	8 869 179.60	Committed	ODA	Grant	Mitigation	Transport	Support to Kenya Energy and Transport sectors
Lebanon / Asia - Middle east	2 000 000.00	2 217 294.90	Committed	ODA	Grant	Cross-cutting	Other	Civil Society Partnership to Promote Reform in Lebanon
Lebanon / Asia - Middle east	100.00	110.86	Committed	ODA	Grant	Adaptation	Water and sanitation	Monitoring of water infrastructure and economic recovery projects in the Bekaa valley and North Lebanon regions
Liberia / Africa - South of Sahara	22 000 000.00	24 390 243.90	Committed	ODA	Grant	Mitigation	Energy	Consolidation of Monrovia Transmission and Distribution
Madagascar / Africa - South of Sahara	8 000 000.00	8 869 179.60	Committed	ODA	Grant	Adaptation	Other	AMCC+ Madagascar : Renforcement des conditions et capacités d'adaptation durable au changement climatique
Mali / Africa - South of Sahara	12 000 000.00	13 303 769.40	Committed	ODA	Grant	Adaptation	Other	Program for Strengthening Food Security in Mali (PRORESA)
Mauritania / Africa - South of Sahara	10 000 000.00	11 086 474.50	Committed	ODA	Grant	Adaptation	Cross-cutting	Renforcement Institutionnel vers la Résilience Agricole et Pastorale (RIRAP) en Mauritanie.
Middle East, regional / Asia - Middle east	1 600 000.00	1 773 835.92	Committed	ODA	Grant	Cross-cutting	Cross-cutting	Support to the Regional Transport Action Plan (Maritime and Rail)
Moldova / Europe	4 948.00	5 485.59	Committed	ODA	Grant	Cross-cutting	Energy	"Dummy contract" Late payment interests Moldova Energy and Biomass Project (Phase II) (354 896)
Moldova / Europe	2 000 000.00	2 217 294.90	Committed	ODA	Grant	Cross-cutting	Other	Support to Public Administration Reform (PAR) II Component for Danube Transnational Programme
Moldova / Europe	2 000 000.00	2 217 294.90	Committed	ODA	Grant	Cross-cutting	Other	Technical Cooperation Facility
Moldova / Europe	1 032.00	1 144.12	Committed	ODA	Grant	Cross-cutting	Cross-cutting	Comprehensive demonstrational project for sustainable energy development in the town of Orhei.

Moldova / Europe	504.00	558.76	Committed	ODA	Grant	Cross-cutting	Cross-cutting	Green Light Moldova Modernisation and Saving Energy at Street Lighting.
Moldova / Europe	788.00	873.61	Committed	ODA	Grant	Cross-cutting	Cross-cutting	Renewables and Energy Efficiency for Public Buildings (REEPB)
Montenegro / Europe	2 000 000.00	2 217 294.90	Committed	ODA	Grant	Cross-cutting	Agriculture	Rural development programme
Montenegro / Europe	412.00	456.76	Committed	ODA	Grant	Cross-cutting	Other	Preparation of National Environmental Approximation Strategy
Morocco / Africa - North of Sahara	2 000 000.00	2 217 294.90	Committed	ODA	Grant	Cross-cutting	Other	Additional funding # 1 (2015) to the Competitiveness Growth Program
Morocco / Africa - North of Sahara	40 000 000.00	44 345 898.00	Committed	ODA	Grant	Cross-cutting	Other	PROGRAM TO SUPPORT GROWTH AND COMPETITIVENESS IN MOROCCO PACC
Myanmar / Asia - South and central	8 000 000.00	8 869 179.60	Committed	ODA	Grant	Adaptation	Other	Myanmar Sustainable Aquaculture Programme (MYSAP)
Myanmar / Asia - South and central	1 236.00	1 370.29	Committed	ODA	Grant	Mitigation	Other	SMART Myanmar (SMEs for environmental Accountability, Responsibility and Transparency)
Nicaragua / America - North & Central	8 000 000.00	8 869 179.60	Committed	ODA	Grant	Adaptation	Agriculture	Support to Bovine Value Chain in Nicaragua (BOVINOS)
Niger / Africa - South of Sahara	6 200 000.00	6 873 614.19	Committed	ODA	Grant	Mitigation	Other	Program to support security and resilience in the Diffa region and to prevent migration risks in Niger
North & Central America, regional / America - North & Central	14 000 000.00	15 521 064.30	Committed	ODA	Grant	Adaptation	Other	Central America Catastrophe Risk Programme
North & Central America, regional / America - North & Central	2 000 000.00	2 217 294.90	Committed	ODA	Grant	Cross-cutting	Other	Technical Assistance for Strategic Planning in Central America (ATEPECA)
North & Central America, regional / America - North & Central	15 000 000.00	16 629 711.75	Committed	ODA	Grant	Adaptation	Cross-cutting	Central American program for the integral management of coffee rust (PROCAGICA)
Pakistan / Asia - South and central	18 000 000.00	19 955 654.10	Committed	ODA	Grant	Adaptation	Cross-cutting	Balochistan Rural Development and Community Empowerment Programme
Pakistan / Asia - South and central	4 800 000.00	5 321 507.76	Committed	ODA	Grant	Mitigation	Other	International Labour and Environment Standards Application Pakistan's SMEs (ILES), Pakistan
Peru / America - South	1 320 000.00	1 463 414.63	Committed	ODA	Grant	Mitigation	Cross-cutting	Support Measures for Peru
Saint Lucia / America - North & Central	6 175 000.00	6 845 898.00	Committed	ODA	Grant	Adaptation	Other	Saint Lucia Post Trough Infrastructure Rehabilitation Programme
Saint Vincent and the Grenadines / America - North & Central	6 500 000.00	7 206 208.43	Committed	ODA	Grant	Adaptation	Other	Saint Vincent & the Grenadines Post Trough Infrastructure Rehabilitation Programme
Samoa / Oceania	3 000 000.00	3 325 942.35	Committed	ODA	Grant	Adaptation	Water and sanitation	Samoa Global Climate Change Alliance Project 2011
Samoa / Oceania	6 880 000.00	7 627 494.46	Committed	ODA	Grant	Adaptation	Water and sanitation	Water & Sanitation Sector Policy Support Programme
Sao Tome and Principe / Africa - South of Sahara	8 100 000.00	8 980 044.35	Committed	ODA	Grant	Adaptation	Water and sanitation	STP Sector Reform Contract Sector of Water and Sanitation
Senegal / Africa - South of Sahara	24 000 000.00	26 607 538.80	Committed	ODA	Grant	Adaptation	Agriculture	Sectoral reform contract in support of sustainable agricultural development and food and nutrition security
Serbia / Europe	6 000 000.00	6 651 884.70	Committed	ODA	Grant	Cross-cutting	Agriculture	Rural development programme

Serbia / Europe	288.00	319.29	Committed	ODA	Grant	Cross-cutting	Energy	Construction of Substation 400/110 kV Vranje 4, Republic of Serbia
Serbia / Europe	25 924 000.00	28 740 576.50	Committed	ODA	Grant	Mitigation	Transport	Development of the Transport Sector
Solomon Islands / Oceania	4 000 000.00	4 434 589.80	Committed	ODA	Grant	Adaptation	Agriculture	Rural Development Programme II
Somalia / Africa - South of Sahara	34 000 000.00	37 694 013.30	Committed	ODA	Grant	Adaptation	Cross-cutting	Resilience Programme for Somalia
South Africa / Africa - South of Sahara	2 000 000.00	2 217 294.90	Committed	ODA	Grant	Cross-cutting	Cross-cutting	EU South Africa Dialogue Facility
South America, regional / America - South	4 800 000.00	5 321 507.76	Committed	ODA	Grant	Adaptation	Other	Regional Facility for International Cooperation and Partnerhis
South Asia, regional / Asia - South and central	20 000 000.00	22 172 949.00	Committed	ODA	Grant	Cross-cutting	Other	Sustainable Use of Peatland and Haze Mitigation in ASEAN
Sri Lanka / Asia - South and central	12 000 000.00	13 303 769.40	Committed	ODA	Grant	Adaptation	Cross-cutting	'Support to Integrated Rural Development in the Most Vulnerable Districts of the Central & Uva Provinces of Sri Lanka
States Ex-Yugoslavia unspecified / Europe	800 000.00	886 917.96	Committed	ODA	Grant	Adaptation	Cross-cutting	Cross Border Cooperation Programme Serbia Bosnia and Herzegovina
States Ex-Yugoslavia unspecified / Europe	480 000.00	532 150.78	Committed	ODA	Grant	Adaptation	Cross-cutting	Cross Border Cooperation Programme Serbia Montenegro
Suriname / America - South	3 000 000.00	3 325 942.35	Committed	ODA	Grant	Adaptation	Other	Global Climate Change Alliance Suriname
Swaziland / Africa - South of Sahara	6 000 000.00	6 651 884.70	Committed	ODA	Grant	Adaptation	Agriculture	Water Harvesting, Small and Medium Earth Dams Project (WHDP)
Swaziland / Africa - South of Sahara	340.00	376.94	Committed	ODA	Grant	Mitigation	Other	Late payment interest for 149983
Thailand / Asia - Far east	556.00	616.41	Committed	ODA	Grant	Mitigation	Other	Interest on late payment
Tonga / Oceania	10 000 000.00	11 086 474.50	Committed	ODA	Grant	Mitigation	Energy	Energy Sector Reform Contract II
Turkey / Europe	27 600 000.00	30 598 669.62	Committed	ODA	Grant	Cross-cutting	Agriculture	Rural development programme
Turkey / Europe	27 600 000.00	30 598 669.62	Committed	ODA	Grant	Cross-cutting	Agriculture	Rural development programme
Turkey / Europe	10 640 000.00	11 796 008.87	Committed	ODA	Grant	Mitigation	Energy	Support to Energy sector
Turkey / Europe	10 000 000.00	11 086 474.50	Committed	ODA	Grant	Cross-cutting	Other	Multi annual Action Programme for Turkey on Environment and Climate Action
Turkey / Europe	10 164 000.00	11 268 292.68	Committed	ODA	Grant	Mitigation	Industry	Science Technology and Innovation
Turkey / Europe	6 468 000.00	7 170 731.71	Committed	ODA	Grant	Mitigation	Industry	Science Technology and Innovation
Turkey / Europe	46 200 000.00	51 219 512.20	Committed	ODA	Grant	Mitigation	Transport	Sustainable and safe transport
Turkey / Europe	10 516 000.00	11 658 536.59	Committed	ODA	Grant	Adaptation	Water and sanitation	Water
Turkey / Europe	5 240 000.00	5 809 312.64	Committed	ODA	Grant	Adaptation	Water and sanitation	Water
Uganda / Africa - South of Sahara	5 200 000.00	5 764 966.74	Committed	ODA	Grant	Mitigation	Forestry	Sawlog Production Grant Scheme III
Ukraine / Europe	6 000 000.00	6 651 884.70	Committed	ODA	Grant	Cross-cutting	Other	Technical Cooperation Facility
Zimbabwe / Africa - South of Sahara	5 200 000.00	5 764 966.74	Committed	ODA	Grant	Adaptation	Agriculture	Agriculture Based Economic Recovery Programme

Zimbabwe / Africa - South of Sahara	16 000 000.00	17 738 359.20	Committed	ODA	Grant	Adaptation	Agriculture	Zimbabwe Agricultural Growth Programme (ZAGP)
Zimbabwe / Africa - South of Sahara	6 000 000.00	6 651 884.70	Committed	ODA	Grant	Adaptation	Other	Resilience Building and Food and Nutrition Security Programme
EIB / Armenia	2 000 000.00	2 217 294.90	Committed	other	other	Mitigation	Solid waste	The project foresees the construction of a sanitary landfill, closure of the existing landfill and implementation of waste diversion measures in Yerevan, the capital city of Armenia.
EIB / Azerbaijan	1 000 000.00	1 108 647.45	Committed	other	other	Mitigation	Credit lines	A dedicated EIB loan to finance projects promoted by SMEs and Mid-Caps in Azerbaijan. Projects in fields considered as priority under the Mandate (i.e. local private sector development, development of social and economic infrastructure, and climate change mitigation and adaptation) carried out by eligible promoters of any size can also be funded, provided that financing thereto does not exceed 30 % of the overall EIB loan amount.
EIB / Bangladesh	135 000 000.00	149 667 405.76	Committed	ODA	other	Mitigation	Transport	Construction of a second track and upgrading of the existing track on the 72 km section between Laksam and Akhaura in eastern central Bangladesh, forming part of the Trans-Asian Railway network.
EIB / Brazil	3 000 000.00	3 325 942.35	Committed	ODA	other	Mitigation	Credit lines	The project concerned is an Intermediated Loan dedicated to on-lending to SMEs and MidCaps, and to private sector entities of any size undertaking small-scale investments in support of priority objectives under the mandate in Brazil.
EIB / Côte d'Ivoire	8 239 000.00	9 134 146.34	Committed	other	other	Mitigation	Energy	The Project will improve access to energy, increase energy efficiency and improve network management. Project components include; upgrading and reinforcement of the distribution infrastructure in Abidjan, Bouaké and San Pedro; Installing higher efficiency public lighting throughout Côte d'Ivoire (CI), and implementing a modern dispatch control centre and network control infrastructure.
EIB / Dominican Republic	200 000.00	221 729.49	Committed	OOF	other	Mitigation	Credit lines	Lending Facility to provide medium to long-term funding to low-income small and micro-enterprises, low income households and community based organisations through selected financial intermediaries in the Caribbean and Pacific countries.
EIB / Dominican Republic	200 000.00	221 729.49	Committed	OOF	other	Mitigation	Credit lines	The project will consist of providing credit lines in local currency to microfinance institutions in the Dominican Republic. With the aim to further diversify and enlarge the impact of the Bank on this sector, these credit lines will not only be granted to the usual partners of the Bank but also to other acceptable entities that are active in the sector. The project will also include an equity participation of EUR 1 M in favour of FONDESA to support its upgrade from an NGO into a regulated financial institution.
EIB / Egypt	200 000 000.00	221 729 490.02	Committed	other	other	Mitigation	Transport	Extension of Line 3 (Phase 3) of the Cairo Metro with 17.7 km to serve the main transportation corridors of urban greater Cairo.
EIB / Egypt	2 400 000.00	2 660 753.88	Committed	OOF	other	Mitigation	Credit lines	Line of credit to Egyptian banks for the purpose of financing small and medium sized projects in productive and service sectors in Egypt. The overall objective of the Loan is to promote economic growth and employment for Egyptian private sector companies.
EIB / Ethiopia	8 000 000.00	8 869 179.60	Committed	other	other	Adaptation	Water, sewerage	The Urban Water Supply Programme aims at expanding and rehabilitating urban water supply and sanitation infrastructures in small and medium towns in Ethiopia. The funds will be channelled through the Water Resources Development Fund (WRDF), under the Ministry of Water, Irrigation and Energy, and will be managed through a revolving fund mechanism, on a full cost recovery principle. The programme also aims at the improvement of the institutional capacity of the WRDF, the Regional Water Bureaus and the Town Water Utilities.
EIB / Georgia	800 000.00	886 917.96	Committed	other	other	Mitigation	Credit lines	Loan for SMEs and Mid-Caps for financing small and medium scale projects in Georgia.
EIB / Georgia	4 000 000.00	4 434 589.80	Committed	other	other	Mitigation	Water, sewerage	Investments to build, rehabilitate and modernise municipal water sector infrastructure.

EIB / Georgia	300 000.00	332 594.24	Committed	other	other	Mitigation	Credit lines	Loan for small and medium-sized projects promoted by SMEs, Mid-Caps and other private or public sector entities
EIB / Ghana	200 000.00	221 729.49	Committed	OOF	other	Mitigation	Credit lines	Global loan (IF) for 1) onlending to private companies in Ghana, operating in traditional eligible sectors and for 2) funding the capital expenditures of the intermediary banks to develop their capacities of intermediation (e.g. branch network, IT systems, buildings, training...). The funds will be channelled through some of the best performing banks in the Ghanaian financial sector and selected on the basis of their expectations of future development in a very buoyant financial market.
EIB / Ghana	300 000.00	332 594.24	Committed	OOF	other	Mitigation	Credit lines	Global loan (IF) for 1) onlending to private companies in Ghana, operating in traditional eligible sectors and for 2) funding the capital expenditures of the intermediary banks to develop their capacities of intermediation (e.g. branch network, IT systems, buildings, training...). The funds will be channelled through some of the best performing banks in the Ghanaian financial sector and selected on the basis of their expectations of future development in a very buoyant financial market.
EIB / Guinea	65 000 000.00	72 062 084.26	Committed	other	other	Mitigation	Energy	Interconnexion électrique entre les pays membres de l'OMVG (Organisation de Mise en Valeur du fleuve Gambie: Sénégal, La Gambie, Guinée Bissau et Guinée Conakry).
EIB / Honduras	2 382 478.63	2 641 328.86	Committed	other	other	Adaptation	Transport	The project consists of the rehabilitation and upgrading of the road sections CA-11 La Entrada - El Florido and CA-4 La Entrada - Santa Rosa de Copán (in total 116 km). Both road sections form part of the Western Corridor of the primary national road network, connecting the second biggest city of the country -San Pedro Sula- to the international border crossings with Guatemala and El Salvador.
EIB / India	30 000 000.00	33 259 423.50	Committed	other	other	Mitigation	Credit lines	A dedicated EIB loan to finance investments promoted by SMEs and Mid-Caps in India contributing to private sector development and other priorities under the Mandate such as social and economic infrastructure, and climate change mitigation and adaptation.
EIB / Israel	141 000 000.00	156 319 290.47	Committed	other	other	Mitigation	Energy	Design, construction and operation of a solar thermal power plant with a net installed capacity of 121MW on a Build-Operate-Transfer basis.
EIB / Jordan	66 273 932.25	73 474 426.00	Committed	other	other	Mitigation	Energy	The project is a multi-component program to reinforce Jordan's high voltage electricity backbone network to integrate more renewable generation capacity and improve reliability of supply. It consists of building two new transmission lines (400 kV/140 km and 132 kV/60 km), constructing one new electricity substation (400/132 kV, 800/1200 MVA) and extending two existing substations. The investments are reinforcing the network in the central Jordan desert area, where opportunities for renewable generation are most favourable.
EIB / Jordan	4 970 544.92	5 510 581.95	Committed	other	other	Adaptation	Water, sewerage	The Project consists of a new water intake facility from the King Abdullah Canal, a treatment plant, pumping facilities and a transmission pipeline to the Zabda Reservoir on the western side of the City of Irbid. The system will provide an additional 30 million cubic metres of potable water per year to the Northern Governorates.
EIB / Lao People's Democratic Rep.	18 905 378.58	20 959 399.76	Committed	other	other	Mitigation	Transport	The project is to construct a BRT (Bus Rapid Transit) system in Vientiane in Laos and includes the introduction of dedicated bus lanes, the acquisition of the buses and also facilities for parking management, traffic management and pedestrians.

EIB / Malawi	1 200 000.00	1 330 376.94	Committed	other	other	Mitigation	Water, sewerage	Medium term investment programme to optimise available water resources to bridge the gap in water demand in Malawi's fast growing capital city. The project's main components consist of extension of water treatment works, reduction of leakages and improving network management, improving water supply to low income areas and upgrading of a dam that is Lilongwe's primary water source.
EIB / Malawi	3 600 000.00	3 991 130.82	Committed	other	other	Adaptation	Water, sewerage	Medium term investment programme to optimise available water resources to bridge the gap in water demand in Malawi's fast growing capital city. The project's main components consist of extension of water treatment works, reduction of leakages and improving network management, improving water supply to low income areas and upgrading of a dam that is Lilongwe's primary water source.
EIB / Mauritius	8 000 000.00	8 869 179.60	Committed	other	other	Mitigation	Solid waste	Installation and operation of a carbon burn-out facility to convert coal fly and bottom ashes into additives for portland cement. This is an innovative waste management project addressing the problem of ash disposal in Mauritius.
EIB / Montenegro	800 000.00	886 917.96	Committed	other	other	Mitigation	Credit lines	Loans for financing small and medium-sized projects carried out primarily by SMEs as well as Final Beneficiaries of any size and ownership, including Local Authorities
EIB / Morocco	1 250 000.00	1 385 809.31	Committed	OOF	other	Mitigation	Credit lines	FEMIP Sustainable Energy facility aims at providing credit lines to local Financial Intermediaries (FIs) in Jordan and Morocco to finance energy efficiency and small renewable energy investments in the industrial, SMEs, agribusiness, commercial services and residential sectors. The project, which is co-financed by the EBRD (Lead IFI), AFD and KfW, will contribute to the reduction of greenhouse gas emissions and the enhancement of security of supply.
EIB / Morocco	22 500 000.00	24 944 567.63	Committed	other	other	Adaptation	Water, sewerage	Water Supply and Sanitation Improvement Program.
EIB / Mozambique	400 000.00	443 458.98	Committed	OOF	other	Mitigation	Credit lines	Line of credit to eligible financial intermediaries engaged in financing private companies and commercially-run public entities, in particular SMEs, in Mozambique. The line of credit will be made available in EUR/USD and/or local currency. Technical Assistance (TA) will complement this operation. A global authorisation is requested for this operation and approval is sought for the first participating financial intermediary, Moza Banco. The Mozambique Financial Sector Line of Credit is the first financial sector operation to be structured under the Cotonou Mandate in Mozambique.
EIB / Nepal	25 200 000.00	27 937 915.74	Committed	other	other	Mitigation	Energy	This project comprises the construction of transmission infrastructure, comprising a 26.5 km long 220 kV overhead transmission line from Chilime to Trishuli and 2 new substations, that are required to evacuate electricity from newly-constructed hydropower plants in the Trishuli River basin into the national grid, as well as a rural electrification component to supply power to communities in the vicinity of the project areas. The project also includes an upgrade of the national Load Dispatch Center (LDC).
EIB / Nepal	98 942 460.13	109 692 306.13	Committed	ODA	other	Mitigation	Energy	The project comprises priority investments in the power transmission grid, including seven new high voltage transmission lines and associated substations as well as expansion and upgrade of several existing substations. The project will contribute to meeting domestic demand by connecting new hydroelectric schemes in the Western Development region to the national grid and will facilitate cross-border power exchange with India. In the near term, trading will mainly concern imports from India. Some export of wet season surplus power is likely in the medium term, while in the longer term exports are expected to predominate as the high-voltage transmission network is further expanded to support large-scale hydropower development in Nepal.

EIB / Nicaragua	146 092 037.99	161 964 565.40	Committed	other	other	Mitigation	Energy	The project consists of 480 km of 230 kV line and five substations to connect a new large (253 MW) hydro power plant (Tumarin) to the main electricity network, located in northern Nicaragua. It also includes a new control centre for the transmission network and related fibre optics network.
EIB / Nigeria	400 000.00	443 458.98	Committed	OOF	other	Mitigation	Credit lines	A loan to be offered to two second tier Nigerian banks (reduced from four following due diligence). Each bank will receive a loan of Eur 25m which will have terms that permit it to qualify as capital support according to the Central Bank of Nigeria's guidelines. In addition, Eur 50m will be available to both banks on a first-come, first-served basis (to promote competition and uptake) to finance projects undertaken by private enterprises. Following a recent (significant) consolidation, the banks that remain in the Nigerian financial sector are strong and generally well placed to benefit from EIB funds. Past EIB lending has focused on the first tier banks; this project would seek to support the second tier banks in order to promote further financial sector development, assist their diverse client base, and stimulate competition in the sector. The capital support element of the operation will provide funds for expansion of the banks' activities (branches, IT infrastructure etc.).
EIB / Pakistan	50 000 000.00	55 432 372.51	Committed	other	other	Mitigation	Energy	The Project comprises the modernisation and upgrade of a 50-year old hydropower plant, including a comprehensive rehabilitation programme designed to restore the plant to its original capacity of 243 MW and to achieve an additional 40 years of safe, reliable and cost-effective energy production.
EIB / Papua New Guinea	10 673 489.90	11 833 137.36	Committed	other	other	Adaptation	Transport	The Project consists of the replacement of 27 obsolete, narrow single-lane, mainly modular steel bridges with permanent, dual-lane structures on 5 of the 16 priority national road corridors of the Independent State of Papua New Guinea (PNG).
EIB / Regional - Africa	14 772 224.68	16 377 189.22	Committed	other	Equity	Mitigation	Services	Equity investment in a fund focussing on renewable energy projects.
EIB / Regional - Africa	8 000 000.00	8 869 179.60	Committed	ODA	Equity	Mitigation	Services	The operation concerns an investment in a private equity fund, sponsored by Schneider Electric, that will focus on financing SMEs active in electricity generation and distribution in Sub-Saharan Africa. The fund aims to provide access to electricity to at least one million low-income beneficiaries, located in rural and semi-urban areas. The fund will focus on off-grid rural electrification, in particular solar home systems, micro-grid infrastructure and other small/micro-scale renewable energy and hybrid technologies, and will start investing in companies with operations in East Africa before expanding to other Sub-Saharan African countries. As an operation aiming to generate superior developmental impact, it qualifies for the Social Impact Funds window of the Financing Envelope that was launched early 2014 following the increase of the IF resources by EUR 500m for the 2014-2020 period.
EIB / Regional - Africa	2 400 000.00	2 660 753.88	Committed	ODA	Equity	Mitigation	Energy	The Fund will finance primarily greenfield infrastructure projects in the energy and power, transportation, environmental infrastructure, social infrastructure and telecommunications sectors across Africa.
EIB / Regional - Africa	300 000.00	332 594.24	Committed	ODA	Equity	Mitigation	Tele-communications	The Fund will finance primarily greenfield infrastructure projects in the energy and power, transportation, environmental infrastructure, social infrastructure and telecommunications sectors across Africa.
EIB / Regional - Africa	402 000.00	445 676.27	Committed	ODA	Equity	Mitigation	Water, sewerage	The Fund will finance primarily greenfield infrastructure projects in the energy and power, transportation, environmental infrastructure, social infrastructure and telecommunications sectors across Africa.
EIB / Regional - Africa	594 000.00	658 536.59	Committed	ODA	Equity	Mitigation	Services	The Fund will finance primarily greenfield infrastructure projects in the energy and power, transportation, environmental infrastructure, social infrastructure and telecommunications sectors across Africa.
EIB / Regional - Africa	198 000.00	219 512.20	Committed	ODA	Equity	Mitigation	Solid waste	The Fund will finance primarily greenfield infrastructure projects in the energy and power, transportation, environmental infrastructure, social infrastructure and telecommunications sectors across Africa.
EIB / Regional - Africa	300 000.00	332 594.24	Committed	ODA	Equity	Mitigation	Education	The Fund will finance primarily greenfield infrastructure projects in the energy and power, transportation, environmental infrastructure, social infrastructure and telecommunications sectors across Africa.

EIB / Regional - Africa	600 000.00	665 188.47	Committed	ODA	Equity	Mitigation	Health	The Fund will finance primarily greenfield infrastructure projects in the energy and power, transportation, environmental infrastructure, social infrastructure and telecommunications sectors across Africa.
EIB / Regional - Africa	1 206 000.00	1 337 028.82	Committed	ODA	Equity	Mitigation	Transport	The Fund will finance primarily greenfield infrastructure projects in the energy and power, transportation, environmental infrastructure, social infrastructure and telecommunications sectors across Africa.
EIB / Regional - Central Africa	170 000.00	188 470.07	Committed	other	other	Mitigation	Credit lines	Credit facility for financial institutions to finance SMEs and MidCaps in East & Central Africa. The facility contributes to private sector development in the region.
EIB / Regional - East Africa	200 000.00	221 729.49	Committed	OOF	other	Mitigation	Services	Global authorisation to provide medium to long-term funding to micro and small enterprises through selected financial intermediaries in East Africa Community countries.
EIB / Regional - East Africa	100 000.00	110 864.75	Committed	OOF	other	Mitigation	Services	Global authorisation to provide medium to long-term funding to micro and small enterprises through selected financial intermediaries in East Africa Community countries.
EIB / Regional - East Africa	100 000.00	110 864.75	Committed	OOF	other	Mitigation	Credit lines	The East & Central Africa Private Enterprise Finance Facility ("ECA PEFF") will be made available in EUR/USD/local currencies to eligible financial intermediaries engaged in financing private enterprises, in particular SMEs, in Kenya, Tanzania, Uganda, Rwanda, Burundi, Democratic Republic of Congo and Djibouti. Private enterprises involved in eligible sectors would be the final beneficiaries. A global authorisation is requested for this Facility and the first participating financial intermediary, National Microfinance Bank (NMB) Tanzania is presented for approval.
EIB / Regional - East Africa	2 530 000.00	2 804 878.05	Committed	other	other	Mitigation	Credit lines	Credit facility for financial institutions to finance SMEs and MidCaps in East & Central Africa. The facility contributes to private sector development in the region.
EIB / Regional - Southern Africa	80 000.00	88 691.80	Committed	OOF	other	Mitigation	Services	Global authorisation to provide medium to long-term funding to micro and small enterprises through selected financial intermediaries in Southern African ACP countries.
EIB / Regional - Southern Africa	60 000.00	66 518.85	Committed	OOF	other	Mitigation	Services	Global authorisation to provide medium to long-term funding to micro and small enterprises through selected financial intermediaries in Southern African ACP countries.
EIB / Regional - Southern Africa	200 000.00	221 729.49	Committed	OOF	other	Mitigation	Services	Global authorisation to provide medium to long-term funding to micro and small enterprises through selected financial intermediaries in Southern African ACP countries.
EIB / Regional - Southern Africa	120 000.00	133 037.69	Committed	OOF	other	Mitigation	Services	Global authorisation to provide medium to long-term funding to micro and small enterprises through selected financial intermediaries in Southern African ACP countries.
EIB / Regional - Southern Africa	200 000.00	221 729.49	Committed	OOF	other	Mitigation	Services	Global authorisation to provide medium to long-term funding to micro and small enterprises through selected financial intermediaries in Southern African ACP countries.
EIB / Senegal	20 000 000.00	22 172 949.00	Committed	other	other	Mitigation	Energy	Electrical interconnection between the member countries of the OMVG (Gambia River Organization: Senegal, The Gambia, Guinea Bissau and Guinea Conakry).
EIB / Serbia	1 000 000.00	1 108 647.45	Committed	other	other	Mitigation	Credit lines	Loan for SMEs with a Mid-cap tranche for financing SME and medium sized companies projects for at least 70 % of the loan amount, as well as small and medium scale infrastructure projects promoted by local authorities and final beneficiaries of any size in the fields of knowledge economy, energy, environmental protection, health, education and services, including a focus on investments promoted by youth and/or securing youth employment.

EIB / Serbia	1 600 000.00	1 773 835.92	Committed	other	other	Mitigation	Credit lines	Loan for SMEs with a Mid-cap tranche for financing SME and medium sized companies projects, small and medium scale infrastructure projects promoted by local authorities and final beneficiaries of any size in the fields of knowledge economy, energy, environmental protection, health, education and services.
EIB / South Africa	1 000 000.00	1 108 647.45	Committed	other	other	Mitigation	Credit lines	Credit facility to South African financial intermediaries for on lending to limited scale investments undertaken by SMEs and Midcaps.
EIB / South Africa	1 000 000.00	1 108 647.45	Committed	other	other	Mitigation	Credit lines	Credit facility to South African financial intermediaries for on lending to limited scale investments undertaken by SMEs and Midcaps.
EIB / South Africa	1 000 000.00	1 108 647.45	Committed	other	other	Mitigation	Credit lines	Credit facility to South African financial intermediaries for on lending to limited scale investments undertaken by SMEs and Midcaps.
EIB / Tunisia	1 000 000.00	1 108 647.45	Committed	other	other	Mitigation	Credit lines	Intermediated loan to finance projects located in Tunisia carried out by (i) medium-sized enterprises (STIs), (ii) small and medium-sized enterprises (SMEs) or (iii) very small (TPE) of industrial or commercial character intervening in all sectors of the Tunisian economy.
EIB / Turkey	36 000 000.00	39 911 308.20	Committed	other	other	Adaptation	Agriculture, fisheries, forestry	Supporting forest rehabilitation, afforestation and erosion control activities in Turkey during the period 2016-17 through the Ministry of Forestry and Water Works.
EIB / Turkey	2 000 000.00	2 217 294.90	Committed	ODA	other	Mitigation	Credit lines	The proposed operation with Turkish Eximbank will support long-term lending to export oriented SMEs and Midcaps. The loan will furthermore contribute to tackle the country's current account deficit.
EIB / Turkey	1 000 000.00	1 108 647.45	Committed	ODA	other	Mitigation	Credit lines	Dedicated loan aimed at increasing the availability and improving the financial conditions of SMEs and Mid-Caps across Turkey.
EIB / Turkey	4 000 000.00	4 434 589.80	Committed	other	other	Mitigation	Credit lines	MBIL loan aimed at increasing the availability and improving the financial conditions of SMEs and Mid-Caps financing across Turkey.
EIB / Turkey	8 000 000.00	8 869 179.60	Committed	other	other	Mitigation	Energy	The loan is a dedicated SME and Midcap credit line for projects promoted by SMEs and Mid-Caps in Turkey. It is envisaged that as much as 30 % of the overall amount could be used to finance investments in the field of Renewable Energy and Energy Efficiency.
EIB / Turkey	32 000 000.00	35 476 718.40	Committed	other	other	Mitigation	Credit lines	The loan is a dedicated SME and Midcap credit line for projects promoted by SMEs and Mid-Caps in Turkey. It is envisaged that as much as 30 % of the overall amount could be used to finance investments in the field of Renewable Energy and Energy Efficiency.
EIB / Turkey	12 500 000.00	13 858 093.13	Committed	other	other	Mitigation	Water, sewerage	Financing municipal investment schemes in the public transport, water, waste water and solid waste sector in Turkey using ILBANK as an intermediary.
EIB / Turkey	12 500 000.00	13 858 093.13	Committed	other	other	Mitigation	Solid waste	Financing municipal investment schemes in the public transport, water, waste water and solid waste sector in Turkey using ILBANK as an intermediary.
EIB / Turkey	225 000 000.00	249 445 676.27	Committed	other	other	Mitigation	Transport	Financing municipal investment schemes in the public transport, water, waste water and solid waste sector in Turkey using ILBANK as an intermediary.
EIB / Turkey	3 990 978.80	4 424 588.47	Committed	ODA	other	Mitigation	Credit lines	MBIL loan aimed at increasing the availability and improving the financial conditions of SMEs and Mid-Caps financing across Turkey.
EIB / Turkey	295 000 000.00	327 050 997.78	Committed	ODA	other	Mitigation	Transport	Construction of a new 23 km long underground metro line in Istanbul, at the European side of the city between Mahmutbey and Kabatas, and including rolling stock.

EIB / Turkey	2 000 000.00	2 217 294.90	Committed	other	other	Mitigation	Credit lines	MBIL loan aimed at increasing the availability and improving the financial conditions of SMEs and Mid-Caps financings across Turkey
EIB / Turkey	2 000 000.00	2 217 294.90	Committed	other	other	Mitigation	Credit lines	Loan for the financing of SMEs, Midcaps and Innovative enterprises located in Turkey
EIB / Turkey	6 000 000.00	6 651 884.70	Committed	other	other	Mitigation	Services	The project concerns the research activities supported by the Academic Research Funding Programme (ARDEB) and the Industrial R&D and Innovation Programme (TEYDEB) implemented through the Scientific and Technological Research Council (TÜBİTAK) of Turkey. The programmes have national reach and will be implemented in 2015 and 2016.
EIB / Turkey	7 000 000.00	7 760 532.15	Committed	OOF	other	Mitigation	Industry	The project concerns a selection of the promoter's research, development and innovation (RDI) investments within four years, related to the design and testing of tractors and agricultural equipment.
EIB / Turkey	2 000 000.00	2 217 294.90	Committed	ODA	other	Mitigation	Credit lines	Dedicated loan aimed at increasing the availability of long term loans towards SMEs and Midcaps across Turkey.
EIB / Turkey	3 000 000.00	3 325 942.35	Committed	ODA	other	Mitigation	Credit lines	SME and Mid-Cap Loan to finance small and medium-scale projects to be carried out by SMEs and Mid-Caps in Turkey.
EIB / Turkey	2 000 000.00	2 217 294.90	Committed	ODA	other	Mitigation	Credit lines	The proposed operation will provide long term financing for projects promoted by SMEs and Mid-Caps in Turkey. The project will be intermediated by Ziraat Bank, a state owned financial intermediary being one of the leading lenders to the SME and Mid-Cap sector in Turkey.
EIB / Turkey	49 061 784.90	54 392 222.72	Committed	other	other	Mitigation	Energy	EIB guarantee in favour of IBRD, covering five IBRD investment loans in Ukraine contributing to the development of economic infrastructure. The guarantee will release IBRD exposure to Ukraine, enabling IBRD to support emergency gas purchases by Naftogaz.
EIB / Ukraine	24 164 759.72	26 790 199.25	Committed	other	other	Mitigation	Transport	EIB guarantee in favour of IBRD, covering five IBRD investment loans in Ukraine contributing to the development of economic infrastructure. The guarantee will release IBRD exposure to Ukraine, enabling IBRD to support emergency gas purchases by Naftogaz.
EIB / Ukraine	43 988 000.11	48 767 184.15	Committed	other	other	Mitigation	Credit lines	Loan to Ukraine to finance the upgrading of (i) cereals, (ii) oil seeds and (iii) aquaculture and fisheries value chains.
EIB / Ukraine	95 997 999.57	106 427 937.44	Committed	other	other	Adaptation	Credit lines	Loan to Ukraine to finance the upgrading of (i) cereals, (ii) oil seeds and (iii) aquaculture and fisheries value chains.
EIB / Ukraine	80 000 000.00	88 691 796.01	Committed	other	other	Mitigation	Energy	Framework loan for the rehabilitation and upgrading of municipal infrastructure in Ukraine.
EIB / Ukraine	80 000 000.00	88 691 796.01	Committed	other	other	Mitigation	Water, sewerage	Framework loan for the rehabilitation and upgrading of municipal infrastructure in Ukraine.
EIB / Ukraine	20 000 000.00	22 172 949.00	Committed	other	other	Mitigation	Solid waste	Framework loan for the rehabilitation and upgrading of municipal infrastructure in Ukraine.
EIB / Ukraine	20 000 000.00	22 172 949.00	Committed	other	other	Mitigation	Urban development	Framework loan for the rehabilitation and upgrading of municipal infrastructure in Ukraine.

EIB / Ukraine	280 000.00	310 421.29	Committed	other	other	Mitigation	Credit lines	Dedicated line of credit to FNB Zambia for onlending to private SMEs and MidCaps in Zambia
EIB / Zambia	84 000 000.00	93 126 385.81	Committed	other	other	Mitigation	Agriculture, fisheries, forestry	Supporting forest rehabilitation, afforestation and erosion control activities in Turkey during the period 2016-17 through the Ministry of Forestry and Water Works.
Total contributions through bilateral, regional and other channels	3 792 623 540.18	4 204 682 416.98						

CTF Table 7(b): Provision of public financial support: contribution through bilateral, regional and other channels in 2016

	Total amount								
	European euro - EUR	USD							
<i>Recipient country/ region/project/ programme</i>	<i>European euro - EUR</i>	<i>USD</i>	<i>Status:</i>	<i>Funding source:</i>	<i>Financial instrument:</i>	<i>Type of support:</i>	<i>Sector, 7:</i>	<i>Additional information^c</i>	
Afghanistan / Asia - South and central	12 000 000.00	13 274 336.28	Committed	ODA	Grant	Adaptation	Agriculture	Jobs Focused Stimulus Initiative	
Africa, regional / Africa - Regional	80 000 000.00	88 495 575.22	Committed	ODA	Grant	Mitigation	Transport	Infrastructure: African Investment Facility (AFIF)	
Africa, regional / Africa - Regional	71 584 230.00	79 186 095.13	Committed	ODA	Grant	Mitigation	Energy	Delivering access to modern, affordable and sustainable energy (3)	
Africa, regional / Africa - Regional	20 000 000.00	22 123 893.81	Committed	ODA	Grant	Mitigation	Other	SWITCH Africa Green phase 2	
Africa, regional / Africa - Regional	7 600 000.00	8 407 079.65	Committed	ODA	Grant	Mitigation	Agriculture	Continental Panafrican EU Support Programme to the AU IBAR Livestock Development Strategy for Africa (LIVE2AFRICA)	
Africa, regional / Africa - Regional	3 200 000.00	3 539 823.01	Committed	ODA	Grant	Mitigation	Forestry	Supporting sustainable management of tropical trees and conservation of the African Elephant through UNEP and CITES	
Africa, regional / Africa - Regional	4 800 000.00	5 309 734.51	Committed	ODA	Grant	Cross-cutting	Other	Preserving threatened species, their habitats and the people depending on them – Building on the experience and success of SOS Save Our Sp	
Africa, regional / Africa - Regional	8 000 000.00	8 849 557.52	Committed	ODA	Grant	Mitigation	Cross-cutting	Contribution to the African Investment Facility for the realisation of regional infrastructures	
Africa, regional / Africa - Regional	70 000 000.00	77 433 628.32	Committed	ODA	Grant	Adaptation	Other	PRO RESILIENCE ACTION 2016 FED Reserves	
Albania / Europe	1 600 000.00	1 769 911.50	Committed	ODA	Grant	Cross-cutting	Water and sanitation	Support to water management	
Albania / Europe	1 600 000.00	1 769 911.50	Committed	ODA	Grant	Mitigation	Other	Civil Society Facility and Media Albania Action 2	
Albania / Europe	5 200 000.00	5 752 212.39	Committed	ODA	Grant	Cross-cutting	Agriculture	Rural development programme	
Algeria / Africa - North of Sahara	10 000 000.00	11 061 946.90	Committed	ODA	Grant	Mitigation	Energy	Support to the sector of mainly electric renewable energies and energy efficiency in Algeria	
America, regional / America - Regional	40 000 000.00	44 247 787.61	Committed	ODA	Grant	Cross-cutting	Other	Regional Environment / Climate Change programme in Latin America	
America, regional / America - Regional	21 062 904.00	23 299 672.57	Committed	ODA	Grant	Cross-cutting	Cross-cutting	Latin American Investment Facility 2014 LAIF	
Asia, regional / Asia - Regional	8 000 000.00	8 849 557.52	Committed	ODA	Grant	Adaptation	Other	Asi@Connect	
Asia, regional / Asia - Regional	13 600 000.00	15 044 247.79	Committed	ODA	Grant	Mitigation	Industry	SWITCH Asia II, Promoting Sustainable Consumption and Production 2016	
Asia, regional / Asia - Regional	25 000 000.00	27 654 867.26	Committed	ODA	Grant	Cross-cutting	Cross-cutting	Asian Investment Facility MA part 1	
Asia, regional / Asia - Regional	8 000 000.00	8 849 557.52	Committed	ODA	Grant	Cross-cutting	Cross-cutting	Asian Investment Facility	
Bangladesh / Asia - South and central	30 780 000.00	34 048 672.57	Committed	ODA	Grant	Adaptation	Other	Food and Nutrition Security Programme for Bangladesh 2015	

Bangladesh / Asia - South and central	21 328 736.00	23 593 734.51	Committed	ODA	Grant	Adaptation	Other	Bangladesh Resilient Livelihoods Programme MA part 1
Bhutan / Asia - South and central	8 000 000.00	8 849 557.52	Committed	ODA	Grant	Adaptation	Other	Support to Capacity Development for Local Governments and Fiscal Decentralization
Bhutan / Asia - South and central	5 000 000.00	5 530 973.45	Committed	ODA	Grant	Adaptation	Other	Rural Development and Climate Change Response Programme
Bhutan / Asia - South and central	16 500 000.00	18 252 212.39	Committed	ODA	Grant	Adaptation	Cross-cutting	Rural Development and Climate Change Response Programme
Bolivia / America - South	7 000 000.00	7 743 362.83	Committed	ODA	Grant	Adaptation	Other	PRO Resilience Action 2016 Bolivia BS
Bosnia and Herzegovina / Europe	5 000 000.00	5 530 973.45	Committed	ODA	Grant	Adaptation	Other	Support to Flood Protection and Water Management
Burkina Faso / Africa - South of Sahara	21 600 000.00	23 893 805.31	Committed	ODA	Grant	Adaptation	Water and sanitation	Program of Support to the Sectorial Policy on Water and Sanitation (PAPS EA)
Burkina Faso / Africa - South of Sahara	46 800 000.00	51 769 911.50	Committed	ODA	Grant	Adaptation	Agriculture	Support Program for Food and Nutrition Security, Sustainable Agriculture and Resilience in Burkina Faso
Cabo Verde / Africa - South of Sahara	5 000 000.00	5 530 973.45	Committed	ODA	Grant	Cross-cutting	Forestry	Building adaptive capacity and resilience of the forestry sector in Cape Verde
Cambodia / Asia - Far east	12 000 000.00	13 274 336.28	Committed	ODA	Grant	Adaptation	Other	Cambodia Programme for Sustainable and Inclusive Growth in the Fisheries Sector: Aquaculture (CaPFish Aquaculture)
Cameroon / Africa - South of Sahara	4 000 000.00	4 424 778.76	Committed	ODA	Grant	Mitigation	Forestry	PAMFOR / Forestry Governance Improvement Program
Cameroon / Africa - South of Sahara	12 000 000.00	13 274 336.28	Committed	ODA	Grant	Adaptation	Cross-cutting	PNDP FED
Central Asia, regional / Asia - South and central	20 000 000.00	22 123 893.81	Committed	ODA	Grant	Cross-cutting	Cross-cutting	Investment Facility for Central Asia
Chad / Africa - South of Sahara	13 200 000.00	14 601 769.91	Committed	ODA	Grant	Adaptation	Other	Support Program for the Concerted Management of Protected Areas and Fragile Ecosystems of Chad (APEF)
Chad / Africa - South of Sahara	62 400 000.00	69 026 548.67	Committed	ODA	Grant	Adaptation	Other	Food and Nutrition Security (SAN)
Côte d'Ivoire / Africa - South of Sahara	27 306 000.00	30 205 752.21	Committed	ODA	Grant	Mitigation	Energy	ENERGOS 2
Côte d'Ivoire / Africa - South of Sahara	8 000 000.00	8 849 557.52	Committed	ODA	Grant	Adaptation	Agriculture	Support program for the food sector in Côte d'Ivoire
Cuba / America - North & Central	1 350 000.00	1 493 362.83	Committed	ODA	Grant	Adaptation	Other	ENVIRONMENTAL BASES FOR LOCAL FOOD SUSTAINABILITY (BASAL) Expansion of funds DEC 22 714
Developing countries, unspecified / Bilateral unallocated	1 684 000.00	1 862 831.86	Committed	ODA	Grant	Cross-cutting	Other	General Secretariat of the Union for the Mediterranean.
Developing countries, unspecified / Bilateral unallocated	8 200 000.00	9 070 796.46	Committed	ODA	Grant	Adaptation	Other	Mitigation CBRN Risks
Developing countries, unspecified / Bilateral unallocated	6 000 000.00	6 637 168.14	Committed	ODA	Grant	Mitigation	Energy	Covenant of mayors in Sub Saharan Africa. Phase II
Developing countries, unspecified / Bilateral unallocated	37 643 200.00	41 640 707.96	Committed	ODA	Grant	Cross-cutting	Agriculture	Inclusive and sustainable value chains and food fortification
Developing countries, unspecified / Bilateral unallocated	19 200 000.00	21 238 938.05	Committed	ODA	Grant	Adaptation	Agriculture	“Work Programme 2017 2019 of the ACP EU Technical Centre for Agricultural and Rural Cooperation (CTA)”

Developing countries, unspecified / Bilateral unallocated	20 500 000.00	22 676 991.15	Committed	ODA	Grant	Adaptation	Agriculture	Reversing Land Degradation in Africa through Scaling up EverGreen Agriculture
Developing countries, unspecified / Bilateral unallocated	8 000 000.00	8 849 557.52	Committed	ODA	Grant	Mitigation	Other	URBAN LEDS Phase II
Developing countries, unspecified / Bilateral unallocated	500 000.00	553 097.35	Committed	ODA	Grant	Mitigation	Other	SUPPORT TO IEA WORLD ENERGY OUTLOOK: CLIMATE ENERGY DEVELOPMENT NEXUS GPGC
Developing countries, unspecified / Bilateral unallocated	384 108.00	424 898.23	Committed	ODA	Grant	Cross-cutting	Other	Support measures under Global Public Goods and Challenges thematic programme 2016
Developing countries, unspecified / Bilateral unallocated	10 000.00	11 061.95	Committed	ODA	Grant	Cross-cutting	Other	Support Measures for GPGC environment and climate change 2015
Developing countries, unspecified / Bilateral unallocated	2 000 000.00	2 212 389.38	Committed	ODA	Grant	Cross-cutting	Other	Support to COP22 Presidency
Developing countries, unspecified / Bilateral unallocated	250 000.00	276 548.67	Committed	ODA	Grant	Mitigation	Other	Support to developing countries on HFC work
Developing countries, unspecified / Bilateral unallocated	97 750.00	108 130.53	Committed	ODA	Grant	Mitigation	Other	Support to Montreal Protocol Trust Fund
Developing countries, unspecified / Bilateral unallocated	37 000.00	40 929.20	Committed	ODA	Grant	Mitigation	Other	Support to Montreal Protocol Trust Fund
Developing countries, unspecified / Bilateral unallocated	13 780.00	15 243.36	Committed	ODA	Grant	Mitigation	Other	Support to Vienna Convention
Developing countries, unspecified / Bilateral unallocated	2 000 000.00	2 212 389.38	Committed	ODA	Grant	Mitigation	Cross-cutting	MITIGATION Component of the GCCA+ Support Facility
Developing countries, unspecified / Bilateral unallocated	2 250 000.00	2 488 938.05	Committed	ODA	Grant	Cross-cutting	Other	Support to UNFCCC Trust Funds for developing countries
Developing countries, unspecified / Bilateral unallocated	58 600 000.00	64 823 008.85	Committed	ODA	Grant	Cross-cutting	Cross-cutting	2016 Contribution to the NIF (Neighbourhood Investment Facility) for the SOUTH
Developing countries, unspecified / Bilateral unallocated	31 200 000.00	34 513 274.34	Committed	ODA	Grant	Cross-cutting	Cross-cutting	2016 Contribution to the NIF (Neighbourhood Investment Facility) for the EAST
Dominican Republic / America - North & Central	1 400 000.00	1 548 672.57	Committed	ODA	Grant	Adaptation	Other	STRENGTHENING OF THE CARIBBEAN BIOLOGICAL CORRIDOR
Egypt / Africa - North of Sahara	216 000.00	238 938.05	Committed	ODA	Grant	Cross-cutting	Water and sanitation	Dummy Contract to Add € 540,000 to NIF KESWE contract 353 967.
Ethiopia / Africa - South of Sahara	7 200 000.00	7 964 601.77	Committed	ODA	Grant	Cross-cutting	Other	Support to Early Recovery and Socio Economic Stability of the drought affected population in Ethiopia
Europe, regional / Europe	5 400 000.00	5 973 451.33	Committed	ODA	Grant	Adaptation	Water and sanitation	European Water Initiative Plus for Eastern Partnership (EUWI+ 4 EaP) (2016 share)
Europe, regional / Europe	9 400 000.00	10 398 230.09	Committed	ODA	Grant	Cross-cutting	Other	Civil Society Facility and Media Multi country Action 1
Europe, regional / Europe	12 000 000.00	13 274 336.28	Committed	ODA	Grant	Mitigation	Energy	Regional Energy Efficiency Programme for the Western Balkans (REEP) plus

Europe, regional / Europe	20 000 000.00	22 123 893.81	Committed	ODA	Grant	Mitigation	Energy	Green for Growth Fund (GGF)
Europe, regional / Europe	2 116 732.00	2 341 517.70	Committed	ODA	Grant	Cross-cutting	Energy	Energy Policy in Eastern partnership countries and Central Asia (2016 share)
Europe, regional / Europe	25 800 000.00	28 539 823.01	Committed	ODA	Grant	Mitigation	Forestry	Forest governance and trade for better livelihoods
Europe, regional / Europe	480 000.00	530 973.45	Committed	ODA	Grant	Cross-cutting	Cross-cutting	IPA II Cross Border Co operation Action Programme BiH Montenegro for the years 2015 2017 (2016 allocation)
Europe, regional / Europe	14 400 000.00	15 929 203.54	Committed	ODA	Grant	Mitigation	Cross-cutting	Support to the Western Balkans Investment Framework for Technical Assistance for 2016
Europe, regional / Europe	1 200 000.00	1 327 433.63	Committed	ODA	Grant	Adaptation	Cross-cutting	EU Agencies
Europe, regional / Europe	500 000.00	553 097.35	Committed	ODA	Grant	Cross-cutting	Cross-cutting	Multi country Action Programme for 2016 part CLIMA
Europe, regional / Europe	10 200 000.00	11 283 185.84	Committed	ODA	Grant	Cross-cutting	Cross-cutting	Regional Programme in the Eastern Neighbourhood in support of the Eastern Partnership Flagship Initiative on Sustainable Municipal Develop
Europe, regional / Europe	594 328.00	657 442.48	Committed	ODA	Grant	Cross-cutting	Cross-cutting	ENI CBC 2014 2020 / Hungary Slovakia Romania Ukraine
Europe, regional / Europe	536 120.00	593 053.10	Committed	ODA	Grant	Cross-cutting	Cross-cutting	ENI CBC 2014 2020 / Italy Tunisia
Europe, regional / Europe	680 000.00	752 212.39	Committed	ODA	Grant	Adaptation	Cross-cutting	IPA II Cross Border Co operation Action Programme Montenegro Albania for the years 2015 2017 (2016 allocation)
Europe, regional / Europe	224 000.00	247 787.61	Committed	ODA	Grant	Adaptation	Cross-cutting	Cross border cooperation programme Serbia Former Yugoslav Republic of Macedonia
Fiji / Oceania	5 000 000.00	5 530 973.45	Committed	ODA	Grant	Adaptation	Other	PRO Resilience Action 2016 EDF Reserves response FIJI
Fiji / Oceania	4 000 000.00	4 424 778.76	Committed	ODA	Grant	Adaptation	Other	EU Rapid Action Facility for Assistance to Fiji – post Tropical Cyclone Winston
Former Yugoslav Republic of Macedonia / Europe	2 000 000.00	2 212 389.38	Committed	ODA	Grant	Cross-cutting	Agriculture	Rural development programme
Gambia / Africa - South of Sahara	4 600 000.00	5 088 495.58	Committed	ODA	Grant	Adaptation	Other	Post Crisis Response to Food and Nutrition insecurity in The Gambia
Georgia / Asia - South and central	12 800 000.00	14 159 292.04	Committed	ODA	Grant	Adaptation	Other	Technical Cooperation Facility II
Georgia / Asia - South and central	248.00	274.34	Committed	ODA	Grant	Adaptation	Agriculture	Improving Regional Food Security through National Strategies and Small Holder Production in the South Caucasus
Georgia / Asia - South and central	31 000 000.00	34 292 035.40	Committed	ODA	Grant	Cross-cutting	Cross-cutting	ENPARD III (European Neighbourhood Programme for Agriculture and Rural Development in Georgia, phase III)
Ghana / Africa - South of Sahara	3 600 000.00	3 982 300.88	Committed	ODA	Grant	Cross-cutting	Agriculture	CSO RISE (Civil Society Organisations in Research and Innovation for Sustainable development)
Ghana / Africa - South of Sahara	25 000 000.00	27 654 867.26	Committed	ODA	Grant	Adaptation	Agriculture	Market Oriented Agriculture Programme in Ghana MOAP Ghana
Guyana / America - South	30 000 000.00	33 185 840.71	Committed	ODA	Grant	Adaptation	Other	Integrated Coastal Zone Management
Haiti / America - North & Central	40 000 000.00	44 247 787.61	Committed	ODA	Grant	Adaptation	Cross-cutting	Programme SAN en Haïti 11ème FED
Haiti / America - North & Central	4 000 000.00	4 424 778.76	Committed	ODA	Grant	Adaptation	Cross-cutting	PRO Resilience Haiti
Jordan / Asia - Middle east	28 000 000.00	30 973 451.33	Committed	ODA	Grant	Mitigation	Water and sanitation	Support to the implementation of the National Solid Waste Management Strategy
Jordan / Asia - Middle east	18 000 000.00	19 911 504.42	Committed	ODA	Grant	Cross-cutting	Energy	Renewable Energy and Energy Efficiency Programme in Jordan REEE II
Kenya / Africa - South of Sahara	20 000 000.00	22 123 893.81	Committed	ODA	Grant	Adaptation	Water and sanitation	Ending Drought Emergencies: Climate Proofed Infrastructures for improved water supply and sanitation in ASAL

Kenya / Africa - South of Sahara	50 000 000.00	55 309 734.51	Committed	ODA	Grant	Adaptation	Agriculture	AgriFI Kenya Support to productive, adapted and market integrated smallholder agriculture in Kenya
Kyrgyzstan / Asia - South and central	4 000 000.00	4 424 778.76	Committed	ODA	Grant	Adaptation	Agriculture	Integrated Rural Development Program for the Kyrgyz Republic (IRD)
Lesotho / Africa - South of Sahara	7 000 000.00	7 743 362.83	Committed	ODA	Grant	Mitigation	Energy	Support to Reform in the Energy Sector in Lesotho (Phase I)
Liberia / Africa - South of Sahara	30 000 000.00	33 185 840.71	Committed	ODA	Grant	Adaptation	Agriculture	EU Liberia Agriculture Programme
Liberia / Africa - South of Sahara	6 000 000.00	6 637 168.14	Committed	ODA	Grant	Mitigation	Other	Global Climate Change Alliance + Liberia
Malawi / Africa - South of Sahara	28 000 000.00	30 973 451.33	Committed	ODA	Grant	Adaptation	Other	Afikepo (let them, the children, develop to their full potential) Nutrition programme in Malawi
Mali / Africa - South of Sahara	20 000 000.00	22 123 893.81	Committed	ODA	Grant	Cross-cutting	Agriculture	Contract Reform Sectorial sector Agricultural SANAD (focus on rice sector and governance at the Office du Niger)
Mali / Africa - South of Sahara	6 000 000.00	6 637 168.14	Committed	ODA	Grant	Mitigation	Other	AGCC Mali 2 Global Alliance Against Climate Change in Mali Phase 2
Marshall Islands / Oceania	9 100 000.00	10 066 371.68	Committed	ODA	Grant	Mitigation	Energy	RMI Support for the reform of the energy sector
Marshall Islands / Oceania	1 575 000.00	1 742 256.64	Committed	ODA	Grant	Adaptation	Other	PRO Resilience Action 2016 EDF Reserves response RMI
Mauritius / Africa - South of Sahara	3 000 000.00	3 318 584.07	Committed	ODA	Grant	Adaptation	Agriculture	GCCA + Flagship Initiative Supporting climate smart agriculture for small holders in Mauritius
Micronesia / Oceania	1 800 000.00	1 991 150.44	Committed	ODA	Grant	Adaptation	Other	PRO Resilience Action 2016 EDF Reserves response FSM
Middle East, regional / Asia - Middle east	2 000 000.00	2 212 389.38	Committed	ODA	Grant	Cross-cutting	Transport	Support to the Regional Transport Action Plan (Maritime and Rail)
Moldova / Europe	24 000 000.00	26 548 672.57	Committed	ODA	Grant	Cross-cutting	Agriculture	Development of Rural areas in the Republic of Moldova
Montenegro / Europe	2 000 000.00	2 212 389.38	Committed	ODA	Grant	Cross-cutting	Agriculture	Rural development programme
Montenegro / Europe	6 400 000.00	7 079 646.02	Committed	ODA	Grant	Cross-cutting	Other	Capacity Building and Acquis related Activities for Sector Environment & Climate Action
Namibia / Africa - South of Sahara	8 000 000.00	8 849 557.52	Committed	ODA	Grant	Adaptation	Agriculture	Livestock Support Programme in the Northern Communal Areas of Namibia
Nauru / Oceania	2 400 000.00	2 654 867.26	Committed	ODA	Grant	Mitigation	Energy	Support to Energy Efficiency and Renewable Energy in the Republic of Nauru
Nepal / Asia - South and central	8 000 000.00	8 849 557.52	Committed	ODA	Grant	Cross-cutting	Water and sanitation	Water, Energy, Agriculture: Village livelihoods Enhancement in the Mid Far West (WAVE)
Niger / Africa - South of Sahara	81 200 000.00	89 823 008.85	Committed	ODA	Grant	Adaptation	Agriculture	Sectoral Reform Contract Food and Nutrition Security and Sustainable Agricultural Development in Niger
Niger / Africa - South of Sahara	663 140.00	733 561.95	Committed	ODA	Grant	Adaptation	Cross-cutting	Climate Resilience Support Project for Sustainable Agricultural Development / PARC DAD
Nigeria / Africa - South of Sahara	52 000 000.00	57 522 123.89	Committed	ODA	Grant	Mitigation	Energy	EU Support to the Energy Sector in Nigeria Phase 1
Nigeria / Africa - South of Sahara	14 800 000.00	16 371 681.42	Committed	ODA	Grant	Adaptation	Other	EU Support to Strengthening Resilience in Northern Nigeria
Niue / Oceania	300 000.00	331 858.41	Committed	ODA	Grant	Mitigation	Energy	Support to Energy Efficiency in Niue
Palau / Oceania	1 125 000.00	1 244 469.03	Committed	ODA	Grant	Adaptation	Other	PRO Resilience Action 2016 EDF Reserves response Palau
Papua New Guinea / Oceania	9 240 000.00	10 221 238.94	Committed	ODA	Grant	Adaptation	Water and sanitation	Support to the Papua New Guinea National WaSH Policy 2015 - 2030 Part 1
Paraguay / America - South	3 200 000.00	3 539 823.01	Committed	ODA	Grant	Cross-cutting	Agriculture	Promotion of a Diversified and Sustainable Livestock Production

Rwanda / Africa - South of Sahara	70 800 000.00	78 318 584.07	Committed	ODA	Grant	Mitigation	Energy	Sector Reform Contract (SRC) to increase performance of Rwanda's energy sector and develop the corresponding institutional capacities
Rwanda / Africa - South of Sahara	80 000 000.00	88 495 575.22	Committed	ODA	Grant	Adaptation	Agriculture	Sector Reform Contract to enhance the agriculture sector's sustainable use of land and water resources, value creation and contribution to
Sao Tome and Principe / Africa - South of Sahara	2 700 000.00	2 986 725.66	Committed	ODA	Grant	Adaptation	Agriculture	Appui auxiliaires agricoles d'exportation à Sao Tomé e principe
Senegal / Africa - South of Sahara	8 000 000.00	8 849 557.52	Committed	ODA	Grant	Adaptation	Cross-cutting	"Projet Beydaare"
Senegal / Africa - South of Sahara	14 000 000.00	15 486 725.66	Committed	ODA	Grant	Mitigation	Cross-cutting	Contribution of the PIN 11 th EDF from Senegal to the Africa Investment Facility in support of the urban sanitation and electrification sectors
Serbia / Europe	1 200 000.00	1 327 433.63	Committed	ODA	Grant	Mitigation	Other	Civil Society Facility and Media Serbia Action 7
Serbia / Europe	8 000 000.00	8 849 557.52	Committed	ODA	Grant	Cross-cutting	Agriculture	Rural development programme
Sierra Leone / Africa - South of Sahara	14 000 000.00	15 486 725.66	Committed	ODA	Grant	Adaptation	Agriculture	Boosting Agriculture & Food Security
Somalia / Africa - South of Sahara	25 000 000.00	27 654 867.26	Committed	ODA	Grant	Adaptation	Cross-cutting	Resilience Programme for Somalia
South Asia, regional / Asia - South and central	10 000 000.00	11 061 946.90	Committed	ODA	Grant	Adaptation	Other	Conservation, sustainable use and good governance of biodiversity in four vulnerable biomes in the centre of South America.
South of Sahara, regional / Africa - South of Sahara	5 200 000.00	5 752 212.39	Committed	ODA	Grant	Adaptation	Water and sanitation	Support to Water Resources Management and Nexus Water Energy Agriculture in the Senegal River Basin OMVS
South of Sahara, regional / Africa - South of Sahara	2 800 000.00	3 097 345.13	Committed	ODA	Grant	Mitigation	Energy	Enhancement of Regional energy market in the ESA IO region
South of Sahara, regional / Africa - South of Sahara	3 600 000.00	3 982 300.88	Committed	ODA	Grant	Adaptation	Agriculture	Support towards the Operationalization of SADC Regional Agriculture Policy
South of Sahara, regional / Africa - South of Sahara	24 600 000.00	27 212 389.38	Committed	ODA	Grant	Cross-cutting	Other	Support for the preservation of biodiversity and fragile ecosystems (ECOFAC 6)
South of Sahara, regional / Africa - South of Sahara	12 000 000.00	13 274 336.28	Committed	ODA	Grant	Adaptation	Other	11 th EDF RIP SUPPORTED INTERVENTIONS IN WILDLIFE IN HORN OF AFRICA, EASTERN AFRICA AND SOUTHERN AFRICA
South of Sahara, regional / Africa - South of Sahara	92 000 000.00	101 769 911.50	Committed	ODA	Grant	Mitigation	Cross-cutting	Contribution (phase 2) to the Africa Investment Facility in support of regional economic integration in West Africa.
South of Sahara, regional / Africa - South of Sahara	40 000 000.00	44 247 787.61	Committed	ODA	Grant	Mitigation	Cross-cutting	Contribution to the African Investment Facility in support of regional economic integration in West Africa
South of Sahara, regional / Africa - South of Sahara	51 000 000.00	56 415 929.20	Committed	ODA	Grant	Adaptation	Other	PRO Resilience Action 2016 EDF Reserves response: Horn of Africa
South of Sahara, regional / Africa - South of Sahara	63 000 000.00	69 690 265.49	Committed	ODA	Grant	Adaptation	Other	PRO Resilience Action 2016
South of Sahara, regional / Africa - South of Sahara	70 000 000.00	77 433 628.32	Committed	ODA	Grant	Cross-cutting	Other	GCCA + / intra ACP
States Ex-Yugoslavia unspecified / Europe	800 000.00	884 955.75	Committed	ODA	Grant	Adaptation	Cross-cutting	Cross Border Cooperation Programme Serbia Bosnia and Herzegovina
States Ex-Yugoslavia unspecified / Europe	480 000.00	530 973.45	Committed	ODA	Grant	Adaptation	Cross-cutting	Cross Border Cooperation Programme Serbia Montenegro

Sudan / Africa - South of Sahara	8 500 000.00	9 402 654.87	Committed	ODA	Grant	Adaptation	Other	Strengthening Local Communities Resilience to Climate Change in Sudan
Sudan / Africa - South of Sahara	40 000 000.00	44 247 787.61	Committed	ODA	Grant	Adaptation	Other	Special support measure in favour of the people of the Republic of Sudan to be financed from the reserve of the European Development Fund
Suriname / America - South	5 200 000.00	5 752 212.39	Committed	ODA	Grant	Adaptation	Agriculture	Sustainable Agriculture Development in Suriname
Tanzania / Africa - South of Sahara	20 000 000.00	22 123 893.81	Committed	ODA	Grant	Mitigation	Energy	Support to Rural Electrification Programme
Timor-Leste / Asia - Far east	2 000 000.00	2 212 389.38	Committed	ODA	Grant	Adaptation	Agriculture	Pro Act resilience Timor Leste Action 2016 EDF reserves response
Timor-Leste / Asia - Far east	27 000 000.00	29 867 256.64	Committed	ODA	Grant	Mitigation	Forestry	Partnership for Sustainable Agro Forestry between Timor Leste, the EU and Germany (PSAF)
Togo / Africa - South of Sahara	12 000 000.00	13 274 336.28	Committed	ODA	Grant	Cross-cutting	Water and sanitation	WATER AND SANITATION PROJECT IN TOGO (PEAT) PHASE 2
Togo / Africa - South of Sahara	10 000 000.00	11 061 946.90	Committed	ODA	Grant	Cross-cutting	Other	Support Program for the Fight against Climate Change in Togo
Turkey / Europe	19 892 000.00	22 004 424.78	Committed	ODA	Grant	Adaptation	Water and sanitation	Water
Turkey / Europe	9 180 000.00	10 154 867.26	Committed	ODA	Grant	Adaptation	Water and sanitation	Water
Turkey / Europe	42 040 000.00	46 504 424.78	Committed	ODA	Grant	Mitigation	Transport	Sustainable and safe transport
Turkey / Europe	27 600 000.00	30 530 973.45	Committed	ODA	Grant	Cross-cutting	Agriculture	Rural development programme
Turkey / Europe	10 164 000.00	11 243 362.83	Committed	ODA	Grant	Mitigation	Industry	Science Technology and Innovation
Turkey / Europe	6 468 000.00	7 154 867.26	Committed	ODA	Grant	Mitigation	Industry	Science Technology and Innovation
Turkey / Europe	4 784 000.00	5 292 035.40	Committed	ODA	Grant	Cross-cutting	Other	Multi annual Action Programme for Turkey on Environment and Climate Action
Turkmenistan / Asia - South and central	12 000.00	13 274.34	Committed	ODA	Grant	Mitigation	Energy	Support to the introduction of Sustainable Development policies – Rationale use of natural resources in the energy environment sectors in
Uganda / Africa - South of Sahara	4 800 000.00	5 309 734.51	Committed	ODA	Grant	Cross-cutting	Transport	Institutional Capacity Building for the Transport Sector in Uganda
Uganda / Africa - South of Sahara	53 120 000.00	58 761 061.95	Committed	ODA	Grant	Cross-cutting	Agriculture	Development initiative for Northern Uganda (DINU)
Uganda / Africa - South of Sahara	6 000 000.00	6 637 168.14	Committed	ODA	Grant	Cross-cutting	Agriculture	Support to Developing a Market Oriented and Environmentally Sustainable Beef Meat Industry in Uganda under the 11 th EDF
Uganda / Africa - South of Sahara	4 000 000.00	4 424 778.76	Committed	ODA	Grant	Adaptation	Other	Support to Promoting Commercial Aquaculture in Uganda under the 11 th EDF
Uzbekistan / Asia - South and central	8 600 000.00	9 513 274.34	Committed	ODA	Grant	Adaptation	Agriculture	Horticulture Development Project
Viet Nam / Asia - Far east	43 200 000.00	47 787 610.62	Committed	ODA	Grant	Mitigation	Energy	Energy Sector Policy Support Programme to enhance Access to Sustainable Energy in Rural Areas of Viet Nam
West Bank and Gaza Strip / Asia - Middle east	8 000 000.00	8 849 557.52	Committed	ODA	Grant	Adaptation	Agriculture	Improving access to economic enablers
West Indies, regional / America - North & Central	9 200 000.00	10 176 991.15	Committed	ODA	Grant	Mitigation	Energy	Technical Assistance Programme for Sustainable Energy in the Caribbean (TAPSEC)
West Indies, regional / America - North & Central	12 000 000.00	13 274 336.28	Committed	ODA	Grant	Cross-cutting	Cross-cutting	Caribbean Investment Facility (CIF) under the European Development Fund (EDF) blending framework

Zambia / Africa - South of Sahara	40 000 000.00	44 247 787.61	Committed	ODA	Grant	Mitigation	Energy	Support to the Energy Sector in Zambia (Renewable Energy)
Zambia / Africa - South of Sahara	26 000 000.00	28 761 061.95	Committed	ODA	Grant	Mitigation	Energy	Lusaka Distribution Transmission Rehabilitation Project (LDTRP) Low Voltage Distribution Network
Zimbabwe / Africa - South of Sahara	12 000 000.00	13 274 336.28	Committed	ODA	Grant	Adaptation	Other	Zimbabwe Natural Resource Management
EIB / Armenia	3 544 783.14	3 921 220.29	Committed	other	other	Mitigation	Credit lines	MBIL for SMEs and MidCaps through the Central Bank of the Republic of Armenia (APEX structure), with agri-food and tourism potentially significant beneficiary sectors
EIB / Armenia	3 544 783.14	3 921 220.29	Committed	other	other	Adaptation	Credit lines	MBIL for SMEs and MidCaps through the Central Bank of the Republic of Armenia (APEX structure), with agri-food and tourism potentially significant beneficiary sectors
EIB / Belize	156 506.06	173 126.17	Committed	other	other	Mitigation	Credit lines	Credit line to finance medium and small private sector projects and microinvestments in Belize.
EIB / Benin	3 000 000.00	3 318 584.07	Committed	other	other	Adaptation	Water, sewerage	Strengthening of the drinking water supply system in urban and peri-urban areas of Cotonou to meet demand until 2025 and establishment of a sludge treatment plant.
EIB / Bosnia and Herzegovina	500 000.00	553 097.35	Committed	other	other	Mitigation	Credit lines	Loan to finance small and medium scale projects promoted by SMEs in industry, tourism, services and agriculture or by local authorities in the fields of environmental protection, energy efficiency, knowledge economy and infrastructure.
EIB / Bosnia and Herzegovina	200 000.00	221 238.94	Committed	other	other	Mitigation	Credit lines	Loan for small and medium-sized projects promoted by SMEs, Mid-Caps and other private or public sector entities
EIB / Bosnia and Herzegovina	600 000.00	663 716.81	Committed	other	other	Mitigation	Credit lines	Loan operation for financing small and medium scale projects promoted by SMEs and Mid-caps, projects promoted by local authorities and final beneficiaries of any size for investments of limited scale in the fields of environmental protection, energy efficiency, knowledge economy, infrastructure, industry, services and tourism.
EIB / Burkina Faso	60 000.00	66 371.68	Committed	other	other	Mitigation	Credit lines	A credit line to support the development of private enterprises and the financial sector, including microfinance, in the two least developed Sahelian countries in the world (Burkina Faso and Niger). The loans will be granted to subsidiaries of the Bank of Africa Group in these countries.
EIB / Cameroon	911 620.77	1 008 430.05	Committed	other	other	Mitigation	Tele-communications	The project consists of the purchase and installation of mobile telecom equipment to extend the reach of telecommunication services to rural communities of the Democratic Republic of Congo and Cameroon currently not served by any operator. The project is to be implemented from 2016 to 2018. Services will operate using the frequency bands awarded to established operators under revenue share agreements. By the end of 2018 the two networks are planned to provide coverage to over 3.6 m people based on 650 sites. The project will extend mobile telecommunication network population coverages from 75 % to 80 % in the DRC and from 85 % to 95 % in Cameroon. It includes investments in the core, access, transmission components and energy equipment.

EIB / Congo (Democratic Republic)	22 790 519.14	25 210 751.26	Committed	other	other	Mitigation	Tele-communications	The project consists of the purchase and installation of mobile telecom equipment to extend the reach of telecommunication services to rural communities of the Democratic Republic of Congo and Cameroon currently not served by any operator. The project is to be implemented from 2016 to 2018. Services will operate using the frequency bands awarded to established operators under revenue share agreements. By the end of 2018 the two networks are planned to provide coverage to over 3.6 m people based on 650 sites. The project will extend mobile telecommunication network population coverages from 75 % to 80 % in the DRC and from 85 % to 95 % in Cameroon. It includes investments in the core, access, transmission components and energy equipment.
EIB / Dominican Republic	100 000.00	110 619.47	Committed	OOF	other	Mitigation	Credit lines	Lending Facility to provide medium to long-term funding to low-income small and micro-enterprises, low income households and community based organisations through selected financial intermediaries in the Caribbean and Pacific countries.
EIB / Ecuador	40 968 729.70	45 319 391.26	Committed	ODA	other	Mitigation	Transport	Construction of the first metro line in Quito
EIB / Egypt	75 000 000.00	82 964 601.77	Committed	other	other	Mitigation	Transport	Purchase of additional rolling stock to improve services at line 2 of Cairo Metro, to alleviate traffic congestion and promote public transport in urban greater Cairo.
EIB / Egypt	200 000 000.00	221 238 938.05	Committed	other	other	Mitigation	Transport	Extension of Line 3 (Phase 3) of the Cairo Metro with 17.7 km to serve the main transportation corridors of urban greater Cairo.
EIB / Egypt	551 166.64	609 697.61	Committed	other	other	Mitigation	Credit lines	Loan for SMEs and MidCaps targeting private sector with EU Comprehensive Guarantee.
EIB / Egypt	10 000 000.00	11 061 946.90	Committed	OOF	other	Mitigation	Credit lines	Loan for SMEs and MidCaps to support all eligible industrial and services sectors of the Egyptian economy.
EIB / Egypt	1 837 222.12	2 032 325.35	Committed	other	other	Mitigation	Credit lines	Loan for SMEs targeting private sector with EU-risk sharing mechanism.
EIB / FYROM	200 000.00	221 238.94	Committed	other	other	Mitigation	Credit lines	Loan for small and medium-sized projects promoted by SMEs, Mid-Caps and other private or public sector entities
EIB / Georgia	15 000 000.00	16 592 920.35	Committed	other	other	Mitigation	Agriculture, fisheries, forestry	Loan to Georgia (APEX structure) for upgrade of the horticulture (incl. nuts) and wine sectors in the country.
EIB / Georgia	45 000 000.00	49 778 761.06	Committed	other	other	Adaptation	Agriculture, fisheries, forestry	Loan to Georgia (APEX structure) for upgrade of the horticulture (incl. nuts) and wine sectors in the country.
EIB / Georgia	452 785.75	500 869.20	Committed	other	other	Mitigation	Credit lines	Loan dedicated to finance SMEs and Mid-Caps engaging in trade and commerce in Georgia.
EIB / Ghana	300 000.00	331 858.41	Committed	OOF	other	Mitigation	Credit lines	Global loan (IF) for 1) onlending to private companies in Ghana, operating in traditional eligible sectors and for 2) funding the capital expenditures of the intermediary banks to develop their capacities of intermediation (e.g. branch network, IT systems, buildings, training...). The funds will be channelled through some of the best performing banks in the Ghanaian financial sector and selected on the basis of their expectations of future development in a very buoyant financial market.
EIB / India	200 000 000.00	221 238 938.05	Committed	other	other	Mitigation	Transport	Construction of a 23 km metro line and purchase of a fleet of about 80 metro cars in Lucknow, Uttar Pradesh, in northern India.
EIB / Kazakhstan	25 000 000.00	27 654 867.26	Committed	other	other	Mitigation	Credit lines	A dedicated loan to the Kazakh state-owned "JSC DAMU - Entrepreneurship Development Fund" (DAMU), for on-lending to SMEs and Mid-Caps investing in projects eligible under the Bank's own-risk Climate Action and Environment Facility (CAEF)

EIB / Kazakhstan	75 000 000.00	82 964 601.77	Committed	other	other	Mitigation	Credit lines	A dedicated loan to the National Management Holding "Baiterek" for on-lending via "JSC DAMU Entrepreneurship Development Fund ("DAMU") to SMEs and MidCaps investing in projects eligible under the Bank's Own Risk Climate Action and Environmental Facility (CAEF)
EIB / Kyrgyzstan	3 412 500.00	3 774 889.38	Committed	other	other	Mitigation	Water, sewerage	The water and wastewater component will primarily support improvements in water supply, metering and wastewater networks. The solid waste management component of the project comprises construction of sanitary landfills and closure of the existing dumpsites, as well as supply of waste collection equipment for the local municipal companies.
EIB / Kyrgyzstan	1 137 500.00	1 258 296.46	Committed	other	other	Mitigation	Solid waste	The water and wastewater component will primarily support improvements in water supply, metering and wastewater networks. The solid waste management component of the project comprises construction of sanitary landfills and closure of the existing dumpsites, as well as supply of waste collection equipment for the local municipal companies.
EIB / Madagascar	2 800 000.00	3 097 345.13	Committed	other	other	Adaptation	Transport	The project is part of the "Grand Antananarivo Program" designed to reduce the chronic traffic congestion in the capital and comprises two missing sections of the ring roads North-East and East of Antananarivo.
EIB / Malawi	600 000.00	663 716.81	Committed	other	other	Mitigation	Services	EIB intermediated facility for on-lending to SMEs, Midcaps and private sector entities of any size undertaking limited scale projects in Malawi, in particular agristorage investments.
EIB / Maldives	31 500 000.00	34 845 132.74	Committed	other	other	Mitigation	Energy	The project will finance individual hybrid minigrid systems consisting of solar photovoltaic panels, together with efficient diesel engine generators and integrated lithium-ion accumulators in the Maldives' Outer Islands, and possibly an electricity transmission cable. The objective of the project is to reduce diesel fuel usage and costs of electricity generation, enhance the use of renewables, improve security of supply and reduce CO ₂ emissions (climate action).
EIB / Moldova, Republic of	50 000 000.00	55 309 734.51	Committed	other	other	Mitigation	Transport	The project consists of a framework with two components: (i) acquisition of 11 main-line diesel locomotives suitable for both freight and passenger services and the associated maintenance equipment; (ii) rehabilitation of selected sections of railway infrastructure.
EIB / Montenegro	600 000.00	663 716.81	Committed	other	other	Mitigation	Credit lines	Loans for financing small and medium-sized projects carried out primarily by SMEs as well as Final Beneficiaries of any size and ownership, including Local Authorities
EIB / Morocco	4 000 000.00	4 424 778.76	Committed	other	other	Mitigation	Solid waste	A dedicated bank-intermediated EIB loan to finance projects by private promoters in the waste management sector in Morocco
EIB / Morocco	3 000 000.00	3 318 584.07	Committed	other	other	Mitigation	Credit lines	A dedicated EIB loan to finance projects promoted by SMEs and Midcaps in Morocco
EIB / Morocco	3 750 000.00	4 148 230.09	Committed	OOF	other	Mitigation	Credit lines	FEMIP Sustainable Energy facility aims at providing credit lines to local Financial Intermediaries (FIs) in Jordan and Morocco to finance energy efficiency and small renewable energy investments in the industrial, SMEs, agribusiness, commercial services and residential sectors. The project, which is co-financed by the EBRD (Lead IFI), AFD and KfW, will contribute to the reduction of greenhouse gas emissions and the enhancement of security of supply.

EIB / Morocco	3 750 000.00	4 148 230.09	Committed	OOF	other	Mitigation	Credit lines	FEMIP Sustainable Energy facility aims at providing credit lines to local Financial Intermediaries (FIs) in Jordan and Morocco to finance energy efficiency and small renewable energy investments in the industrial, SMEs, agribusiness, commercial services and residential sectors. The project, which is co-financed by the EBRD (Lead IFI), AFD and KfW, will contribute to the reduction of greenhouse gas emissions and the enhancement of security of supply.
EIB / Niger	100 000.00	110 619.47	Committed	other	other	Mitigation	Credit lines	A credit line to support the development of private enterprises and the financial sector, including microfinance, in the two least developed Sahelian countries in the world (Burkina Faso and Niger). The loans will be granted to subsidiaries of the Bank of Africa Group in these countries.
EIB / Nigeria	1 200 000.00	1 327 433.63	Committed	other	other	Mitigation	Credit lines	The Nigeria Private Enterprise Finance Facility (NIGERIA PEFF) will be made available to eligible Nigerian financial intermediaries for 1) on lending to private enterprises in Nigeria, operating in productive and human capital sectors; 2) funding the banks' capital expenditures to further develop their capacities of intermediation.
EIB / Panama	4 585 893.79	5 072 891.36	Committed	other	other	Mitigation	Water, sewerage	The Project will improve the environmental conditions of Panama City and Bay by doubling the current treatment capacity of 190 000 cubic meters per day to 380 000 cubic meters per day of the Juan Díaz Wastewater Treatment Plant.
EIB / Panama	6 878 840.69	7 609 337.04	Committed	other	other	Adaptation	Water, sewerage	The Project will improve the environmental conditions of Panama City and Bay by doubling the current treatment capacity of 190 000 cubic meters per day to 380 000 cubic meters per day of the Juan Díaz Wastewater Treatment Plant.
EIB / Sao Tome and Principe	5 400 000.00	5 973 451.33	Committed	other	other	Mitigation	Energy	The project comprises multiple schemes concerning power infrastructure and provides technical assistance for implementation, capacity building and sector reforms. The project aims to increase renewable capacity and reduce losses in the network while improving overall system security and safety of supply. This will be done by rehabilitating an existing 1.9 MW hydropower plant, upgrading the low and medium voltage distribution network, and installing electricity meters.
EIB / Senegal	1 962 500.00	2 170 907.08	Committed	OOF	other	Adaptation	Industry	The project encompasses phased investments to set-up a vertically integrated agri-food company in the Senegal River Valley. The investments comprise the establishment of a rice farm (4500 ha [gross]) and an industrial site with a rice mill and storage facilities. The irrigation infrastructure will be designed to enable rice growers in the project's influence area to access irrigation water for private use. The promoter follows a socially responsible investment approach to guarantee the project's long-term success and has developed a comprehensive social plan.
EIB / Senegal	5 887 500.00	6 512 721.24	Committed	OOF	other	Adaptation	Agriculture, fisheries, forestry	The project encompasses phased investments to set-up a vertically integrated agri-food company in the Senegal River Valley. The investments comprise the establishment of a rice farm (4500 ha [gross]) and an industrial site with a rice mill and storage facilities. The irrigation infrastructure will be designed to enable rice growers in the project's influence area to access irrigation water for private use. The promoter follows a socially responsible investment approach to guarantee the project's long-term success and has developed a comprehensive social plan.

EIB / Serbia	3 000 000.00	3 318 584.07	Committed	other	other	Mitigation	Credit lines	Loan for SMEs with a Mid-Cap tranche for financing projects promoted by SMEs and medium-sized companies, projects promoted by final beneficiaries of any size for investments of limited scale in the fields of knowledge economy, energy, environment protection, industry, health, education and services.
EIB / Serbia	400 000.00	442 477.88	Committed	other	other	Mitigation	Credit lines	Loan for SMEs with a Mid-cap tranche for financing SME and medium sized companies projects, small and medium scale infrastructure projects promoted by local authorities and final beneficiaries of any size in the fields of knowledge economy, energy, environmental protection, health, education and services.
EIB / Tunisia	1 000 000.00	1 106 194.69	Committed	other	other	Mitigation	Credit lines	Intermediated loan to finance projects located in Tunisia carried out by (i) small and medium-sized enterprises (SMEs) or (ii) very small enterprises (TPE), private or public, industrial or commercial in all sectors of the Tunisian economy.
EIB / Tunisia	13 920 000.00	15 398 230.09	Committed	other	other	Mitigation	Water, sewerage	The Project consists of an investment programme that includes the rehabilitation and extension of waste water treatment plants along with sewerage network located in coastal areas.
EIB / Tunisia	380 000.00	420 353.98	Committed	ODA	other	Mitigation	Industry	Environmental upgrading of certain facilities of the Tunisian Chemical Group (GCT), particularly in Skhira, 50 km north of Gabès, and M'Dhilla, 100 km west of Gabès, to reduce atmospheric emissions and releases at sea.
EIB / Turkey	3 904 863.33	4 319 539.08	Committed	ODA	other	Mitigation	Credit lines	Multi-Beneficiary Intermediated Loan aimed at increasing the availability and improving the financial conditions of SMEs and Mid-Caps financing across Turkey.
EIB / Turkey	1 200 000.00	1 327 433.63	Committed	other	other	Mitigation	Credit lines	Dedicated EIB loan for the financing, via leasing schemes, of small and medium sized projects in Turkey promoted by SMEs and Mid-Caps in eligible sectors.
EIB / Turkey	4 000 000.00	4 424 778.76	Committed	ODA	other	Mitigation	Credit lines	Intermediated Loan dedicated to on-lending to export oriented SMEs and Midcaps in Turkey. The loan is expected to contribute to tackle the country's current account deficit.
EIB / Turkey	33 000 000.00	36 504 424.78	Committed	ODA	other	Mitigation	Energy	Construction of three wind power plants in Turkey (Uluborlu, Kizilcaterzi and Karova) for a total capacity of 106MW
EIB / Turkey	2 000 000.00	2 212 389.38	Committed	other	other	Mitigation	Credit lines	Dedicated EIB loan for the financing, via leasing schemes, of small and medium sized projects in Turkey promoted by SMEs and Mid-Caps in eligible sectors.
EIB / Turkey	2 000 000.00	2 212 389.38	Committed	other	other	Mitigation	Credit lines	The loan is a dedicated SME and Midcap credit line for projects promoted by SMEs and Mid-Caps in Turkey.
EIB / Turkey	4 000 000.00	4 424 778.76	Committed	other	other	Mitigation	Credit lines	Loan to finance small and medium-scale projects to be carried out by SMEs and Mid-Caps in Turkey.
EIB / Turkey	73 574 130.11	81 387 312.06	Committed	other	other	Mitigation	Energy	Framework loan to finance small and medium-sized renewable energy and energy efficiency projects in Turkey.
EIB / Turkey	31 531 770.05	34 880 276.60	Committed	other	other	Mitigation	Credit lines	Framework loan to finance small and medium-sized renewable energy and energy efficiency projects in Turkey.
EIB / Turkey	250 000 000.00	276 548 672.57	Committed	other	other	Mitigation	Transport	The Project involves the construction of the 13,4 km long Atakoy - Ikitelli line with 12 new stations on the European side of Istanbul. The new line will intersect with 6 different urban rail systems and provide improved network connections.
EIB / Turkey	2 000 000.00	2 212 389.38	Committed	ODA	other	Mitigation	Credit lines	MBIL loan aimed at increasing the availability and improving the financial conditions of SMEs and Mid-Caps across Turkey.
EIB / Turkey	35 704 909.42	39 496 581.22	Committed	ODA	other	Mitigation	Transport	The construction of a container port in the Aliaga district of the Izmir province on the Aegean coast of Turkey.

EIB / Turkey	72 250 000.00	79 922 566.37	Committed	other	other	Mitigation	Energy	The loan will finance small to medium sized investments in Turkey in the fields of Renewable Energy, Energy Efficiency and projects that substantially increase the environmental performance of industrial processes.
EIB / Turkey	12 750 000.00	14 103 982.30	Committed	other	other	Mitigation	Water, sewerage	The loan will finance small to medium sized investments in Turkey in the fields of Renewable Energy, Energy Efficiency and projects that substantially increase the environmental performance of industrial processes.
EIB / Turkey	2 000 000.00	2 212 389.38	Committed	other	other	Mitigation	Credit lines	Loan for the financing of SMEs, Midcaps and Innovative enterprises located in Turkey
EIB / Turkey	2 000 000.00	2 212 389.38	Committed	other	other	Mitigation	Credit lines	Dedicated loan for the financing of SMEs in Turkey, including those in the less developed parts of the country
EIB / Turkey	2 000 000.00	2 212 389.38	Committed	other	other	Mitigation	Credit lines	The loan is a dedicated SME and Midcap credit line for projects promoted by SMEs and Mid-Caps in Turkey.
EIB / Turkey	2 000 000.00	2 212 389.38	Committed	ODA	other	Mitigation	Credit lines	The proposed operation will provide long term financing for projects promoted by SMEs and Mid-Caps in Turkey. The project will be intermediated by Ziraat Bank, a state owned financial intermediary being one of the leading lenders to the SME and Mid-Cap sector in Turkey.
EIB / Turkey	2 000 000.00	2 212 389.38	Committed	other	other	Mitigation	Credit lines	Dedicated loan aimed at providing long term financing for projects promoted by SMEs and Mid-Caps located in Turkey.
EIB / Ukraine	32 121 679.93	35 532 831.78	Committed	other	other	Mitigation	Agriculture, fisheries, forestry	Financing of agriculture storage and logistics investment program of the Nibulon Group in Ukraine
EIB / Ukraine	6 173 858.24	6 829 489.20	Committed	other	other	Adaptation	Agriculture, fisheries, forestry	Financing of agriculture storage and logistics investment program of the Nibulon Group in Ukraine
EIB / Ukraine	23 260 526.84	25 730 671.29	Committed	other	other	Mitigation	Transport	Financing of agriculture storage and logistics investment program of the Nibulon Group in Ukraine
EIB / Ukraine	4 470 724.93	4 945 492.18	Committed	other	other	Adaptation	Transport	Financing of agriculture storage and logistics investment program of the Nibulon Group in Ukraine
EIB / Ukraine	5 200 000.00	5 752 212.39	Committed	other	other	Mitigation	Credit lines	Loan dedicated to finance eligible trade transactions by SMEs and Mid-Caps acting as exporters or importers in Ukraine
EIB / Ukraine	102 675 000.00	113 578 539.82	Committed	other	other	Mitigation	Industry	The project concerns the construction and refurbishment of teaching, research and supporting facilities of seven universities: Kharkiv Polytechnical Institute, Kiev Dragomanov National Pedagogical University, Lviv Polytechnic National University, Poltava National Technical Yuri Kondratyuk University, Chernihiv State Technological University, Sumy State University and Vinnitsa National Technical University.
EIB / Ukraine	8 325 000.00	9 209 070.80	Committed	other	other	Mitigation	Education	The project concerns the construction and refurbishment of teaching, research and supporting facilities of seven universities: Kharkiv Polytechnical Institute, Kiev Dragomanov National Pedagogical University, Lviv Polytechnic National University, Poltava National Technical Yuri Kondratyuk University, Chernihiv State Technological University, Sumy State University and Vinnitsa National Technical University.
EIB / Ukraine	150 000 000.00	165 929 203.54	Committed	other	other	Mitigation	Transport	The Project consists of the phased construction of the electrification of two railway sections, Dolynska - Mykolaiv and Mykolaiv - Kolosivka, over a total length of approximately 253 km.
EIB / Ukraine	200 000 000.00	221 238 938.05	Committed	other	other	Mitigation	Transport	Framework loan for the financing of urban public transport investments in up to 20 municipalities in Ukraine

EIB / Regional - Africa	372 000.00	411 504.42	Committed	other	other	Mitigation	Energy	The project aims at providing affordable and reliable access to electricity and water in Sub-Saharan Africa countries (mainly in Benin, Burkina Faso, Cameroon, Kenya, Madagascar, Senegal, Tanzania and Togo) by financing micro-projects in rural areas of these countries. EIB will lend to an investment vehicle whose objective is to provide stable local currency funding to selected African MFIs, for them to develop a loan portfolio dedicated to micro-projects in the solar energy, irrigation and drinking water sectors. Final beneficiaries include low-income households, micro-entrepreneurs and villages/communities. As an operation aiming to generate superior developmental impact, it qualifies for the Impact Financing Envelope of the Investment Facility.
EIB / Regional - Africa	348 000.00	384 955.75	Committed	other	other	Mitigation	Water, sewerage	As above
EIB / Regional - Africa	480 000.00	530 973.45	Committed	other	other	Mitigation	Services	As above
EIB / Regional - Caribbean	200 000.00	221 238.94	Committed	OOF	other	Mitigation	Credit lines	Lending Facility to provide medium to long-term funding to low-income small and micro-enterprises, low income households and community based organisations through selected financial intermediaries in the Caribbean and Pacific countries.
EIB / Regional - East Africa	200 000.00	221 238.94	Committed	OOF	other	Mitigation	Services	Global authorisation to provide medium to long-term funding to micro and small enterprises through selected financial intermediaries in East Africa Community countries.
EIB / Regional - East Africa	300 000.00	331 858.41	Committed	OOF	other	Mitigation	Credit lines	The East & Central Africa Private Enterprise Finance Facility ("ECA PEFF") will be made available in EUR/USD/local currencies to eligible financial intermediaries engaged in financing private enterprises, in particular SMEs, in Kenya, Tanzania, Uganda, Rwanda, Burundi, Democratic Republic of Congo and Djibouti. Private enterprises involved in eligible sectors would be the final beneficiaries. A global authorisation is requested for this Facility and the first participating financial intermediary, National Microfinance Bank (NMB) Tanzania is presented for approval.
EIB / Regional - East Africa	140 000.00	154 867.26	Committed	OOF	other	Mitigation	Credit lines	The East & Central Africa Private Enterprise Finance Facility ("ECA PEFF") will be made available in EUR/USD/local currencies to eligible financial intermediaries engaged in financing private enterprises, in particular SMEs, in Kenya, Tanzania, Uganda, Rwanda, Burundi, Democratic Republic of Congo and Djibouti. Private enterprises involved in eligible sectors would be the final beneficiaries. A global authorisation is requested for this Facility and the first participating financial intermediary, National Microfinance Bank (NMB) Tanzania is presented for approval.
EIB / Regional - East Africa	560 000.00	619 469.03	Committed	other	other	Mitigation	Credit lines	Credit facility for financial institutions to finance SMEs and MidCaps in East & Central Africa. The facility contributes to private sector development in the region.
EIB / Regional - East Africa	240 000.00	265 486.73	Committed	other	other	Mitigation	Credit lines	Credit facility for financial institutions to finance SMEs and MidCaps in East & Central Africa. The facility contributes to private sector development in the region.
EIB / Regional - East Africa	200 000.00	221 238.94	Committed	other	other	Mitigation	Credit lines	Credit facility for financial institutions to finance SMEs and MidCaps in East & Central Africa. The facility contributes to private sector development in the region.
EIB / Regional - East Africa	400 000.00	442 477.88	Committed	other	other	Mitigation	Credit lines	Credit facility for financial institutions to finance SMEs and MidCaps in East & Central Africa. The facility contributes to private sector development in the region.

EIB / Regional - Southern Africa	150 000.00	165 929.20	Committed	OOF	other	Mitigation	Services	Global authorisation to provide medium to long-term funding to micro and small enterprises through selected financial intermediaries in Southern African ACP countries.
Total contributions through bilateral, regional and other channels	4 677 887 589.79	5 174 654 413.44						

Documentation box

1: Core/general

The EU supports a variety of global programmes and Trust Funds managed by multilateral organisations, including the UNDP, UNEP, FAO and the World Bank. The EU also provides support to the operating entities of the financial mechanism of UNFCCC, the Global Environment Facility (GEF) and the Green Climate Fund (GCF). However, the EU's statistical system categorises all climate finance support as bilateral with multiple recipients, even where the finance is delivered through a multilateral organisation, with the exception of core contributions to the UNFCCC, which are reported in CTF Table 7(a). Therefore, all other finance provided through a multilateral organisation is reported in CTF 7(b).

2: Climate-specific

The EU categorises its climate finance as climate specific if it has been given a Rio Marker.

CTF Table 7 combines the climate finance provided by the EU and EIB for the years 2015 and 2016. In 2015, the EU provided € 1 517 million (USD 1 682 million) and the EIB provided € 2 276 million (USD 2 523 million). For 2016, the EU provided € 2 730 million (USD 3 020 million) and the EIB provided € 1 948 million (USD 2 155 million).

The EIB's climate relevant financial flows are tracked using the joint approach developed by the Multilateral Development Banks (MDBs) that does not use the Rio markers.

3: Status

The EU categorises the status of its climate finance as committed and disbursed but reports on committed funding for a given calendar year, in this case, 2015 and 2016. The status of the EIB's climate finance is committed.

4: Funding source

The EU categorises the funding source of its climate finance as ODA. All EIB funds which are reported here are provided in the form of loans alongside several equity investments.

5: Financial instrument

The EU categorises the financial instrument used in its climate finance as grants. All EIB funds which are reported here are provided in the form of loans alongside several equity investments.

6: Type of support

The EU categorises the type of its climate finance support into "mitigation", "adaptation" or "cross-cutting", making use of the Rio markers. The method that it assigns is explained in detail in Section 6.2 of the EU Biennial Report. The EIB categorises its climate finance support into "mitigation" and "adaptation".

7: Sector

The EU categorises the provision of climate finance into the following eight sectors: Energy, Transport, Industry, Agriculture, Forestry, Water &

sanitation, Cross-cutting, Other, and assigns one of these sectoral codes to each project visible in CTF Tables 7(a) and 7(b).

CTF Table 8: Provision of technology development and transfer support during 2015-2016

Measures and activities related to technology transfer	Recipient country and/or region	Targeted area	Sector	Source of the funding for technology transfer	Activities undertaken by	Status	Additional information
1) Horizon 2020	Global	Mitigation	Multisector	Private and Public	Private and Public	Ongoing	<p>Horizon 2020 is the EU's largest research and innovation programme, comprising of three different programmes: excellent science, industrial leadership, and societal challenges (including climate change).</p> <p>The majority of Horizon 2020 projects foster cooperation between countries, often in the form of public-private partnerships which aim to leverage public and private investments, to develop new technologies, products and services. Supporting international research and innovation is important as it not only leads to new discoveries, but also helps bring great ideas from the lab to the market.</p>
2) Technical Assistance Facility (TAF) for the Sustainable Energy for All (SE4ALL)	East Asia-Pacific, Latin America and Caribbean, South Asia and Sub-Saharan Africa Regions	Mitigation	Energy	Private and Public	Private and Public	Ongoing	<p>The EU's TAF for SE4ALL is designed to deliver high level technical assistance to partner countries, to support them in improving their policy and regulatory frameworks in order to scale-up investment in their energy sector.</p> <p>The TAF supports partner countries on demand basis through expert missions to increase their administrative and technical capacity, accelerate energy sector policy reform, and facilitate investment in access to energy. Technical assistance packages cover five key themes: policy reform, capacity building, investment, mobilising funds and partnerships, and industrial and technological cooperation.</p>
3) Low Emission Capacity Building (LECB) Programme	25 participating countries around the world	Mitigation	Cross-sector	Public	Private and Public	Implemented	<p>The United Nations Development Programme's (UNDP) Low Emission Capacity Building (LECB) Programme is supporting 25 countries around the globe to enhance the capacity of the public and private sectors to scale up mitigation action through the development of Low Emission Development Strategies (LEDS) and Nationally Appropriate Mitigation Actions (NAMAs), and the strengthening of the underlying systems for Measuring, Reporting and Verification (MRV) and national greenhouse gas (GHG) inventories, and the participation of selected industries in the design and adoption of mitigation actions.</p> <p>Funded through generous contributions from the European Commission and the</p>

							German and Australian governments, the LECB Programme acts as a pathfinder for policymakers – paving the way to define a low carbon future that also delivers national sustainable development goals.
4) Global Climate Change Alliance <i>Plus</i> (GCCA+)	Focus on least developed countries (LDCs) and small island developing states (SIDS) (38 countries, 51 programmes)	Adaptation/ Mitigation	Cross-sector	Private and Public	Private and Public	Ongoing	The Global Climate Change Alliance <i>Plus</i> (GCCA+) aims to build a stronger alliance between the European Union, European Member States and the developing countries that are most vulnerable to climate change. It focuses on providing assistance to Least Developed Countries (LDCs) and Small Island Developing States (SIDS) in undertaking climate change adaptation or mitigation actions. Using ambitious and innovative approaches, it will achieve its goals by (1) serving as a platform for dialogue and exchange of experience between the EU and developing countries, focusing on climate policy and bringing renewed attention to the issue of international climate finance, and (2) acting as a source of technical and financial support to targeted developing countries to integrate climate change into their development policies and budgets and to implement adaptation and mitigation interventions.
5) Schneider Electric private equity fund	EIB / Regional - Africa	Mitigation	Services	Private	Private	Ongoing	The operation concerns an investment in a private equity fund, sponsored by Schneider Electric, that will focus on financing SMEs active in electricity generation and distribution in Sub-Saharan Africa. The fund aims to provide access to electricity to at least one million low-income beneficiaries, located in rural and semi-urban areas. The fund will focus on off-grid rural electrification, in particular solar home systems, micro-grid infrastructure and other small/micro-scale renewable energy and hybrid technologies, and will start investing in companies with operations in East Africa before expanding to other Sub-Saharan African countries. As an operation aiming to generate superior developmental impact, it qualifies for the Social Impact Funds window of the Financing Envelope that was launched early 2014 following the increase of the IF resources by EUR 500m for the 2014-2020 period
6) Support to Climate Technology Transfer Services and Partnerships	Developing countries, unspecified / Bilateral unallocated	Cross-cutting	Other	Private and Public	Private and Public	Ongoing	Technology transfer is a cornerstone of the UNFCCC negotiations. This action aims to strengthen and advance the Centre, in accordance with its political mandate and the EU's priorities.
7) RMI Support for the reform of the energy sector	Marshall Islands / Oceania	Mitigation	Energy	Private and Public	Private and Public	Committed	The specific objectives are to achieve universal access to modern and sustainable energy services by specific initiatives in the outer islands, to increase energy efficiency and to increase the share of renewable energy.

8) Work Programme 2017-2019 of the ACP EU Technical Centre for Agricultural and Rural Cooperation (CTA)	Developing countries, unspecified / Bilateral unallocated	Adaptation	Agriculture	Private and Public	Private and Public	Committed	ACP-EU Technical Centre for Agricultural and Rural Cooperation (CTA)'s work programme for 2017, 2018 and 2019 to be financed under the 11 th European Development Fund (EDF).
9) Asi@Connect	Asia, regional / Asia - Regional	Adaptation	Other	Private and Public	Private and Public	Committed	Asi@Connect successor to Trans-Eurasia Information Network 5 (TEIN 5). This project provides dedicated high-bandwidth, high quality internet connectivity between research and education communities in the Asia region and globally.
10) Academic Research Funding Programme research activities	EIB / Turkey	Mitigation	Services	Private and Public	Private and Public	Committed	The project concerns the research activities supported by the Academic Research Funding Programme (ARDEB) and the Industrial R&D and Innovation Programme (TEYDEB) implemented through the Scientific and Technological Research Council (TÜBİTAK) of Turkey. The programmes have national reach and will be implemented in 2015 and 2016.
11) Retrofitting 3 kindergartens in Rustavi City in order to achieve high energy efficiency standards and greenhouse emission reduction	Georgia / Asia - South and central	Mitigation	Cross-cutting	Private and Public	Private and Public	Committed	To develop and implement standard set of measures, materials and technologies to achieve high energy efficiency standards and reduction of greenhouse gas emissions in kindergartens.
12) Support to Rural Electrification Programme	Tanzania / Africa - South of Sahara	Mitigation	Energy	Private and Public	Private and Public	Committed	Rural Electrification Programme: Turnkey III - in Tanzania
13) Science Technology and Innovation	Turkey / Europe	Mitigation	Industry	Private and Public	Private and Public	Committed	Sectoral Operational Programme on Competitiveness and Innovation for Turkey (2014-2016)

Footnote: This table includes details of a non-exhaustive list of selected initiatives implemented in cooperation with developing country partners, with an important technology development and transfer component, which the EU believes are fairly representative of the overall technology development and transfer support provided by the EU.

CTF Table 9: Provision of capacity-building support during 2015-2016

Programme or project title	Recipient country / region	Targeted area	Description of programme or project
1) Capacity building on monitoring, reporting and verifications of the GHG emission and actions in developing countries	Algeria, Angola, Egypt, Ethiopia, Ghana, Morocco, Nigeria and Senegal.	Mitigation	The project focuses on building capacity on MRV of GHG emissions, the preparation of UNFCCC reports, planning, development, implementation and MRV of Mitigation Actions. The project is split in 2 phases, a scoping phase that will cover all selected countries and will result in a country report to assess the gaps and opportunities related to Monitoring Reporting and Verification. Four countries will be selected for in-depth analysis, while 2-3 countries will benefit from the implementation of capacity building programmes.
2) ClimaSouth	Algeria, Egypt, Israel, Jordan, Lebanon, Libya, Morocco, Palestine and Tunisia	Cross-cutting	ClimaSouth provides technical assistance on climate mitigation and adaptation in the Mediterranean. The project supports sharing and use of MRV of GHG emissions and provides technical assistance and training in the formulation of Low Emission Development Strategies. It organizes seminars and trainings and works with national authorities to strengthen the capacity of policy makers to engage effectively in international negotiations, support the development of adaptation and climate resilience, and facilitate access to climate change finance.
3) ClimaEast	EU Eastern Partnership Countries (Armenia, Azerbaijan, Belarus, Georgia, Moldova, Ukraine) and Russia	Mitigation	The policy component of the project seeks to foster improved climate change policies, strategies and market mechanisms by supporting regional cooperation and improving information access to EU climate change policies, laws and expertise. It includes, among others, strengthening capacity for strategic planning with regard to mitigation, and developing relevant infrastructure for data capture, assessment and reporting to underpin policy, monitoring and compliance with international or domestic commitments (including GHG Registry and Inventory, and Monitoring, Reporting and Verification systems).
4) Environment and Climate Regional Accession Network (ECRAN)	the EU Candidate Countries and Potential Candidates (Albania, Bosnia and Herzegovina, the former Yugoslav Republic of Macedonia, Kosovo Montenegro, Serbia and Turkey).	Cross-cutting	The objective of the project is strengthening regional cooperation between the EU candidate countries and potential candidates in the fields of environment and climate action. The project includes an environment component, a climate action component as well as the NGOs Environment Forum. Under the climate component, specific capacity building activities on GHG inventory process and the national inventory system as per the Monitoring Mechanism Regulation have been implemented. The work has also focused on alignment with climate acquis, training on MRV for competent authorities, ETS-like installation operators and verifiers, as well as development of country ETS road maps. The project has also supported development of country INDCs.
5) Promoting Low Emission Urban Development Strategies in Emerging Economy Countries (URBAN-LEDS)	Brazil, India, Indonesia, South-Africa	Mitigation	The Urban-LEDS project has the objective of enhancing the transition to low emission urban development in emerging economy countries by offering selected local governments a comprehensive methodological framework (the GreenClimateCities methodology) to integrate low-carbon strategies into all sectors of urban planning and development. It offers tailor-made training to local governments, organizes study tours, workshops and seminars. Through its HEAT+ greenhouse gas emissions quantification and monitoring software and a pool of experts, it ensures appropriate verification processes are established (MRV). The project is implemented by UN-HABITAT + ICLEI.

6) ICAT – Initiative for Climate Action Transparency	Colombia, Costa Rica, Dominican Republic, Ecuador, Mexico, Peru, Democratic Republic of the Congo, Egypt, Ghana, Kenya, Morocco, Mozambique, Rwanda, Senegal, Tanzania, Indonesia, Vietnam, Philippines, Sri Lanka, Cambodia	Mitigation	The work of ICAT is a public-privately funded multi-stakeholder initiative hosted by the United Nations Office of Project Services and will be implemented by currently three organisations that are leaders in developing solutions for addressing climate change – UNEP DTU Partnership (UDP), Verified Carbon Standard (VCS) and the World Resources Institute (WRI). Two further organisations, Climate, Community & Biodiversity Alliance (CCBA) and Rainforest Alliance (RA) will also participate in the work as sub-contractors. Other organizations/technical bodies may be added if additional task requires that. By helping countries credibly evaluate the impact of their policies and actions, national governments will be able to effectively report on their progress towards achieving domestic and global targets. By linking these efforts to large-scale donor- and private finance, it will be possible to support and reward the development and implementation of high-performing policies and actions. Countries need funding to implement many of their most impactful policies and actions and will be more willing to verify and report results where there are financial incentives to do so. Likewise, by engaging private sector actors operating domestically, stronger, more resilient partnerships can be formed to drive change and increase impacts. Facilitating links to finance will ultimately facilitate further improvements in global MRV while increasing ambition at the international climate negotiations and in domestic decision-making processes.
7) NEPAD African Network of Centres of Excellence on Water Sciences and Technology (Phase II)	Africa, regional / Africa - Regional	Adaptation	This project aims at supporting the establishment of a Human Capacity Development Programme of the African Ministers' Council on Water (AMCOW) in the water sector in Africa through the NEPAD African Network of Centres of Excellence in Water Sciences.
8) Building adaptive capacity and resilience of the forestry sector in Cape Verde	Cabo Verde / Africa - South of Sahara	Cross-cutting	Under Global Climate Change Alliance (GCCA) initiative. The main objective is to increase resilience and enhance key adaptive capacity to address the additional risks posed by climate change to desertification and land degradation in CV.
9) Covenant of mayors in Sub Saharan Africa. Phase II	Developing countries, unspecified / Bilateral unallocated	Mitigation	To increase capacities of cities to provide access to energy related services to urban/semi-urban populations. Special attention to energy efficiency as a driver for local and climate resilient development. Focus: urban design, mobility, energy.
10) Support measures under Global Public Goods and Challenges thematic programme 2016	Developing countries, unspecified / Bilateral unallocated	Cross-cutting	The Support Measures will be used to finance, among others, activities such as i) risk-based audits and evaluations, ii) technical support for the identification and formulation of new actions, iii) studies and advisory services, trainings, seminars,
11) Strengthening of the Caribbean Biological Corridor	Dominican Republic / America - North & Central	Adaptation	This project seeks to build a strong and sustained collective, institutionalised regional approach to the conservation and management of terrestrial and marine biodiversity in the Caribbean, focusing initially on Cuba, Haiti and Dominican Republic

Footnote: This table includes details of a non-exhaustive list of selected support initiatives with an important capacity building component, which the EU believes are fairly representative of the overall capacity building support provided by the EU.

