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Seventh national communication and third biennial report from the European Union under the UN Framework Convention on Climate Change (UNFCCC) (required under the UNFCCC and the Kyoto Protocol)

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1.1.1. *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.

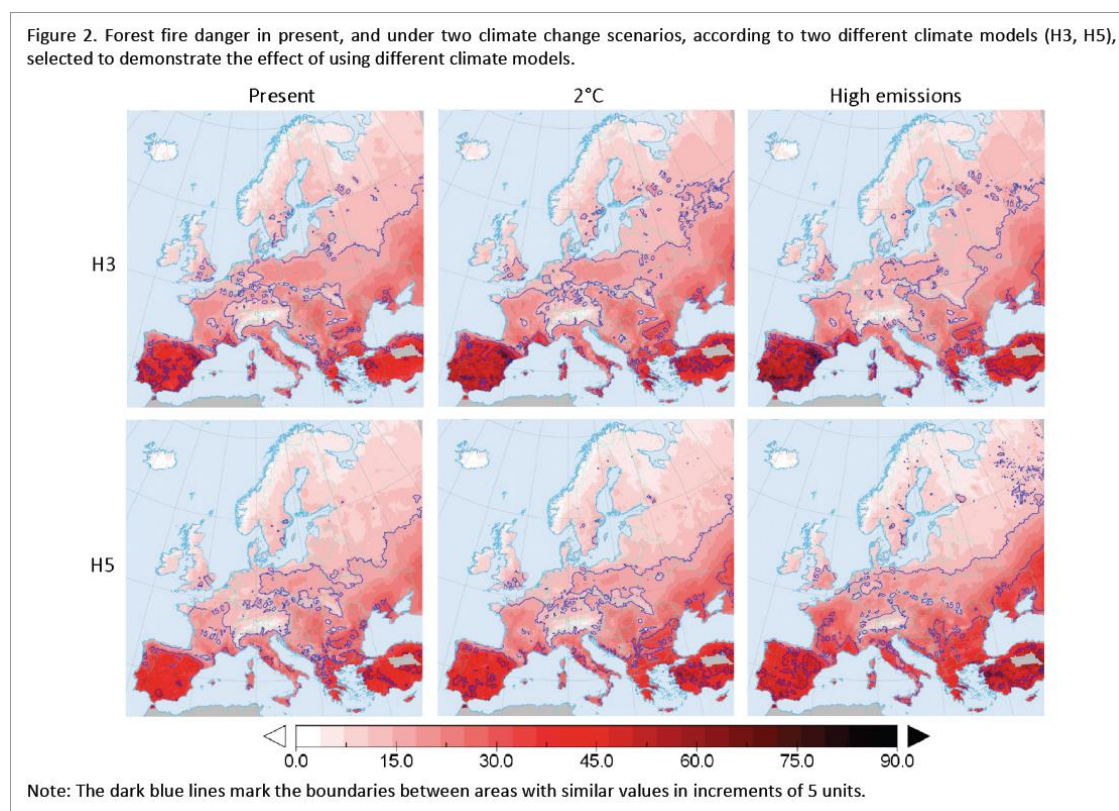
1.1.2. Forestry

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 6-1 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.¹



¹ JRC (2017) PESETA III Science for Policy Summary Series: Climate Change and Forest Fires

1.1.3. *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 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.

1.1.4. *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.

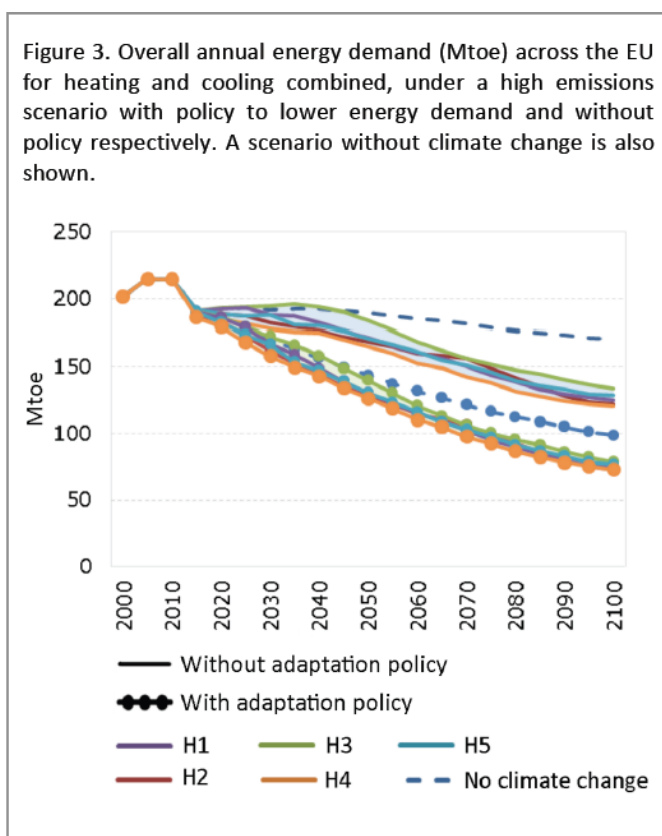
Elevated sea temperatures have triggered a major northwards retreat of colder water plankton in the North-east Atlantic, estimated at 1 100 km over the last 40 years. This trend has accelerated since 2000 and is expected to shift the distribution of fisheries. Sub-arctic species are receding northwards 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.

1.1.5. 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 III² indicates that the net effect on energy demand would be a decrease of around 25 % by 2100. In addition, the introduction of better building insulation would further reduce demand by up to 40 %. See Figure 6.7 below.

Figure 6-2 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.³



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.

² PESETA III: findings expected in 2017

³ JRC (2017) PESETA III Science for Policy Summary Series: Climate change and residential energy demand.

1.1.6. *Infrastructure and Urban Settlements*

1.1.6.1. 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 infrastructure⁴. With a higher proportion of elderly people, cities will also be more sensitive to heat waves and other climatic hazards.

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 sealing⁵ 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.⁶

1.1.6.2. 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).

1.1.6.3. 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

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

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









6 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).

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.

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 6-3 below).

Figure 6-3 How climate impacts affect urban living, working, and moving⁷

	 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

1.1.7. 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.

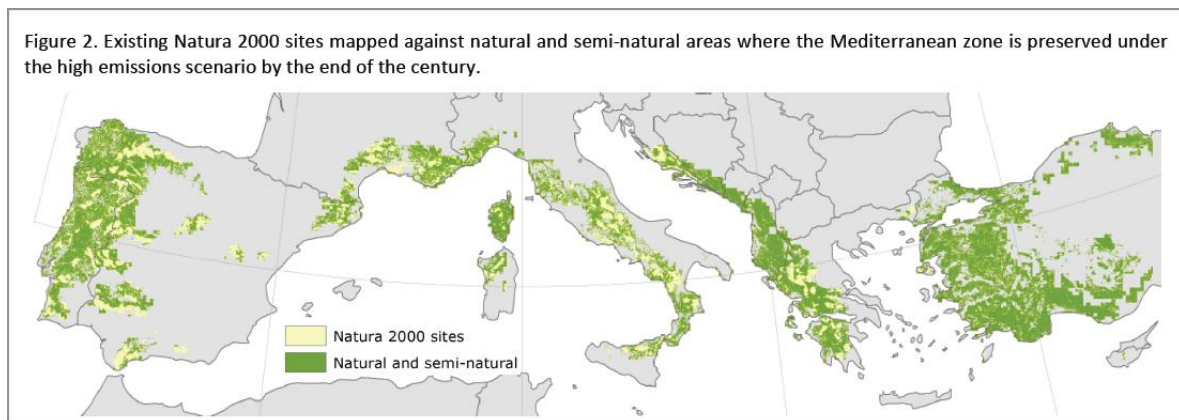
⁷ EEA (2016) Urban adaptation to climate change in Europe 2016 — Transforming cities in a changing climate, European Environment Agency

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 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 6-4 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.⁸



1.1.8. *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,

⁸ JRC (2017) PESETA III Science for Policy Summary Series: Climate change and Mediterranean Habitat Loss.

changes in the distribution of climate-sensitive diseases and changes in environmental and social conditions⁹.

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 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).¹⁰

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.

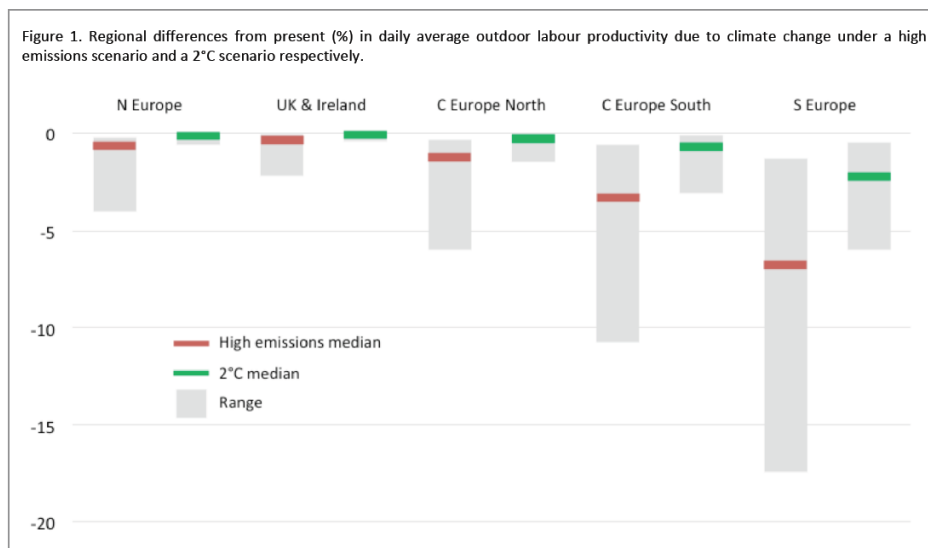
Labour productivity in outdoors sectors (like agriculture and construction sectors) can be affected by increasing air temperature. According to the preliminary results of the JRC PESETA III project, under a high emissions scenario and in the absence of adaptation, global warming could result in declines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

9 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/Ifna26494enn.pdf](http://publications.jrc.ec.europa.eu/repository/bitstream/JRC86970/Ifna26494enn.pdf)

10 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.

also see declines in labour productivity with climate change, at around 2-4 %. See Figure 6.10 below.

Figure 6-5 Regional differences from present (%) in daily average outdoor labour productivity due to climate change under high emissions scenario and a 2 degree scenario respectively¹¹



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.

¹¹ JRC (2017) PESETA III Science for Policy Summary Series: Outdoor Labour Productivity and Climate Change

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.

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

1.1.9. *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.

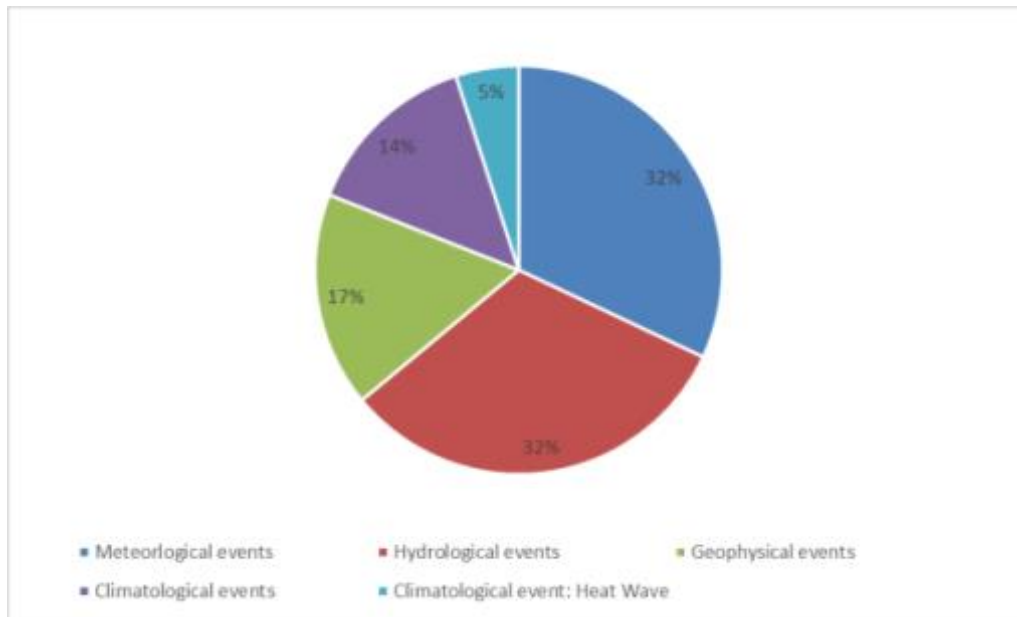
Rising temperatures and erratic weather patterns have the potential to reduce agricultural productivity across many European regions. Extreme weather events can severely disrupt economic activity. Sea-level rise will put physical capital assets at increasing risk. On the other hand, climate change may 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 billion¹². 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 events¹³. The losses by climate-event are presented in Figure 6-6 below.

¹² <http://www.eea.europa.eu/data-and-maps/indicators/direct-losses-from-weather-disasters-3/assessment>

¹³ <http://www.eea.europa.eu/data-and-maps/indicators/direct-losses-from-weather-disasters-3/assessment>

Figure 6-6 Losses from Natural Hazards in EEA member countries (EUR 519 628 million)¹⁴



Estimates of the projected economic impacts of climate change in Europe are emerging¹⁵, 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.¹⁶ 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

¹⁴ <http://www.eea.europa.eu/data-and-maps/indicators/direct-losses-from-weather-disasters-3/assessment>

¹⁵ ECONADAPT: 'The Economics of Climate Change Adaptation'; CIRCLE 2

¹⁶ 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.

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.¹⁷ However, the study also shows that increased levels of adaptation expenditure could have a positive impact on job creation.

1.1.10. *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 CLIMSAVE¹⁸ 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 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.

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"¹⁹. It was followed by the White Paper "Adapting to climate change: Towards a European framework for action"²⁰ in 2009. These documents led to the adoption of the 'EU strategy on adaptation to climate change'²¹ 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 Reduction²² and also the Aichi biodiversity (CBD) targets. It is also in line with the ten priorities of the Juncker Commission.

17 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.

18 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>

19 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>

20 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>

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

22 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>

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

1.2.1. *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)

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

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.

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 guidelines²³ 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 readiness²⁴. 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 6-7 shows an overview of the status of National Adaptation Strategies in EEA member countries.

²³ 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.](#)

²⁴ <http://climate-adapt.eea.europa.eu/eu-adaptation-policy/strategy/index.html?resolveuid=bbc416202fd844b1a09f90a2990553ae>

Figure 6-7 below provides an overview of adaptation activities in all EU Member States.

Figure 6-7 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

level²⁵. 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 European Investment Bank. The NCFF 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 benefits²⁶. 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.

²⁵ 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).

²⁶ See: <http://www.eib.org/products/blending/ncff/index.htm>

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 growth²⁷. Climate action is one of the cross-cutting 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 them²⁸. 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 Europe²⁹. 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

²⁷ <https://ec.europa.eu/programmes/horizon2020/en/what-horizon-2020>

²⁸ <https://ec.europa.eu/programmes/horizon2020/en/h2020-section/fighting-and-adapting-climate-change-1>

²⁹ 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

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 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.

2. 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 2016³⁰.
- 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.

Introduction

This chapter includes information on financial, technological and capacity-building support provided by the EU to developing country Parties to the UNFCCC Convention³¹, 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.

³⁰ 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>

³¹ 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.

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.

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.

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.

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.

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.

3. 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)"³². 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,

32 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 IPCC³³ 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 projects³⁴ 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-Paris³⁵

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.

33 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>

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

35 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^{36,37}

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

36 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).

37 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)*³⁸

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)*³⁹

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*⁴⁰

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.

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

39 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).

40 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*⁴¹

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)⁴².

*European Environment Agency (EEA)*⁴³ and *European Environment Information and Observation Network (EIONET)*⁴⁴

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)*⁴⁵

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)*⁴⁶

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 timeframe⁴⁷. In addition,

41 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).

43 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)

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

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

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

47 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 climate⁴⁸.

*European Institute of Innovation & Technology (EIT)*⁴⁹

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-KIC⁵⁰ and EIT's InnoEnergy⁵¹ 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 use⁵². 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)*⁵³

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

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

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

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

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

52 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).

53 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’⁵⁴, 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 Countries⁵⁵. 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 proposals⁵⁶.

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*⁵⁷

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

54 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>

55 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/3cpart/h2020-hi-list-ac_en.pdf)

56 http://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/3cpart/h2020-hi-3cpart_en.pdf

57 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 Area⁵⁸ 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.

⁵⁸ European Commission. 2017. European Research Area. Available from: http://ec.europa.eu/research/era/index_en.htm [accessed on 25/07/2017].

JPI-Climate⁵⁹ 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)⁶⁰ 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.

⁵⁹ JPI Climate. 2017. Connecting Climate Knowledge for Europe. Available from: <http://www.jpi-climate.eu/home>. [accessed on 20/07/2017].

⁶⁰ 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 Europe⁶¹ 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 185⁶²

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 EUREKA⁶³ and COST⁶⁴.

61 Urban Europe. 2017. Introduction JPI Urban Europe. Available from: <http://jpi-urbaneurope.eu/about/intro/> [accessed on 20/07/2017].

62 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].

63 Eureka Network – Innovation Across Borders. 2017. Eureka Cluster Success Story. Available from: <http://www.eurekanetwork.org/> [accessed on 20/07/2017].

64 Cost, European Cooperation in Science and Technology. 2017. About Cost. Available from: <http://www.cost.eu/> [accessed on 20/07/2017].

*Copernicus*⁶⁵

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.

⁶⁵ 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 change⁶⁶, 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 and it is

⁶⁶ 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].

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 ⁶⁷		(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

⁶⁷ 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 Countries⁶⁸. 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 euro⁶⁹) 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

⁶⁸ 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]

⁶⁹ 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

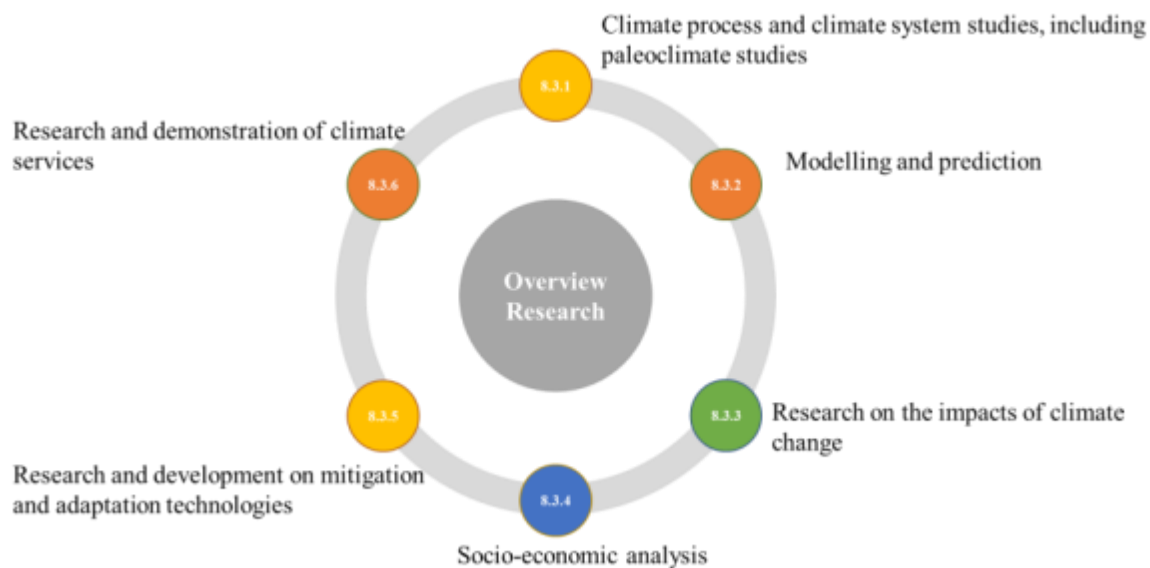
As described under Section 8.2.1.6., the LIFE Programme (French: L'Instrument Financier pour l'Environnement) is the European Union's funding instrument for the environment and climate action. From 1992 LIFE has co-financed some 4 306 projects across the EU.

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

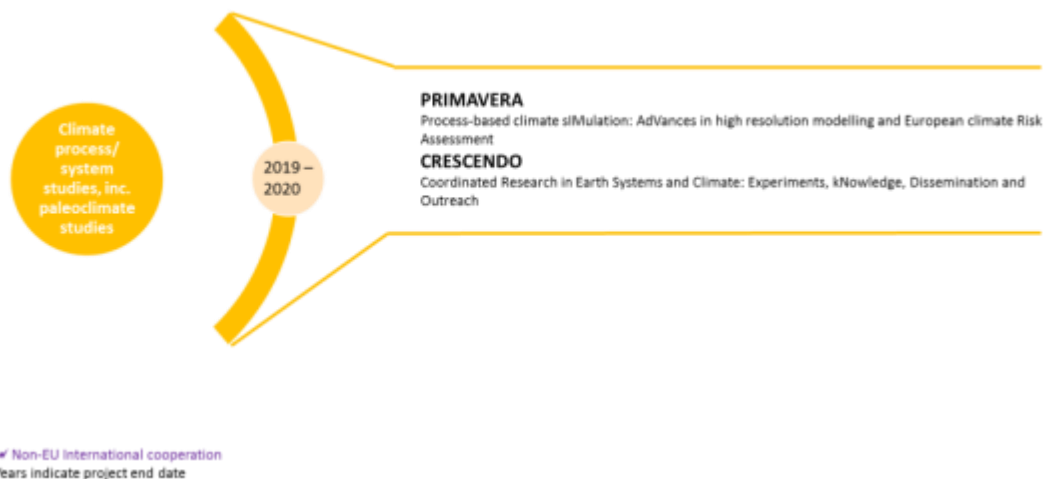
Figure 8-1 gives an overview of the main areas for research projects and the sections where they are discussed in this national communication.

Figure 8-1 Overview of main areas of research projects and section numbers

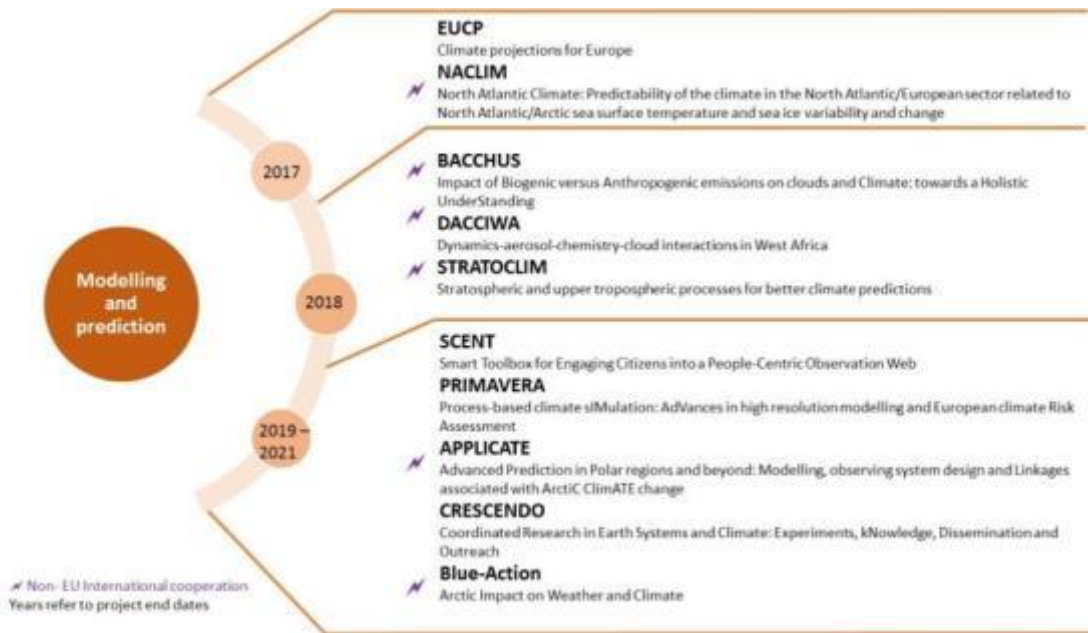


8.3.1. Climate process and climate system studies, including paleoclimate studies

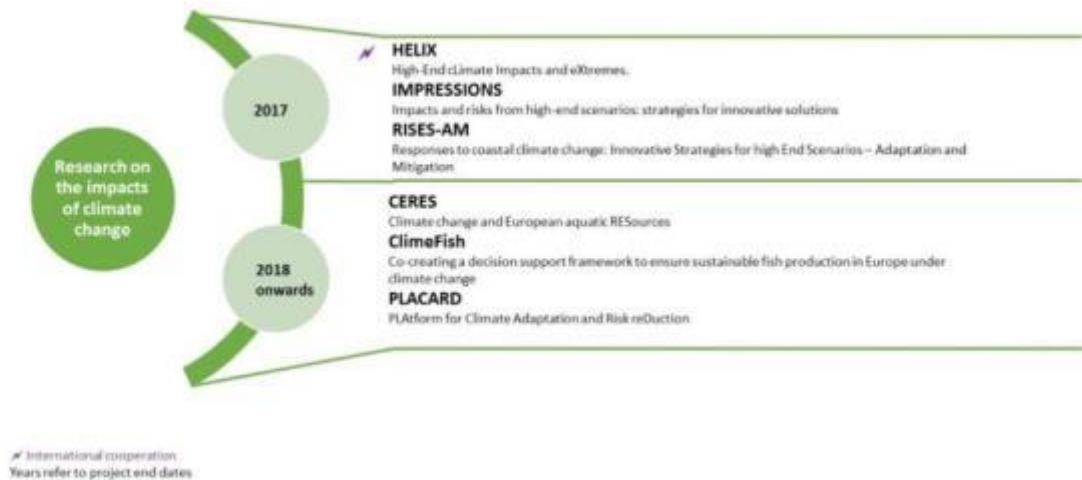
For most of the areas in Sections 8.3, 8.4 and 8.5, a selection of key projects is listed as in the diagram below. This includes some additional information such as the end date of the project and whether it included cooperation with participants from outside the EU. Further information about the projects, including their end date, EU contribution and website is given in Appendix III.



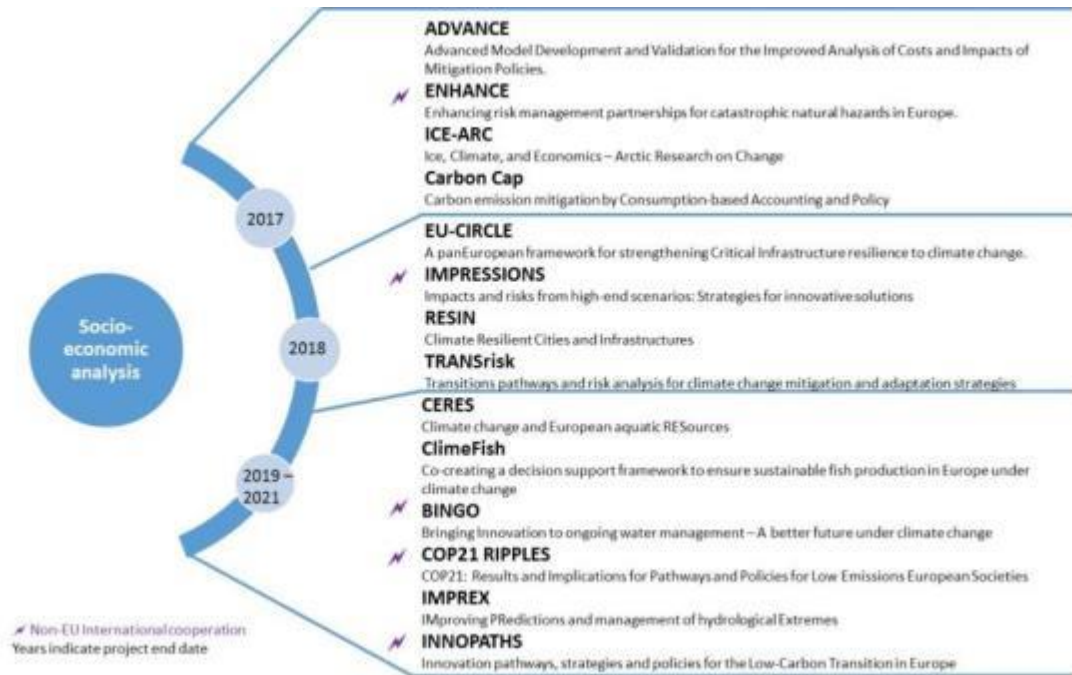
8.3.2. Modelling and prediction, including general circulation models



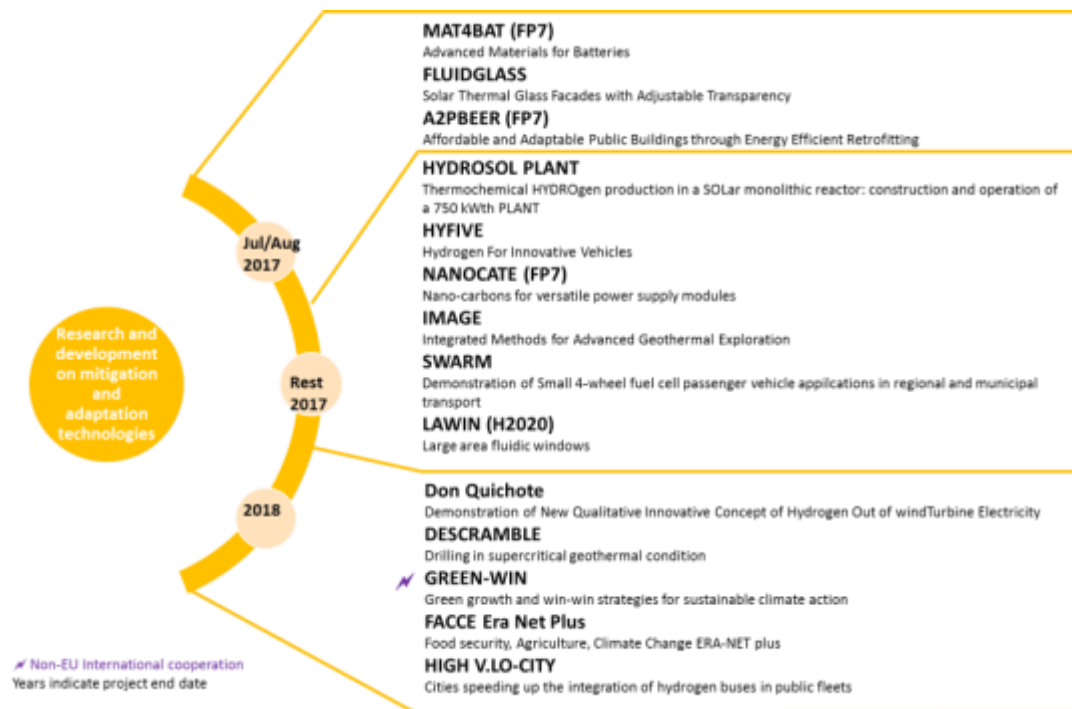
8.3.3. Research on the impacts of climate change

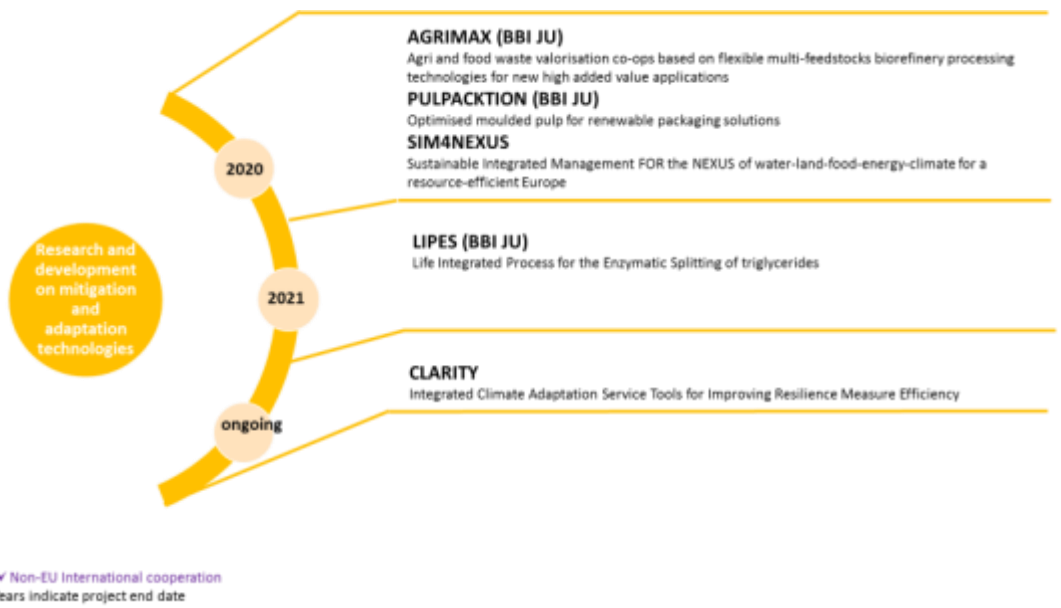
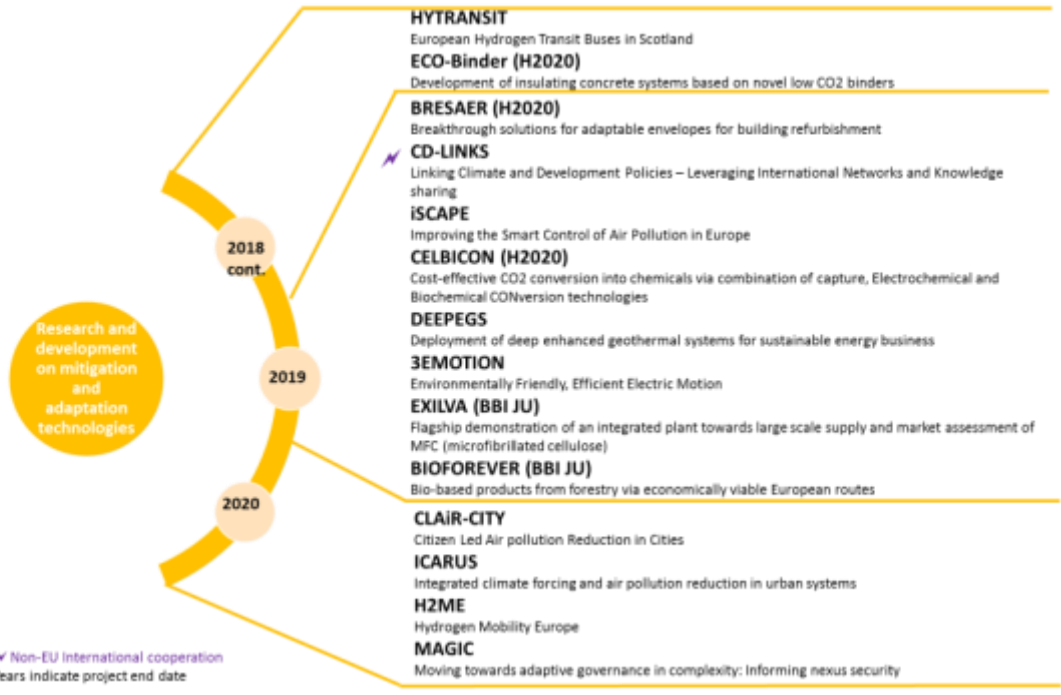


8.3.4. Socio-economic analysis, including analysis of both the impacts of climate change and response options

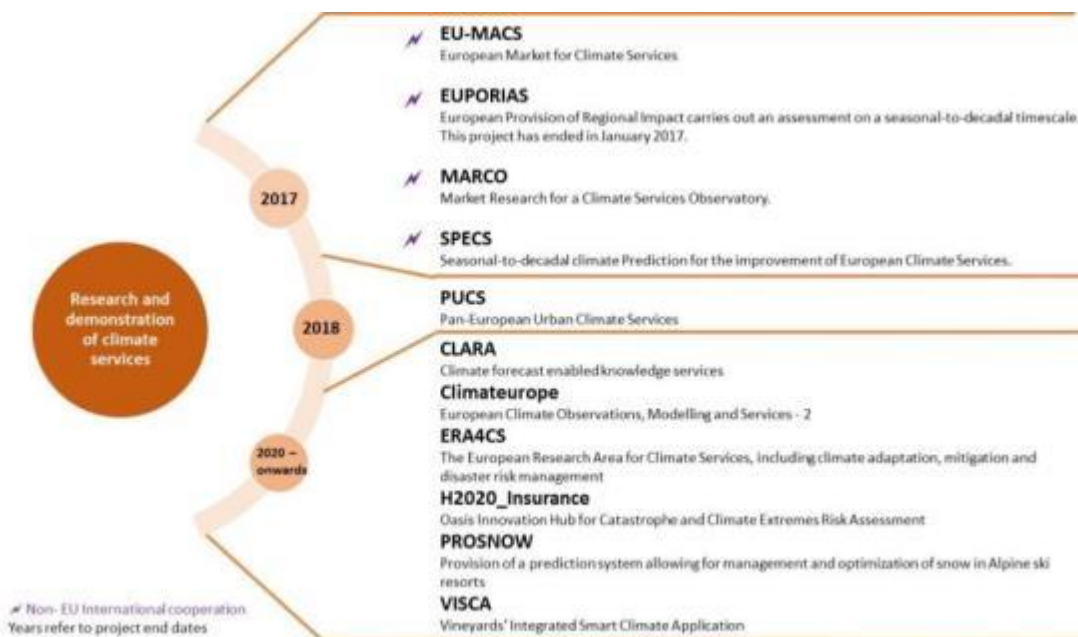


8.3.5. Research and development on mitigation and adaptation technologies





8.3.6. Research and demonstration of climate services



8.4. Systematic observation

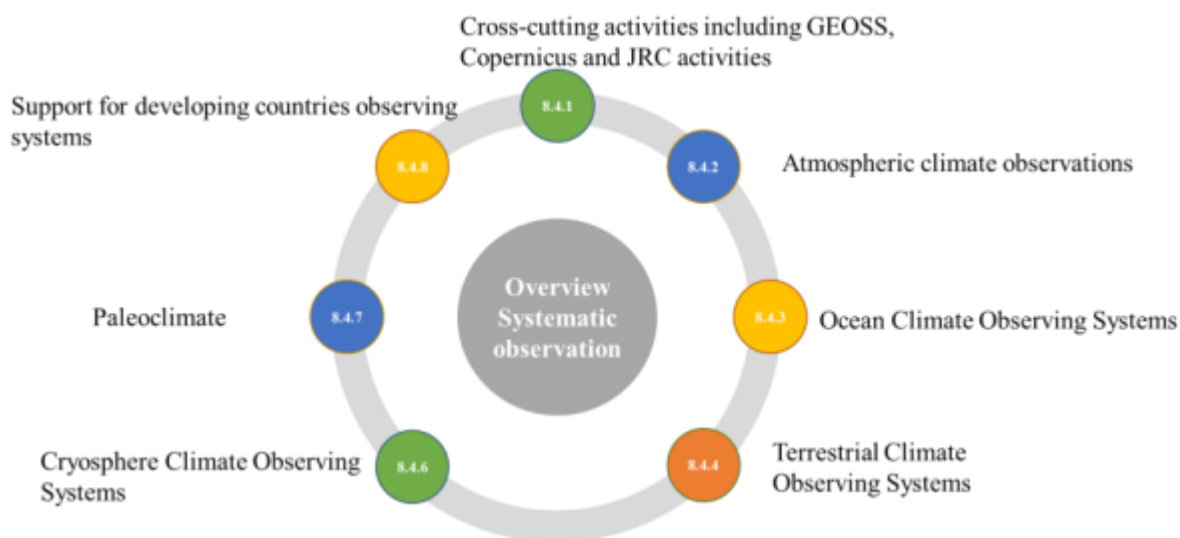
The EU contributes to Systematic Observation through various channels and various programmes and projects. This section will describe both the cross-cutting activities including GCOS, (see 8.2.3), GEOSS (see 8.4.1.1), Copernicus (see 8.4.1.2), JRC activities (see 8.4.1.3) and other key projects and programmes 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.

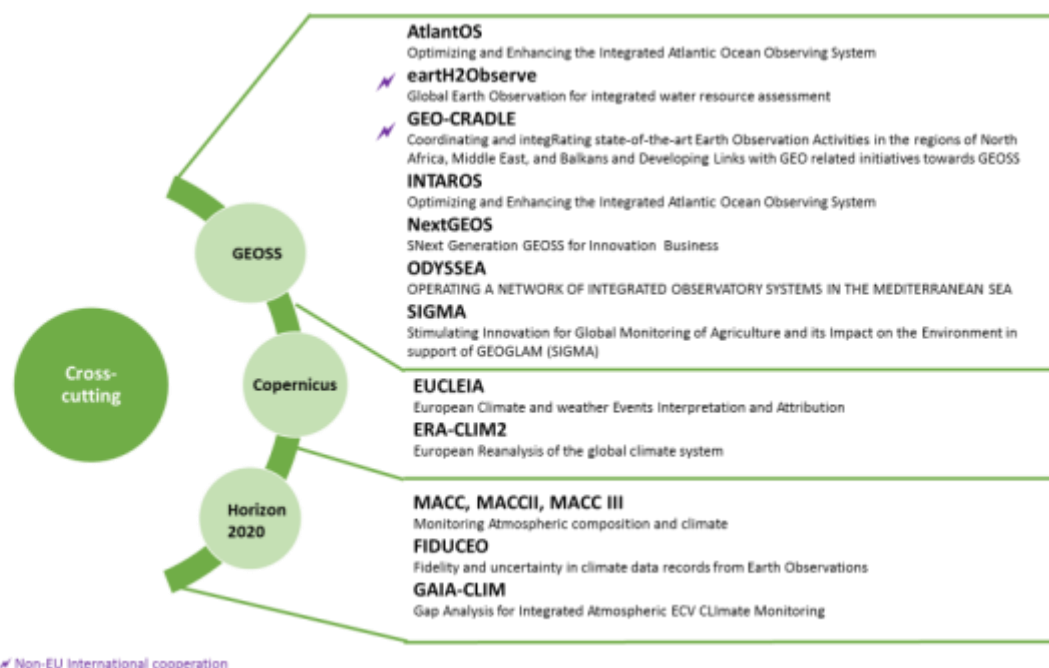
The information provided by the Copernicus services can be used by end users for a wide range of applications in a variety of areas. These include urban area management, sustainable development and nature protection, regional and local planning, agriculture, forestry and fisheries, health, civil protection, 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 ⁷⁰ . 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 ⁷¹ .
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.

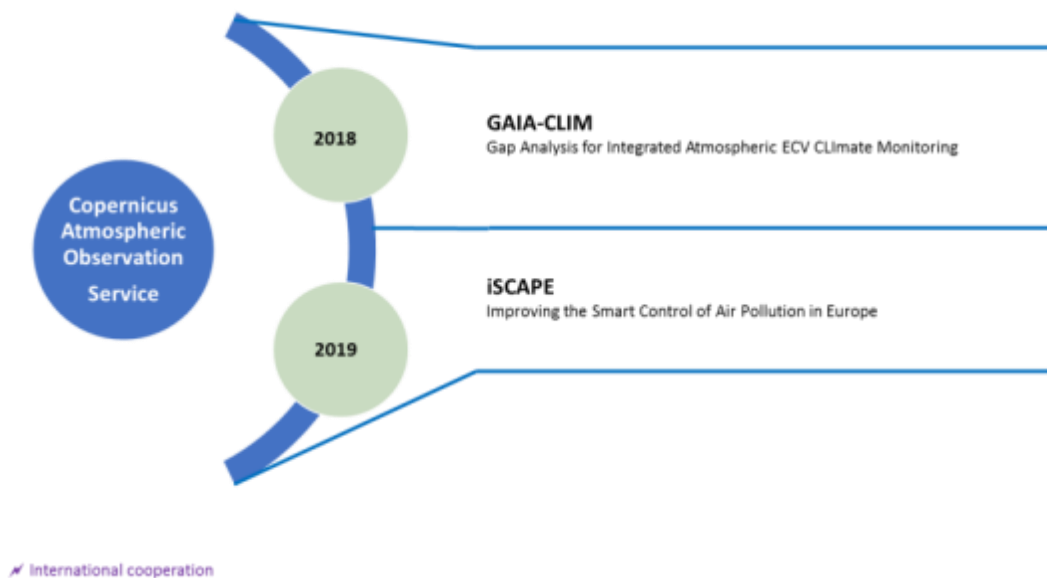
CAMS delivers the following operational services:

- 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;

70 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>

71 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.

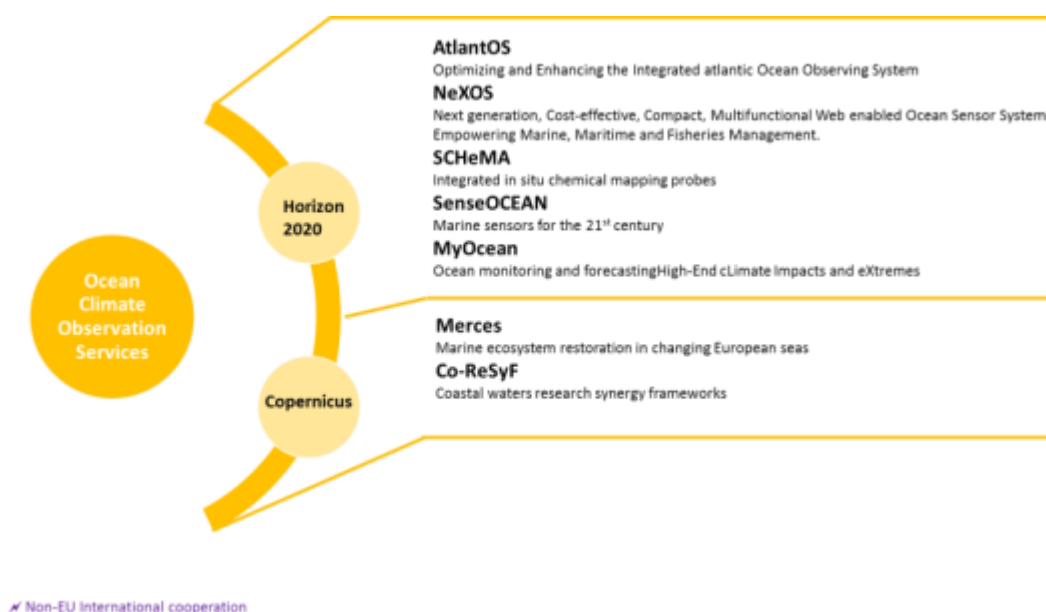
The service also contributes to the protection and the sustainable management of living marine resources in particular for aquaculture, fishery research or regional fishery organisations.

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 portal⁷².



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.

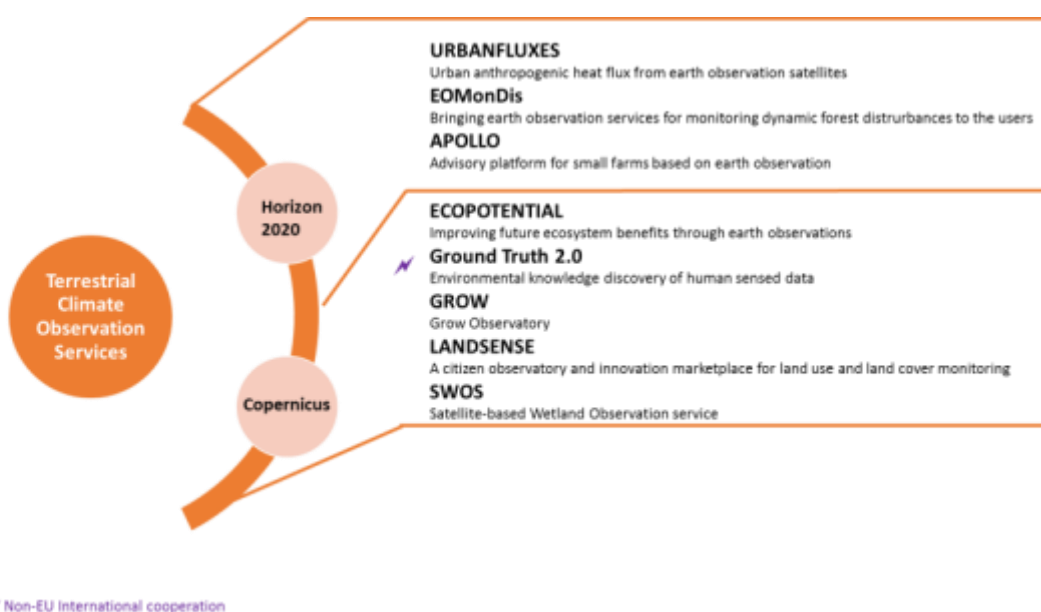
The Pan-European component is coordinated by the EEA and will produce five high resolution data sets describing the main land cover types: artificial surfaces (e.g. roads and

⁷² 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:

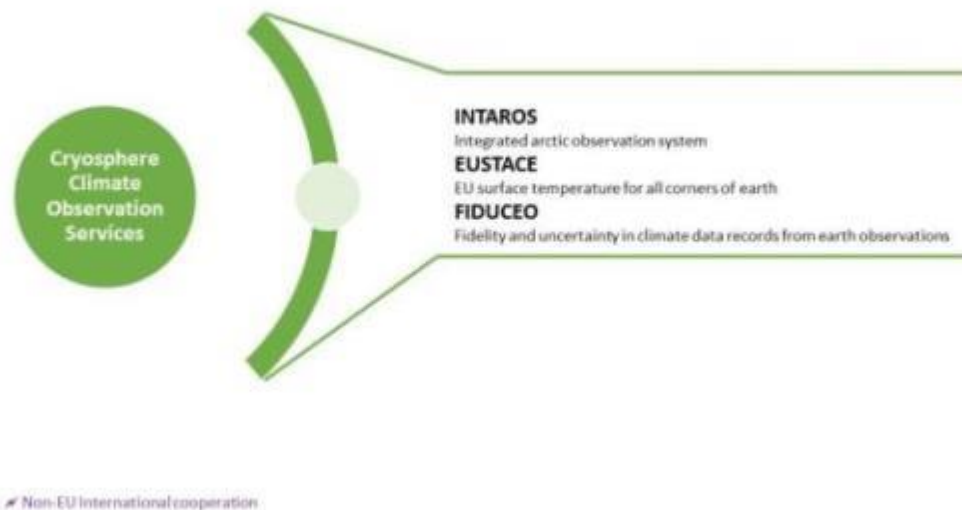
- **Informing** policy development to protect citizens from climate-related hazards such as high-impact weather events;
- **Improving** planning of mitigation and adaptation practices for key human and societal activities;
- **Promoting** the development of new services for the benefit of society.

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 systems⁷³

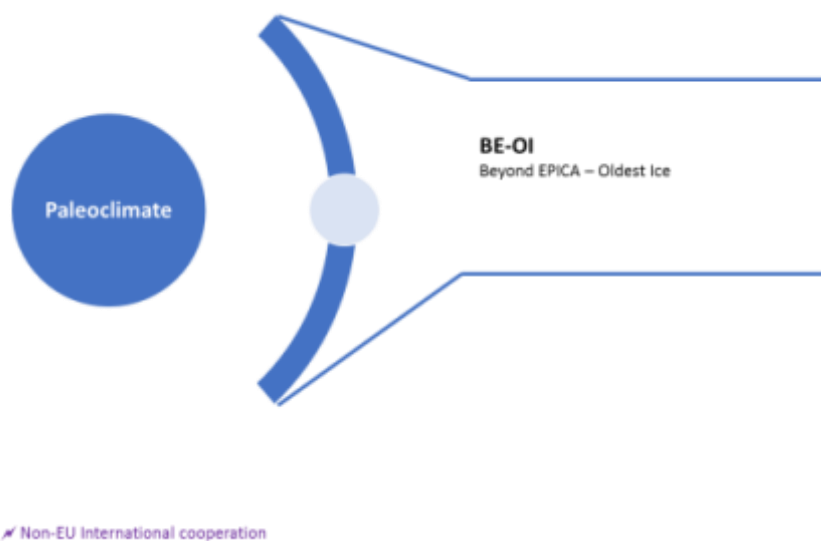
As part of the global land service (see also Section 8.4.4.1) Copernicus is developing a set of cryosphere products – snow extent, snow water equivalent and lake ice extent. In the period from 2016-2020 these operations are being brought online. These build on work in the ESA GlobSnow and EC CryoLand and SEN3App projects.



⁷³ 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

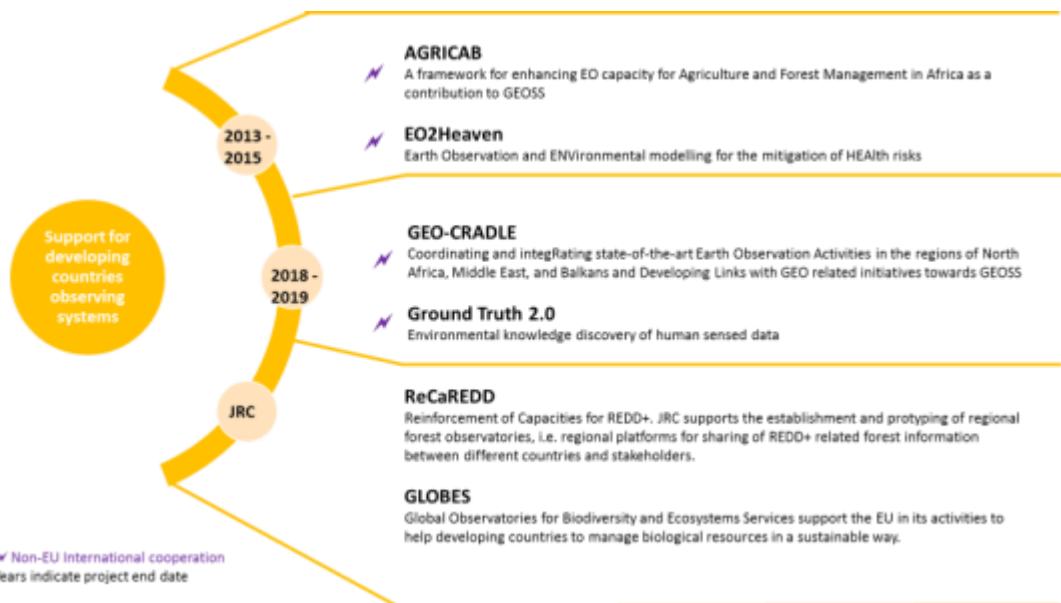
Example projects for support for developing countries to establish and maintain observing systems are depicted below. These include Agricab, EO2 Heaven, Geo-Cradle and Ground Truth 2.0.

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

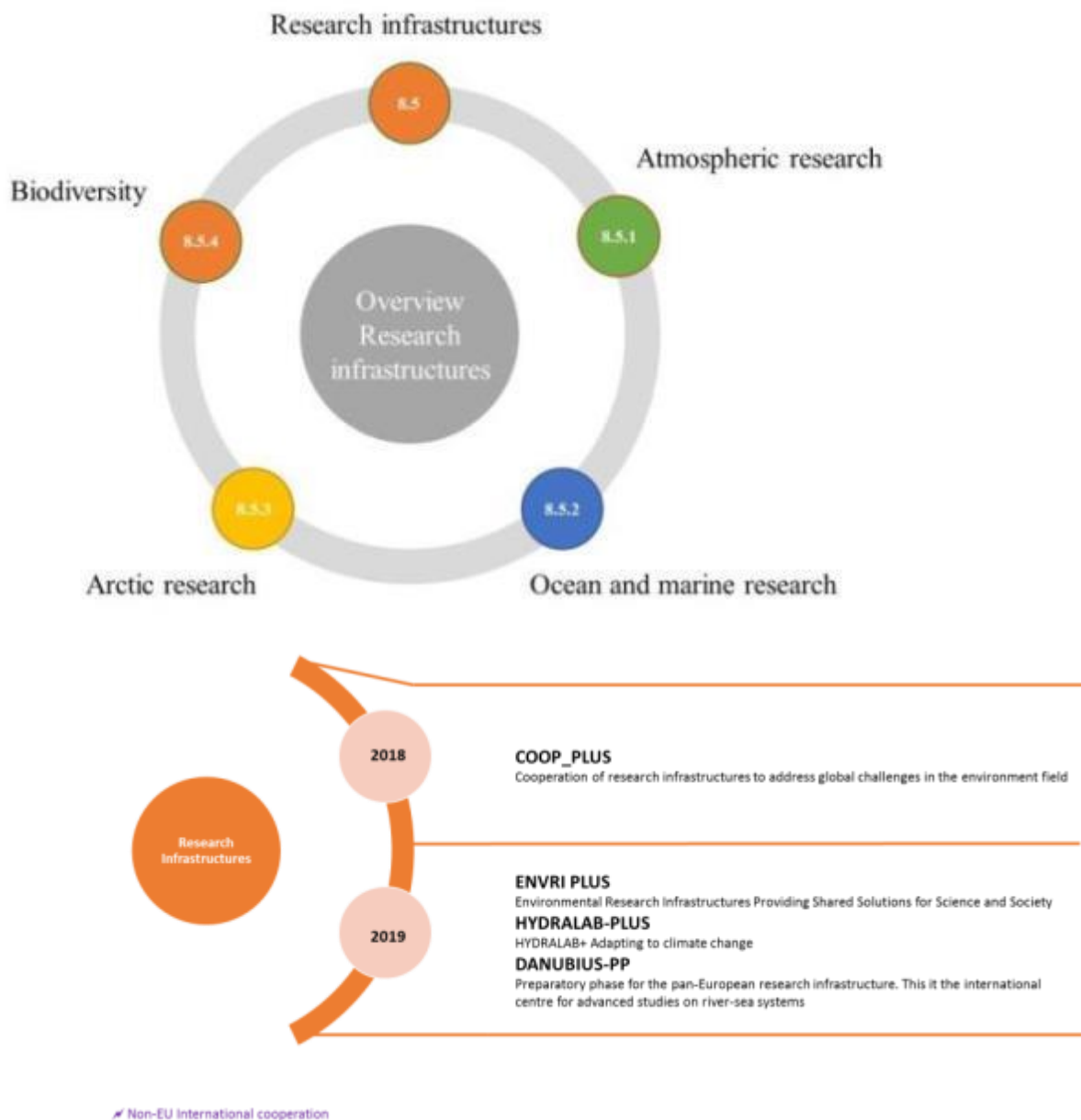
the improvement of the baseline information sought by the EC and the UN Convention on Biological Diversity to assess progress on key targets, and the increased support of JRC to developing countries through capacity building and improved access to essential information.



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

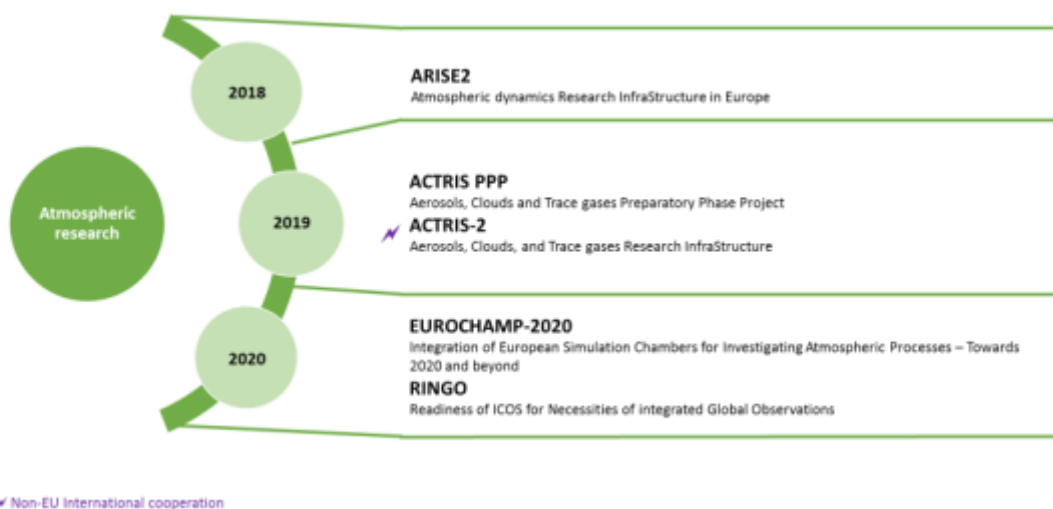


8.5.1. Atmospheric research

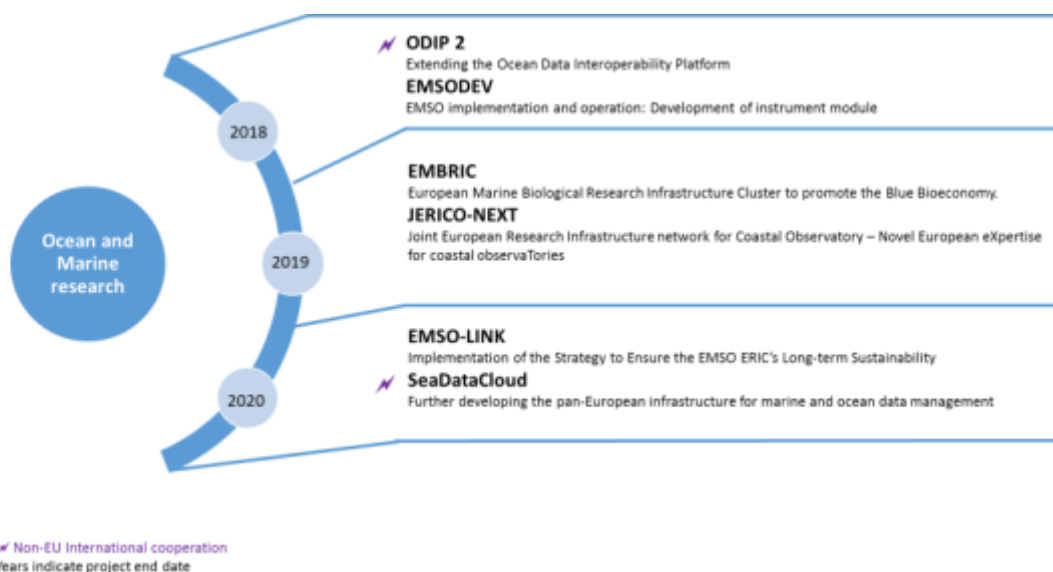
Example project of research infrastructures for atmospheric research are depicted below.

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.



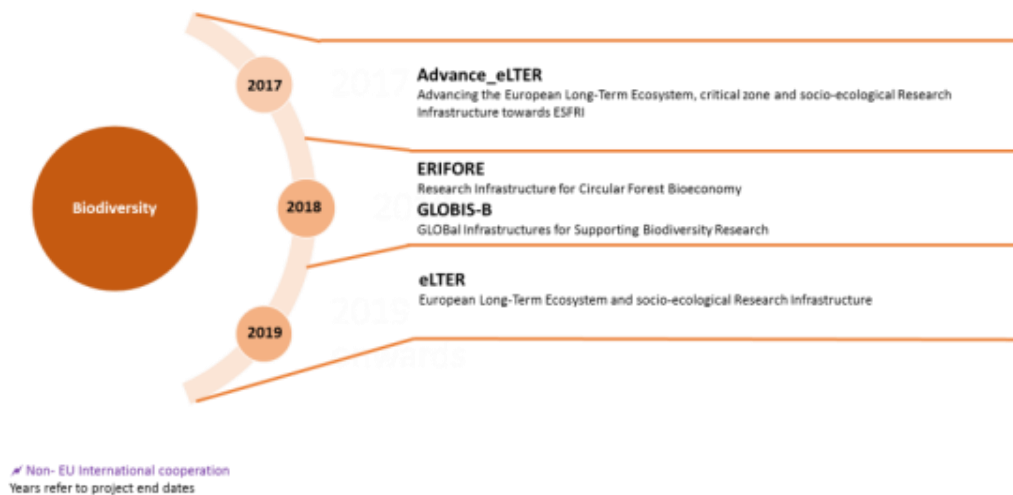
8.5.2. Ocean and Marine research



8.5.3. Arctic research



8.5.4. Biodiversity



4. 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).

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.

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.

4.2.1. *Erasmus+ – Education*⁷⁴

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.

4.2.2. *Horizon 2020 – science education*⁷⁵

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.

4.2.3. *Climate KIC*⁷⁶ *and InnoEnergy*⁷⁷

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)

⁷⁴ European Commission, Erasmus+, http://ec.europa.eu/programmes/erasmus-plus/node_en (webpage accessed 29-08-2017)

⁷⁵ European Commission, Science Education, <https://ec.europa.eu/programmes/horizon2020/en/h2020-section/science-education> (webpage accessed 29-08-2017)

⁷⁶ European Commission, Climate-KIC, <http://www.climate-kic.org/> (webpage accessed 17-10-2017)

⁷⁷ European Commission, EIT InnoEnergy, <https://eit.europa.eu/eit-community/eit-innoenergy>. (webpage accessed 17-10-2017)

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.

4.3.1. *EU Climate Diplomacy Days*^{78, 79, 80}

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.

78 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)

79 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)

80 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.

4.3.2. *EU Open Doors Day*^{81, 82, 83}

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.

4.3.3. *Covenant of Mayors for Climate and Energy*⁸⁴

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 & Energy⁸⁵, a newly merged initiative to bring these two efforts together.

81 European Union, Europe Day, https://europa.eu/european-union/about-eu/symbols/europe-day_en. (webpage accessed on 29-08-2017)

82 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)

83 European Commission, Climate and Energy Stand 2017, http://ec.europa.eu/belgium/events/170506_ener_clima_en. (webpage accessed on 29-08-2017)

84 Covenant of Mayors for Climate and Energy, http://www.covenantofmayors.eu/index_en.html. (webpage accessed 29-08-2107)

85 Global Covenant of Mayors for Climate & Energy, [Global Covenant of Mayors for Climate & Energy \(webpage accesses 18-10-2017\)](#)

4.3.4. *EU Sustainable Energy Week*⁸⁶

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.

4.3.5. *Resource Efficiency Campaign*⁸⁷

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.

⁸⁶ European Commission, Sustainable Energy Week, <http://www.eusew.eu/about-sustainable-energy-week>, (webpage accessed 29-08-2107)

⁸⁷ 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)

4.3.6. *EU Green Week*⁸⁸

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.

4.3.7. *European Business Awards for the Environment*⁸⁹

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.

4.3.8. *European Green Capital Award and European Green Leaf Award*⁹⁰

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.

⁸⁸ European Commission, EU Green Week, 2017, <http://www.eugreenweek.eu/>, (webpage accessed 29-08-2107)

⁸⁹ European Commission, European Business Awards for the Environment, <http://ec.europa.eu/environment/awards/index.html>, (webpage accessed 29-08-2107)

⁹⁰ 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.

4.3.9. *Our planet, our future*⁹¹

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.

91 European Commission, Youth & Climate, 2017, https://ec.europa.eu/clima/citizens/youth_en. (webpage accessed 29-08-2107)

4.3.10. *European Mobility Week*^{92, 93}

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.

Monitoring public opinion

4.4.1. *Eurobarometer results on climate change (2017)*⁹⁴

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 2013⁹⁵, 2015⁹⁶ 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

92 European Mobility Week, 16-22 September 2017, <http://www.mobilityweek.eu/home/>, (webpage accessed 29-08-2107)

93 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)

94 European Commission, Special Eurobarometer 459 Climate Change, September 2017, https://ec.europa.eu/clima/sites/clima/files/support/docs/report_2017_en.pdf

95 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)

96 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).

4.4.2. Eurobarometer results on environment (for 2014) ^{97, 98}

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.

Communication activities

4.5.1. 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/

⁹⁷ 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

⁹⁸ 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/

4.5.2. *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 website⁹⁹.

The European Environment Agency also publishes regular assessments on climate change mitigation and adaption, including the annual report on trends and projections on greenhouse

⁹⁹ 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 EU¹⁰⁰. The EEA has also published a comprehensive assessment on climate change impacts and vulnerability in Europe¹⁰¹ as well as an EEA briefing on climate finance¹⁰². 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 2015¹⁰³ focused mainly on climate change, while 2016¹⁰⁴ and 2017¹⁰⁵ 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 website¹⁰⁶.

4.5.3. 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

100 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)

101 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)

102 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)

103 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)

104 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)

105 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)

106 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

4.5.4. *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.

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.

4.6.1. *Erasmus+ – Training*¹⁰⁷

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.

¹⁰⁷ Erasmus Plus, <https://www.erasmusplus.org.uk/>. (webpage accessed 29-08-2017)

4.6.2. *ManagEnergy*¹⁰⁸

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.

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.

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.

4.8.1. *Consultation on revision to the EU Emission Trading System Directive*¹⁰⁹

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.

¹⁰⁸ European Commission, Executive Agency for SMEs, ManagEnergy, <https://ec.europa.eu/easme/en/managenergy>. (webpage accessed on 29-08-2017)

¹⁰⁹ 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.

4.8.2. *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*¹¹⁰

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).

International cooperation on education, training and public awareness

4.9.1. *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 programme¹¹¹ 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.

4.9.2. *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.

110 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)

111 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)

4.9.2.1. Global Climate Change Alliance (GCCA)¹¹²

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.

4.9.2.2. World Bank Partnership for Market Readiness (PMR)¹¹³ and International Carbon Action Partnership (ICAP)¹¹⁴

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 agreed¹¹⁵, 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.

4.9.2.3. Group on Earth Observations (GEO) Capacity Building^{116, 117}

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

112 Global Climate Change Alliance, <http://www.gcca.eu/>, (webpage accessed on 29-08-2017)

113 World Bank, The Partnership for Market Readiness, <https://www.thepmr.org/>, (webpage accessed on 29-08-2017)

114 International Carbon Action Partnership, <https://icapcarbonaction.com/en/>, (webpage accessed on 29-08-2017)

115 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)

116 Group on Earth Observations, Capacity Building, <http://www.earthobservations.org/cb.php>, (webpage accessed on 29-08-2017)

117 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 resources¹¹⁸ (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.

4.9.2.4. Mission Innovation¹¹⁹

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.

¹¹⁸ 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)

¹¹⁹ <http://mission-innovation.net/about/>

5. 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 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://applycate.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	HAWA	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.imprex.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 rēduction, 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/

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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

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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

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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

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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

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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/

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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/

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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

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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

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